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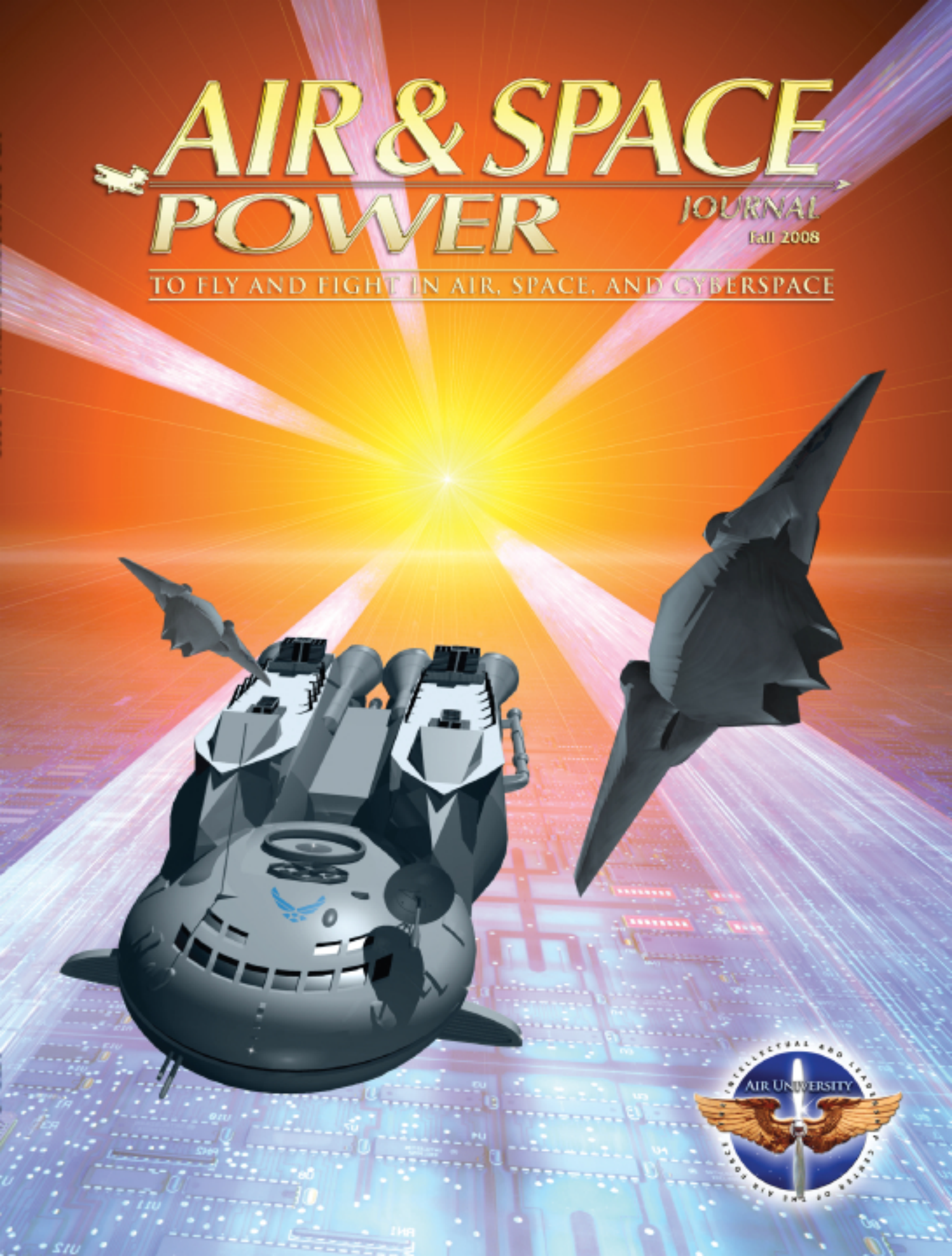
Fall 2008

TO FLY AND FIGHT IN AIR, SPACE, AND CYBERSPACE



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The Transformation of Air Forces on the Korean Peninsula

Lt Gen Stephen G. Wood, USAF
Maj Christopher A. Johnson, DM, USAF

TODAY NEARLY 28,000 American warriors stand shoulder to shoulder with our Republic of Korea (ROK) allies defending freedom along the demilitarized zone. This is the most visible aspect of our commitment to a strong ROK-US alliance, born in blood when the United States came to the Republic of Korea's defense in 1950. Like any enduring relationship, the alliance has evolved since the signing of the armistice in 1953. A good example of this evolutionary change concerns the command relationships within the alliance. When the United States entered the war, the ROK president, Syngman Rhee, placed all ROK forces under the command of the United Nations Command and Gen Douglas MacArthur. This command and control (C2) arrangement remained unaltered until 1994, when the two nations agreed that the Republic of Korea would assume operational control (OPCON) of its own forces during armistice, with the commander of Combined Forces Command (CFC) authorized OPCON only during crisis and war. This evolutionary change was appropriate at the time, based on the threat and the Republic of Korea's capability. Today, the alliance is in the midst of another evolutionary change that will see the most remarkable transformation in its 58-year history.

In February 2007, the defense chiefs of the two nations agreed that on 17 April 2012, the Republic of Korea would assume responsibility for its own defense and retain full OPCON of its own forces during armistice, crisis, and war.

Since 1978 the war-fighting command on the peninsula has been CFC, commanded by a US general officer—currently Gen Walter L. Sharp, who is leading the transformation that will result in several monumental changes in the alliance structure. First, CFC will be disestablished. At that time, the Republic of Korea will assume responsibility for its own defense. Simultaneously, the United States will activate US Korea Command (USKORCOM), which will serve in a doctrinally correct supporting role within our alliance. Importantly, a key imperative is that CFC will remain ready to fight tonight and ensure the defense of the Republic of Korea until the moment that CFC's flag is lowered for the last time. The evolution of the security partnership adds further strength to the two-nation alliance that will serve US interests in the stability of the Asia-Pacific region for many years.[1]

Current and Future Command Relationships

The current CFC headquarters may appear to achieve unity of command, but in reality the US commander of CFC exercises unified command in wartime only, with continuing concurrence of the two allied nations. In fact, as is always the case in multinational operations, both nations maintain command of their forces, authorizing the CFC commander to exercise OPCON of those forces within selected parameters and reserving the right to modify missions or withdraw forces at any time (fig. 1).

In the US supporting-to-supported construct of 2012, the USKORCOM commander will exercise national OPCON over US forces in the same way the present commander of US Forces Korea maintains national command.[2]

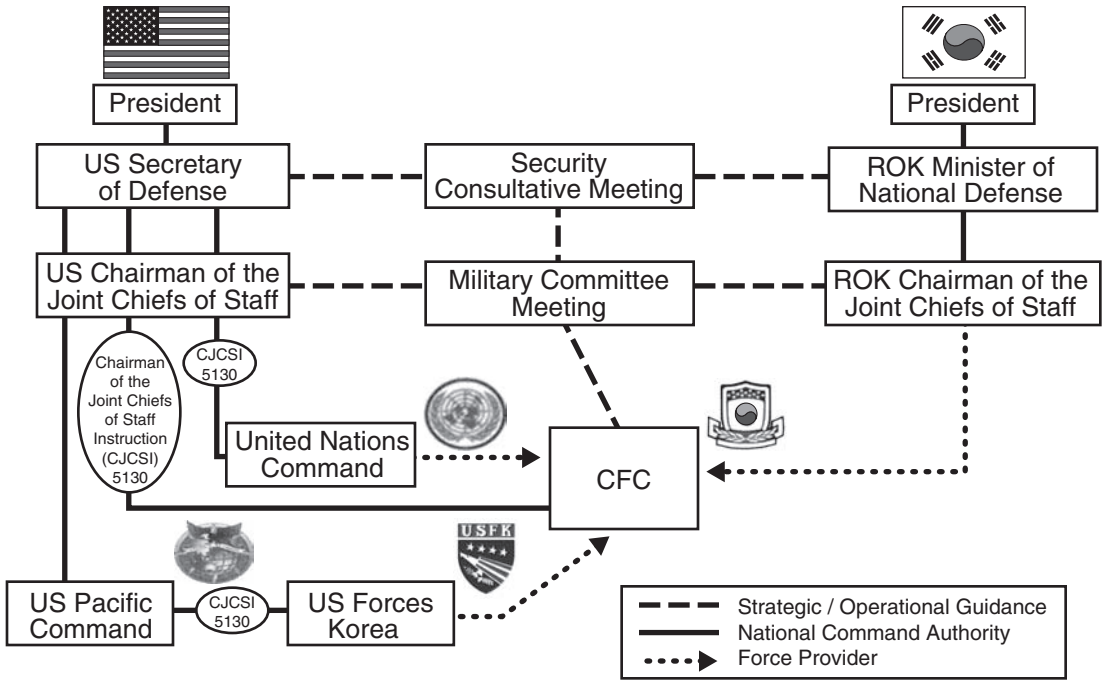

Figure 1. Current command relationships

The USKORCOM commander will then appropriately place committed US forces in supporting roles to Korea Joint Forces Command (KJFC), with command relationships ranging from supporting to tactical control (TACON) and with selected levels of administrative control, while maintaining US OPCON. Specific USKORCOM command relationships with US higher authorities will be determined in appropriate consultative processes and agreements within the alliance and ultimately described in a revised Chairman of the Joint Chiefs of Staff Instruction 5130 (fig. 2).[3]

Presently, air forces of both nations operate under the wartime OPCON of the CFC commander, which he or she delegates to the commander of Air Component Command (ACC). The organizational structure of CFC and its subordinate combined commands is straightforward, resembling a traditional organization with a vertical chain of command (fig. 3).

Based on agreements reached during security consultative meetings, each component is currently led by either a US or an ROK component commander reporting directly to the CFC commander. The Seventh Air Force commander, Lt Gen Stephen G. Wood, leads ACC. After the Republic of Korea assumes wartime OPCON in 2012, both nations agree that the C2 of US and ROK air forces will remain under US leadership in an integrated fashion, much as it is today. The major difference lies in the future supporting-to-supported command relationships (fig. 4).

Alliance Capabilities

The alliance's capability and will to defend the Republic of Korea from North Korean aggression has never been stronger. Well known to the reader are the advancements in US military

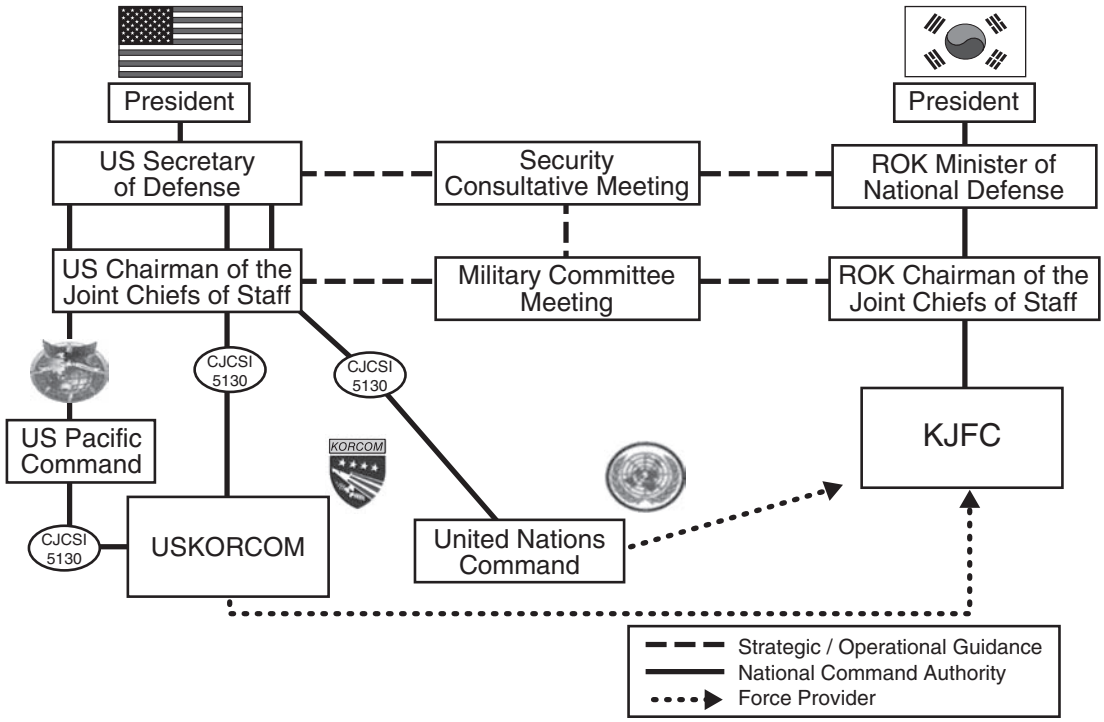

Figure 2. Future command relationships

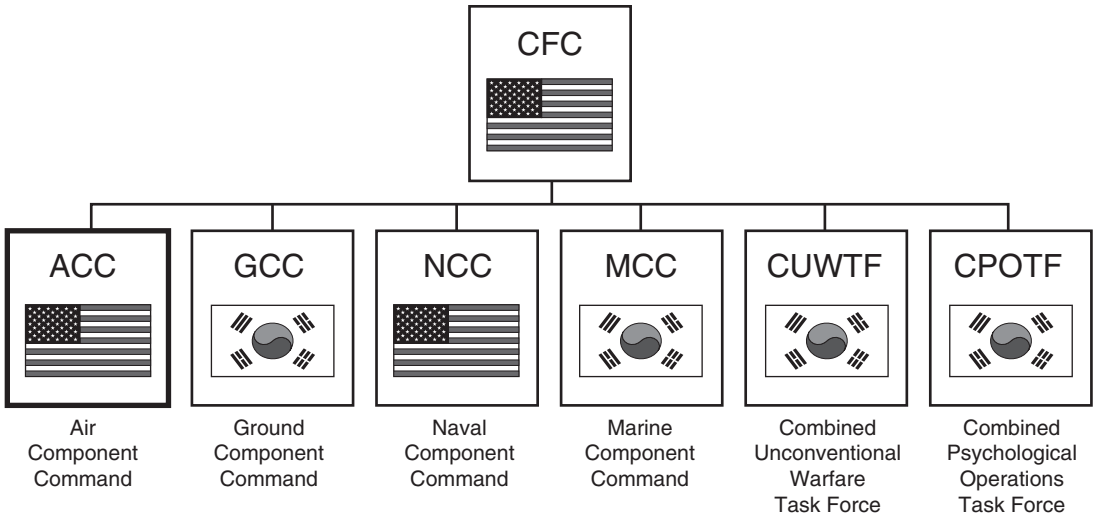

Figure 3. Air forces as part of Combined Forces Command

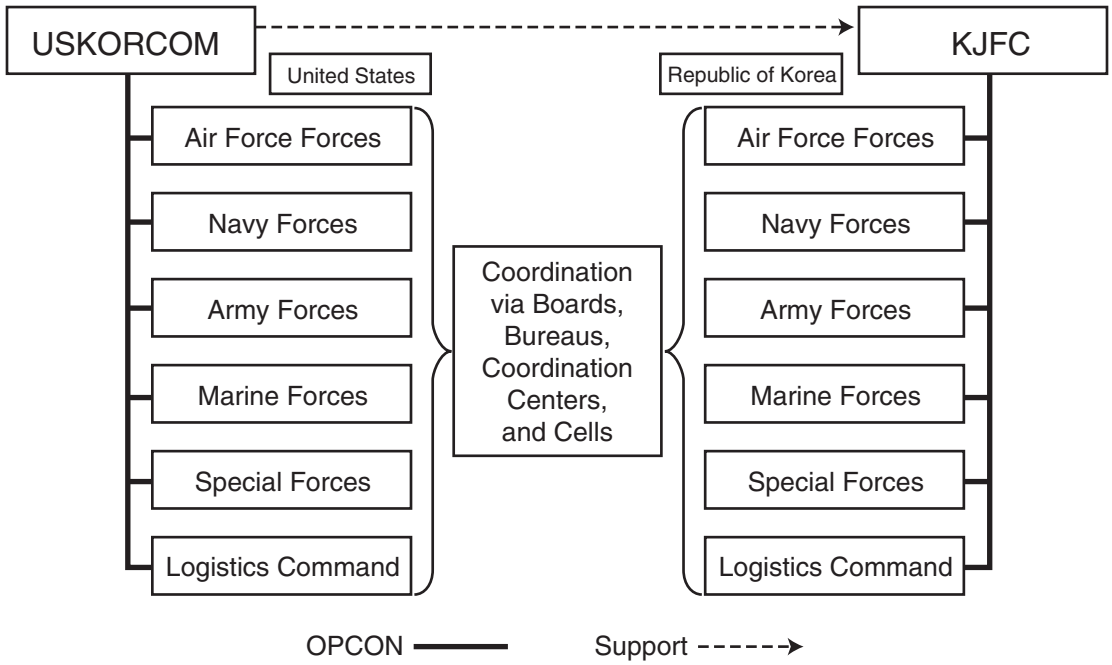

Figure 4. Air component in a supporting role

capability over the last two decades. Less well known is the fact that the Republic of Korea has placed tremendous emphasis on modernization and military competence. The Republic of Korea is now the 13th largest economy in the world, spending approximately $24.3 billion—about 2.6 percent of its gross domestic product—on defense each year. Its military comprises 677,000 active duty personnel, equipped with the most modern military technology. For instance, nearly 40 percent of the ROK Air Force's (ROKAF) 500 fighters are F-15K and F-16 aircraft.[4] However, the bedrock of the ROK military is its ground forces, with 541,000 active duty personnel and an additional 2.96 million trained soldiers in reserve. The leadership of the ROK Army is also top notch, as proven during exercise vignettes in which the CFC commander cedes control to his ROK counterpart. Consequently, from an alliance perspective, the ROK military is capable of leading the ground campaign. Thus, under the CFC transformation plan, the US military's contribution to the alliance will become more air- and naval-centric in the future.

When fully transformed, USKORCOM will be in a doctrinally correct supporting-to-supported relationship with the ROK warfighting command, and the transformed alliance will place a premium on air, space, and cyberspace power. Flawless execution of the integrated tasking order will require placement of air, space, and cyberspace power advocates within the future KJFC headquarters. The heavy emphasis on air requires that the doctrinal concepts of the air component coordination element (ACCE) be fully adopted not only for the United States but also in an integrated fashion with our ROKAF allies. KJFC, leading as the supported organization, will benefit greatly from the collocated presence of both a USAF and ROKAF senior officer who can advocate on behalf of the combined force air component commander (CFACC). These senior officers, acting as the ACCE directors, can explain how the ROKAF and USAF can best support land and maritime operations with air, space, and cyberspace power. More importantly, because of the strong emphasis on air operations in this area of responsibility, the ACCE director can help KJFC understand how to support the air scheme of maneuver.[5] A robust, integrated ACCE team, representative of the skill sets at the Korea Air Operations Center (KAOC), will support the ACCE directors. This team will be matched one for one with ROK counterparts of equivalent rank and expertise.

The emphasis on a US air- and naval-centric approach in 2012 creates a need to evaluate the current joint composition within USKORCOM headquarters. The opening days of crisis or war require that the right composition of skills be available within USKORCOM to support a major air effort. As an absolute requirement, experts in air, space, and cyberspace power from the USAF, along with air experts from the other components, should provide these skills. Today, joint manpower at Headquarters US Forces Korea is generally weighted more towards the Army than the other components due to the legacy organizational structures that required such emphasis at the time. The activation of USKORCOM in 2012 will present an opportunity to restructure the organization to meet twenty-first-century needs, and plans are under way to propose that the service mix in the future USKORCOM staff comprise a higher percentage of USAF joint officers.

The combined ROK and US air forces, formed as the ACC during crisis and war, provide the critical capability for deterring any aggression and are a decisive component for victory. Our strong relationship with our ROK counterparts reflects Seventh Air Force's deep commitment to the peace and stability of the Korean peninsula. In the future, Seventh Air Force will continue to lead through the KAOC in executing the master air attack plan. After 2012, however, the CFACC will operate in a supporting-to-supported relationship to the future KJFC instead of the subordinate relationship that currently exists with CFC. The US CFACC will still receive commander's guidance from the future USKORCOM commander on the best way to fulfill the supporting role but will primarily follow KJFC's strategic guidance and intent.

Air Forces in Supporting-to-Supported Relationships

The United States and Republic of Korea will evolve from a combined command structure to two separate but complementary commands that will operate in a supporting-to-supported relationship, designed to be both responsive and flexible. This relationship permits each nation to adapt in a better way to future changes in the ROK-US alliance. However, use of supporting-to-supported command structures may pose unique challenges that do not presently exist. Unity of effort, the bedrock of an effective combined organization, will have to be preserved with coordination mechanisms. The boards, bureaus, centers, and cells that USKORCOM and its components will establish as coordination mechanisms with the commands they support will preserve unity of effort in the future command relationship. Fortunately, the supporting-to-supported relationship is not a new concept on the peninsula. Commanders frequently place US forces in supporting roles to ROK forces and test them through Exercises Ulchi Freedom Guardian and Key Resolve, which will offer tougher challenges to this construct in future years. Unlike the CFC commander, the future USKORCOM commander will not have wartime OPCON of the ROK forces with which he or she establishes these supporting relationships. Each nation will retain OPCON of its respective forces, and the USKORCOM commander will remain the executive agent for all US forces on the peninsula in all phases of conflict.

The air forces represent one unique exception related to the evolution from combined to supporting-to-supported relationships as it pertains to the KAOC. This organization will remain integrated, with both nations working within the same hardened facility. The KAOC will also stay under the leadership of the USAF with a ROKAF deputy, both lieutenant generals. The United States will continue to lead the KAOC because of its premier air- and space-centric C2 and planning capabilities, which complement what is still a predominantly ground-centric ROK military. However, there will come a time when the ROKAF will be ready to lead, and the USAF fully supports ROKAF efforts to forge an intradependent air force. Intradependency, a mutually reinforcing and redundant situation, adds increased capability, self-reliance, and flexibility for both air forces.

With the disestablishment of ACC in 2012, it will no longer exercise OPCON over ROKAF forces. Instead, the doctrinal concepts of the CFACC will provide definition for new command authorities and relationships. By joint and USAF doctrine, the CFACC will exercise TACON over those air forces offered in support. In Korea the CFACC is also the commander, Air Force forces and thus retains OPCON over USAF service component forces. The future KJFC will provide TACON of ROK air forces to the CFACC for combined air operations as executed through the KAOC. Fortunately, TACON of ROKAF forces and of those provided by the other services is all the authority required when compared to the OPCON presently retained by the ACC commander.

Intradependent Air Forces

In an intradependent relationship, each air force would not depend entirely on the other for the successful accomplishment of a particular task. Of course, self-reliant nations still have unique strengths that, when brought together, create synergies otherwise nonexistent. This is why the alliance between our two nations is so special. The ROK Defense Ministry continues to forge intradependence in its air force with plans to increase spending on arms acquisition by 19.8 percent for fiscal year 2008. This effort will make defense-acquisition spending a total of 29.7 percent of the total defense budget.[6] Three projects included in this budget increase are essential to the ROKAF's self-reliance and force modernization: the surface-to-air missile (SAM-X), the fighter-X (FX), and the early warning aircraft-X (EX).

A critical force-improvement plan for replacing 40-year-old Nike SAMs, the SAM-X project calls for the ROK Defense Ministry to procure modern SAMs from Germany.[7] This effort will significantly modernize air-defense capabilities and ROKAF intradependence as

well as bolster the Republic of Korea's ability to defend against an air attack now and a long-range missile threat from North Korea later. To improve ROKAF self-reliance, this project should continue on an annual basis with the goal of expanding coverage into unprotected areas as a means to reduce reliance on the US Patriot system.

The FX project, which has received much press coverage with the debut of the F-15K, reflects a tremendous success story for the ROKAF's pursuit of intradependency. In 2002 the Republic of Korea signed a contract to purchase 40 F-15Ks from Boeing, which has delivered 28 so far. The remaining inventory is due by the end of 2008. These aircraft replace portions of a significantly aged ROKAF inventory and will allow our alliance partner to perform long-range, precision-strike missions day or night, in any weather, and without escort. Some observers worry that these advanced fighters are not replacing older aircraft fast enough. Fortunately, the Republic of Korea's Defense Acquisition Program Agency completed negotiations with Boeing to buy 21 more F-15Ks before the end of 2012, when CFC disestablishment takes place. This agency also has a long-term vision to acquire about 60 stealth fighter jets, such as the F-35, by 2019. This modernization effort, especially if expanded to include advances in fighter weaponry and weapon-targeting technology, indicates the Republic of Korea's commitment to the FX project as a critical component of ROKAF intradependence.[8]

Another program synchronized with the retention of wartime OPCON by the ROK military in 2012 is the EX project. Of all the ROKAF modernization efforts, the ability to provide robust C2 with airborne early warning and control aircraft will represent another significant advance for ROKAF intradependence. Boeing will deliver the first 737-model early warning aircraft in 2011 and three more in 2012, along with a full complement of flight- and mission-training systems and mission support.[9] This advance in C2 capability increases the ROKAF's self-reliance and enables the country to complement the much-in-demand US E-3 Sentry Airborne Warning and Control System aircraft. Opportunities may exist over the long term to expand the EX program with other systems such as C2 platforms based on the moving target indicator (MTI). In April 2007, Seventh Air Force gained approval to fly several ROKAF senior leaders on a rare but insightful E-8 Joint Surveillance Target Attack Radar System (JSTARS) mission from the 116th Air Control Wing over the Republic of Korea to impress upon them the value of the MTI and JSTARS C2 capabilities. With MTI technology and robust C2, the ROKAF will be able to provide theater ground and air commanders with ground surveillance to support attack operations and targeting that contribute to the delay, disruption, and destruction of enemy forces. Self-reliant surveillance, reconnaissance, and C2 capabilities are within reach, should the Republic of Korea follow up on the success of the EX program with the acquisition of MTI-based platforms and completion of plans to purchase four unmanned surveillance aircraft.

Ready to Fight Tonight

Seventh Air Force and the Republic of Korea's Air Force Operations Command are truly ready to fight tonight, and we will be ready to adapt our integrated operations to a supporting-to-supported construct by 2012. Our robust exercise schedule will challenge us to perform under the new construct while optimizing our relationship with the supported KJFC through inclusion of an integrated US and ROK ACCE. Force-modernization efforts for both nations will play a significant part in our transformation agenda as we approach the disestablishment of ACC. The SAM-X, FX, and EX projects provide only a few examples of how the ROKAF is moving towards intradependence. The ROKAF's continued pursuit of self-reliance and the strong friendship between our two nations will assure the foundation for sustained peace and stability in Northeast Asia. ❑

Notes

1. For details on the meeting between the US secretary of defense and the ROK minister of defense, see US secretary of defense to commander United States Forces Korea, memorandum, subject: US Forces Korea Transformation Guidance, 4 July 2007.

2. See Joint Publication (JP) 0-2, *Unified Action Armed Forces (UNAAF)*, 10 July 2001, chap. 3, "Doctrine and Policy for Joint Command and Control," http://www.dtic.mil/doctrine/jel/new_pubs/jp0_2.pdf; and JP 3-16, *Multinational Operations*, 7 March 2007, http://www.dtic.mil/doctrine/jel/new_pubs/jp3_16.pdf.

3. Chairman of the Joint Chiefs of Staff Instruction 5130.01C, *Relationships between Commanders of Combatant Commands and International Commands and Organizations*, 1 February 2008, outlines specific relationships and defines authorities.

4. *2006 Defense White Paper* (Republic of Korea: Ministry of Defense, 17 May 2007), http://www.mnd.go.kr/mndEng/DefensePolicy/Whitepaper/index.jsp.

5. For details on the ACCE construct, see Air Force Doctrine Center Handbook 10-1, *The Air and Space Commander's Handbook for the Joint Force Air Component Commander*, 27 June 2005.

6. Chin Tae-ung, "Defense Ministry Seeks 20 Percent Hike in Purchase," *World News Connection*, 30 May 2007, 1.

7. Ibid.

8. Lee Chi-dong, "Seoul's Plan to Buy More F-15K Jets Remains Despite F-15 Grounding," *World News Connection*, 8 November 2007, 1.

9. "Boeing Holds E-X Conference in S. Korea," *UPI Security Industry—Briefs*, 6 November 2007, 1.

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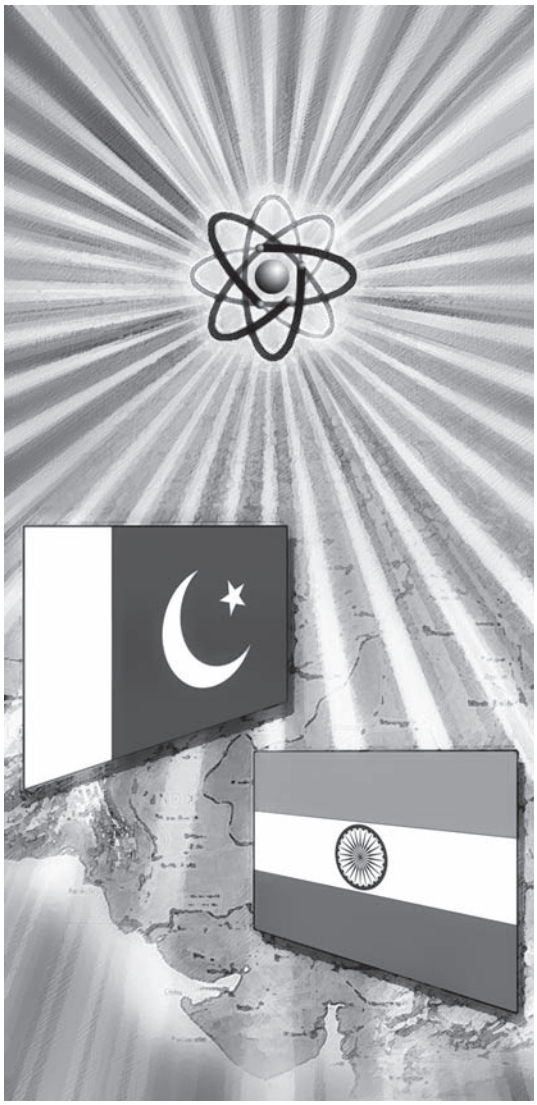
Airpower Imbalance

Nuclear Pakistan's Achilles' Heel

Air Commodore Tariq Mahmud Ashraf, Pakistan Air Force, Retired*



THE OVERT NUCLEARIZATION of India and Pakistan in May 1998 drastically altered the military landscape of South Asia. Military planners on both sides now had to grapple with the additional strategic doctrinal dilemmas and considerations of deterrence, first use of nuclear weapons, counterforce versus countervalue targeting, nuclear thresholds, and so forth.

Conventional imbalance in the military domain has been a constant, defining characteristic of South Asian defence dynamics ever since India and Pakistan achieved independence in 1947. Understandably, the greater size, population, and resources of India have enabled its military to stay ahead in conventional might, with Pakistan continuing to play the "catch-up" game. Needless to say, apart from the resources available to them, the military potential of both countries has also been shaped significantly by what their respective superpower allies or other friendly countries have been willing to provide them in terms of military wherewithal.

One irrefutable legacy that the Indian and Pakistani militaries retained from the British colonials was their rigid adherence to and unshakeable belief in the somewhat outdated tenets of continental warfare. This led both countries to adopt army-centric military doctrines and resulted in the diversion of more resources towards their respective armies, to the neglect of their navies and air forces. This proved truer in the case of Pakistan, where the army has ruled the country for almost half of its total existence.

*I am thankful to Dr. Rodney Jones, president of Policy Architects International, Reston, Virginia, for his invaluable support and help in collecting data for this article.

The chronic inferiority in the conventional military realm that Pakistan has continued to face led its army to a doctrine of "Strategic Defence and Tactical Offence." Although Pakistan undoubtedly has remained militarily inferior to India, one must realize that Indian conventional military superiority has never reached a stage where one would categorize it as having a "decisive edge" over the Pakistani military. The truth of the indecisive nature of this conventional military imbalance was borne out by the indecisive stalemates that occurred during the wars of 1948 and 1965.[1]

The situation that I have depicted in the preceding paragraphs remained valid until the conduct of nuclear tests by India and Pakistan in May 1998, an epochal event that drastically altered the South Asian military scene. First of all, one needs to understand the essential motivation that drove Pakistan and India to go nuclear. In my reckoning, Pakistan's basic objective in its quest to acquire nuclear military capability has always been the desire to be able to counter India's conventional superiority. India's motivation involved, among other things, its desire to emerge as a regional/global power, the need to balance China, and, of course, the wish to gain a decisive military advantage over Pakistan, which India had failed to achieve in the conventional realm. From this it flows that although Pakistan has designed its nuclear arsenal primarily to deter the launching of a conventional attack by India, India is likely to employ nuclear weapons for the projection of political power and to obviate the chances of any other country's employing nuclear weapons against it. Elaborating on Pakistan's nuclear posture, two commentators write that "nuclear weapons are perceived in Pakistan as an instrument to countervail a manifest conventional inferiority." Explaining further, they describe how the Pakistani nuclear posture is strikingly similar to the North Atlantic Treaty Organization (NATO) doctrine of extended deterrence during the Cold War. This doctrine also made constant reference to the possible use of nuclear weapons to countervail conventional inferiority vis-à-vis the Warsaw Pact military forces; furthermore, it refused to issue any no-first-use declaration. In fact, NATO has not issued any such declaration to this day and remains ambiguous on this matter, just as Pakistan has opted to do.[2]

In any military conflict between two nuclear-armed adversaries such as India and Pakistan, one could safely conclude that the chances are much higher of the conventionally weaker country (Pakistan) opting to use nuclear weapons first. This is precisely why India has disavowed first use in its draft nuclear doctrine; Pakistan, however, continues to maintain a semblance of ambiguity regarding its first-use posture while simultaneously continuing to imply that such employment remains a possibility.

Since any future South Asian conflict would start in the conventional realm before escalating to nuclear dimensions, and because Pakistan is the more likely of the two adversaries to opt for the first use of nuclear weapons, it is vital for us to study the possible course of events that could make Pakistan move up the conflict-escalation ladder by opting to go nuclear. In my opinion, one could better describe this decision point—commonly referred to as the "nuclear threshold"—as the "nuclear-escalation threshold."

Because of Pakistan's continuing nuclear ambiguity, we have heard little discussion of such key issues as what its nuclear-escalation threshold actually means. One significant exception to the silence of the Pakistani leadership on this matter occurred when a group of Italian journalists interviewed Lt Gen Khalid Kidwai, the director general of Pakistan's Strategic Plans Division. In a marked departure from earlier statements and interviews, which ignored this vital subject, General Kidwai outlined the limits of Pakistan's nuclear-escalation threshold:

> It is well known that Pakistan does not have a "No First Use Policy." Pakistani nuclear weapons will be used, according to Gen. Kidwai, only "if the very existence of Pakistan as a state is at stake." This has been detailed by Gen. Kidwai as follows:
>
> "Nuclear weapons are aimed solely at India. In case that deterrence fails, they will be used if
>
> a. India attacks Pakistan and conquers a large part of its territory (space threshold)

b. India destroys a large part either of its land or air forces (military threshold)

c. India proceeds to the economic strangling of Pakistan (economic strangling)

d. India pushes Pakistan into political destabilization or creates a large scale internal subversion in Pakistan (domestic destabilization)"[3]

Since domestic destabilization and economic strangulation are not relevant to the subject of this discussion, I will focus on the space and military thresholds. Regarding the territorial or space threshold, I have previously written the following:

> In conventional terms, the occurrence of any of the following events could warrant Pakistan resorting to the nuclear option:
>
> Penetration of Indian forces beyond a certain defined line or crossing of a river.
>
> Imminent capture of an important Pakistani city like Lahore or Sialkot. . . .
>
> Indian crossing of Line of Control . . . to a level that it threatens Pakistan's control over Azad Kashmir.[4]

Although the denial of Pakistani territory to the Indian military would jointly fall into the domain of the Pakistan Army and the Pakistan Air Force (PAF), the former would bear primary responsibility for it, with the latter operating essentially in a supportive role.

At this stage, we would do well to conduct a brief comparative overview of the respective armies and air forces of India and Pakistan since these two military arms would play a major role in determining the outcome of any conventional war between those countries. Regarding the two armies, the Indian Army has a better-than two-to-one advantage in personnel, armour, and artillery. It has always been an accepted fact amongst military strategists and practitioners that in order to ensure success, a land force on the offensive must have a three-to-one advantage in numbers over the defending force since the latter operates from well-dug-in and reinforced positions generally located in terrain very familiar to its personnel. The Indian Army does not by itself possess this decisive advantage over the Pakistan Army. If it were to operate jointly with the might of the Indian Air Force (IAF), however, the balance does definitely tilt in favour of the Indians.

Salient comparative aspects of the IAF and PAF show that the former enjoys almost a 2.6:1 advantage in combat aircraft, purely in numerical terms (see table).[5] However, the IAF's exclusive possession of beyond visual range (BVR) weapons and air-to-air refuelling capability, as well as superiority in unmanned aerial vehicles (UAV), further accentuates its advantage. This edge would increase further once the IAF inducts the Phalcon airborne early warning and control (AEW&C) platforms that it has con-

Table. Comparison of IAF and PAF combat assets and potential

Capability	*IAF*	*PAF*	*Analysis*
Manpower	170,000	45,000	3.78:1
Combat aircraft	852	331	2.57:1
Transport aircraft	288	27	10.59:1
Air-to-air refuelling	Yes	No	IAF enjoys exclusiveness
Airborne Warning and Control System	On order	No	IAF will enjoy exclusiveness
BVR air-to-air missiles	Yes	No	IAF enjoys exclusiveness
UAVs	Yes	Yes	IAF enjoys superiority
High-tech combat aircraft	132	32	4.1:1

Compiled from Anthony H. Cordesman and Martin Kleiber, "The Asian Conventional Military Balance in 2006: The South Asian Military Balance," working draft (Washington, DC: Centre for Strategic and International Studies, 26 June 2006), http://www.csis.org/media/csis/pubs/060626_asia_balance_south.pdf; and Rodney W. Jones, *Conventional Military Imbalance and Strategic Stability in South Asia*, SASSU [South Asian Strategic Stability Unit], Research Paper no. 1 (United Kingdom: University of Bradford, Department of Peace Studies, March 2005), 15, 29–33, http://www.policyarchitects.org/pdf/Conventional_imbalance_RJones.pdf.

tracted to acquire from Israel. The PAF has been able to induct a few UAVs but has still not finalized any plans for the induction of an AEW platform despite having evaluated the Swedish Erieye system. If one also factors into the equation the number of combat aircraft operated by the opposing navies, the disparity increases even further.

The IAF's technological edge is also evidenced by the disproportionately large number of high-technology combat aircraft that it possesses vis-à-vis the PAF.[6] This qualitative advantage has shifted to the IAF because of its unrestricted access to Russian and Israeli technology while Pakistan has been denied any additional aviation assets other than a handful of upgraded F-16 aircraft from the United States. China, Pakistan's main provider of military aircraft, does not currently produce any combat aircraft comparable to the Western high-technology variety. Although this ratio might improve slightly after the initially ordered batch of 24 F-16C/D aircraft enters service (Pakistan has taken delivery of the first two aircraft), the IAF will again gain the edge with the induction of an additional 126 advanced combat aircraft that it is in the process of acquiring from the West. The most significant disparity lies in the number of high-technology combat platforms that the two air forces possess. Although the IAF has a 2.6:1 advantage in overall numbers, its advantage in high-tech aircraft exceeds a factor of 4.1:1, which will probably continue to grow as more Su-30 MKI aircraft and the additional 126 advanced combat aircraft join the IAF and enter operational service.

The IAF has a large fleet of transport aircraft that bestows significant military-airlift capability. Its advantage of over 10:1 in this area gives the IAF a strategic level of airlift capability, but one could best describe the PAF as having only modest airlift potential. Viewed from the perspective of the IAF's substantially greater pool of trained manpower, India's enormous air-transport potential adds significantly to the flexibility of operational mobility in terms of rapid deployment and redeployment.

The IAF possesses more than twice as many total aircraft as the PAF, as well as a 3.78:1 advantage in manpower. The freedom of being able to deploy operational assets at a greater number of operating locations is an obvious corollary of this edge. Having illustrated the gross imbalance that exists between the two air forces, I now move on to the implications that imbalance would have in any future conventional war between India and Pakistan.

To a great extent, modern land warfare depends upon establishing a favourable air situation over the battlefield, which entails the friendly air force's fully supporting its own army while simultaneously preventing the adversary air force from interfering with its operations. The IAF-versus-PAF comparison indicates that the IAF is much more capable of achieving a favourable air situation over the area of the land battle, so it can contribute significantly to the success of an Indian land offensive. Moreover, the strong IAF, with its exclusive access to AEW aircraft and BVR missiles, could neutralize the PAF by mounting a concerted counterair-operations campaign against the latter.[7] Adequate neutralization of the PAF would absolutely open the path to an Indian victory on the ground, and the offensive formations of the Indian Army would be virtually unstoppable. This could well create a state of affairs, mentioned above, in which, as General Kidwai put it, "the very existence of Pakistan as a state is at stake."

An analysis of the comparative strengths of the Indian and Pakistani militaries clearly identifies the air force as the weakest link in Pakistan's military—especially when compared directly with the much more powerful and better equipped IAF. One must not underestimate the significance of this weakest link since the destruction of the PAF emerges as the quickest way to make Pakistan contemplate the undesirable escalatory step of turning a conventional, limited war into a nuclear holocaust.

This conclusion has lessons not only for Pakistan's government but also for the major global powers. The Pakistani government must embark on a crash program to suitably reequip its air force, but the major global powers must also understand that enhancing the level of stability in South Asia requires that Pakistan's nuclear-escalation threshold be raised and not allowed to drop any further. As I have indicated, the

means for doing so lie in strengthening this weakest link in Pakistan's military chain.

As the Kargil conflict of 1999 demonstrated, the advent of nuclear weapons in South Asia has not rendered limited conventional wars in the region impossible. In fact, as Michael Krepon argues in his discussion of the stability-instability paradox, small-scale, limited conventional conflicts might even become more frequent in South Asia.[8] All international and regional measures aimed at promoting and achieving nuclear stability in South Asia must focus on ensuring that the nuclear-escalation threshold of the militarily weaker country—Pakistan—does not drop. Consequently, the global community must remain alert to any weaknesses emerging in Pakistan's conventional military wherewithal vis-à-vis India and address these immediately lest a limited conventional conflict in South Asia turn into a nuclear holocaust with terrifying consequences, not only for the region but also for the entire world.

In this context, one must concentrate specifically on the serious imbalance between the air forces of the two countries since the weak air force currently fielded by Pakistan might well prove to be its Achilles' heel by becoming the prime reason for escalating a limited conflict to the nuclear dimension. Paradoxically, therefore, it appears to be in India's national interest to downplay the increasing strength and potential of its air force so as to preclude a further lowering of Pakistan's perceived nuclear-escalation threshold. ❑

Notes

1. I have intentionally not included the 1971 war here since it was more of a civil war for the Pakistani military. Although it did result in the fall of East Pakistan, the situation on the western borders at the end of the war was once again a stalemate, with neither side making significant gains.

2. Paolo Cotta-Ramusino and Maurizio Martellini, "Nuclear Safety, Nuclear Stability and Nuclear Strategy in Pakistan" (Como, Italy: Landau Network-Centro Volta, 21 January 2002), [6], [6]n11, http://www.mi.infn.it/~landnet/Doc/pakistan.pdf.

3. Ibid., [5]. Readers should note that General Kidwai mentions the destruction of Pakistan's army and air force but makes no mention of Pakistan's navy.

4. Air Commodore Tariq Mahmud Ashraf, *Aerospace Power: The Emerging Strategic Dimension* (Peshawar, Pakistan: Pakistan Air Force Book Club, 2002), 152, http://www.pakdef.info/aeropowerfinal.pdf.

5. In terms of pure numbers, the advantage that the IAF has enjoyed over the PAF has gradually been narrowing. According to *The Story of the Pakistan Air Force: A Saga of Courage and Honour* (Islamabad, Pakistan: Shaheen Foundation, 2000), 469, the IAF enjoyed an almost five-to-one superiority in strength over the PAF during the 1971 war, with the PAF having only 22 percent of the IAF's strength.

6. The combat aircraft included in the category of high-tech aircraft include the IAF's Su-30, Mirage 2000, and MiG-29, while the only PAF platform that merits inclusion in this category is the F-16. See Anthony H. Cordesman and Martin Kleiber, "The Asian Conventional Military Balance in 2006: The South Asian Military Balance," working draft (Washington, DC.: Centre for Strategic and International Studies, 26 June 2006), http://www.csis.org/media/csis/pubs/060626_asia_balance_south.pdf; and Rodney W. Jones, *Conventional Military Imbalance and Strategic Stability in South Asia*, SASSU [South Asian Strategic Stability Unit], Research Paper no. 1 (United Kingdom: University of Bradford, Department of Peace Studies, March 2005), 15, 29–33, http://www.policyarchitects.org/pdf/Conventional_imbalance_RJones.pdf.

7. The IAF would retain exclusive possession of AEW capabilities until the PAF inducts a similar platform. However, the IAF's advantage in BVR missiles might not remain once the PAF inducts the additional batch of 24 F-16C/D aircraft since they are reportedly capable of using advanced medium-range air-to-air missiles (included in the total delivered package).

8. Michael Krepon, "The Stability-Instability Paradox, Misperception, and Escalation Control in South Asia," in *Escalation Control and the Nuclear Option in South Asia*, ed. Michael Krepon, Rodney W. Jones, and Ziad Haider (Washington, DC: Henry L. Stimson Center, November 2004), 1–24, http://www.stimson.org/pub.cfm?ID=191.

Lt Col Paul D. Berg, USAF, Chief, Professional Journals

Selecting *ASPJ* Focus Areas and Presenting the Latest *Chronicles Online Journal* Articles

Air and Space Power Journal (*ASPJ*), the professional journal of the US Air Force, publishes thought-provoking articles about flying and fighting in air, space, and cyberspace. Military activities in our service's three operational domains are diverse, so we focus each quarterly *ASPJ* issue on a subset of them. The *ASPJ* staff selects these focus areas based on what Airmen are doing and what our senior leaders say is important. For example, the *ASPJ*-English issue of Summer 2008 focused on "Expeditionary Operations," a topic of perennial interest to all Airmen. The current issue examines "Redefining Air, Space, and Cyber Power" because Gen T. Michael Moseley, our former chief of staff, identified that topic as a priority.[1] We periodically repeat some focus areas, but others are one-time events. Because our selections evolve in response to today's fast-changing operational environment, we announce planned *ASPJ*-English focus areas on our Web site at http://www.airpower.maxwell.af.mil/airchronicles/QtrlyFocusAreas.html. The Arabic, Chinese, French, Portuguese, and Spanish *ASPJ* editions independently select their own focus areas based on the interests of their respective global audiences.

Few other military journals plan focus areas as far in advance as *ASPJ*-English does, but we find this long-range perspective beneficial. Merely announcing these topics does not guarantee that we will receive enough articles to support them; however, many authors who send us articles mention that seeing the list of proposed focus areas influenced their decision to contribute. Therefore, publishing the list helps us solicit material for upcoming issues. *ASPJ*-English readers are welcome to send their suggestions for topics to us at aspj@maxwell.af.mil.

All *ASPJ* editions promote professional dialogue among Airmen worldwide so that we can harness the best ideas about air, space, and cyberspace power. *Chronicles Online Journal* (*COJ*) complements the printed editions of *ASPJ* but appears only in electronic form. Not subject to any fixed publication schedule or constraints regarding article length, *COJ* can publish timely articles anytime about a broad range of military topics.

Articles appearing in *COJ* are frequently republished elsewhere. The various *ASPJ* language editions routinely translate and print them. Book editors from around the world select them as book chapters, and college professors use them in the classroom. We are pleased to present the following recent *COJ* articles (available at http://www.airpower.maxwell.af.mil/airchronicles/cc.html):

- LT Benjamin Armstrong, USN, "Reaching Translational Lift: The History of the Helicopter and Lessons for 21st Century Technology" (http://www.airpower.maxwell.af.mil/airchronicles/cc/armstrong.html)
- Fleming Saunders, "The Smart Way to Win the Vietnam War: Modern Guided Bombs Take on Ho Chi Minh" (http://www.airpower.maxwell.af.mil/airchronicles/cc/saunders.html)

The *ASPJ* staff seeks insightful articles and book reviews from anywhere in the world. We offer both hard-copy and electronic-publication opportunities in Arabic, Chinese, English, French, Portuguese, and Spanish. To submit an article in any of these languages, please refer to the submission guidelines at http://www.airpower.maxwell.af.mil/airchronicles/howto1.html. To write a book review, please see the guidelines at http://www.airpower.maxwell.af.mil/airchronicles/bookrev/bkrevguide.html. ❑

Note

1. Gen T. Michael Moseley, *The Nation's Guardians: America's 21st Century Air Force*, CSAF White Paper (Washington, DC: Department of the Air Force, Office of the Chief of Staff, 29 December 2007), 5, http://www.af.mil/shared/media/document/AFD-080207-048.pdf.

Ricochets and Replies

We encourage you to e-mail your comments to us at aspj@maxwell.af.mil or cadreaspj@aol.com. We reserve the right to edit your remarks.

A HOUSE DIVIDED

I don't entirely agree with what Lt Gen David Deptula and Maj R. Greg Brown say in "A House Divided: The Indivisibility of Intelligence, Surveillance, and Reconnaissance" (Summer 2008). Studying the world wars leads me to the conclusion that some intelligence sources are in fact strategic—namely, those based on cryptanalysis and electronic exploits. Breaking an adversary's secret code cannot be compared to other forms of intelligence gathering. I think there still is a very good reason to think of communications intelligence as something special and strategic. Adversaries can detect radars, satellites, reconnaissance planes, scouts, and ships, but they tend to believe in their "unbreakable codes." Eavesdropping on "secure" communications will always be the best source of intelligence, and special handling of such eavesdropping will always be required.

Mr. Frank Gerlach
Fellbach, Germany

EXPOSING THE INFORMATION DOMAIN MYTH

In response to Maj Geoffrey Weiss's article "Exposing the Information Domain Myth: A New Concept for Air Force and Information Operations Doctrine" (Spring 2008), I'd say that the author takes most of 14 pages (including endnotes) to tell us the blindingly obvious—that information is not a domain. We can operate within all of the other areas we accept as domains, including the ground (although we spend most of our time on it instead of in it), and these domains all include a physical element that we can touch. (Even our virtually constructed domain of cyberspace needs physical hardware to exist.) Information, on the other hand, is quite simply ideas. Although ideas can be stored and, to a degree, manipulated and controlled, we cannot operate within them, nor do they need any physical architecture (except what is already within us) in order to exist.

Having said that, I still appreciated the author's effort to straighten the doctrinal construct to rectify the misconceptions he pointed out. However, if he truly intends to properly shift the paradigm that shapes how we view information, he might want to start with the name of the applicable doctrine document. He correctly points out that we attempt to affect information through operations intended initially to control it and ultimately to achieve the greater goals of information superiority or information supremacy. Like control of the air, space, cyberspace, ground, or sea domains,

any type of force or operation may potentially affect or control information. Therefore, the doctrine document should be renamed *Information Effects of Operations*. If we are speaking about an Air Force doctrine document, we could use the term "Air Force operations." If we are discussing joint doctrine, the term could be (perhaps superfluously) "joint operations." Nevertheless, this could be the starting point for refocusing our efforts as we rewrite the doctrine to address this concern.

Jim Bemis
Laurel, Maryland

I found Major Weiss's article very encouraging to read because it discusses information operations (IO) in doctrinal rather than programmatic or organizational terms. He proposes a slimmed-down version of the definition of IO in Joint Publication (JP) 3-13, *Information Operations*, 13 February 2006, as an essential component for a new Air Force way forward, but the real paradigm shift is his acknowledgment that "IO deals with *effects*" (emphasis in original, p. 56) and not the capabilities or means from outdated policies that seem to keep us tied in knots.

His proposed definition moves IO away from the current Department of Defense / service overemphasis on IO's physical dimension (computers, communication systems, networks, supporting infrastructure, etc.) and closer to both the informational and cognitive dimensions of JP 3-13 that actually influence the decision-making process. In fact, his definition mirrors concepts from the preeminent situational awareness (SA) researcher Dr. Mica Endsley and her graphical model of SA in dynamic decision making (available at http://www.satechnologies.com/Papers/pdf/SATheorychapter.pdf). An academic version of the famed observe, orient, decide, act (OODA) loop, Dr. Endsley's model of SA focuses on information flow and decision-maker perceptions of environmental information, rather than the physical systems themselves, to align overall SA and influence decision making.

What a novel approach: using the science of human factors (cognition and decision making) to advance IO doctrine aimed at creating cognitive and decision-making effects!

LCDR Grayson Morgan, USN
Offutt AFB, Nebraska

A LOOK DOWN THE SLIPPERY SLOPE

Maj Bryan D. Watson's "A Look down the Slippery Slope: Domestic Operations, Outsourcing, and the Erosion of Military Culture" (Spring 2008) is a great article, but I think it's rather misleading and ignores the real history regarding what the author calls our "growing domestic role" (p. 94). Federal troops were used for domestic operations more than 200 times between 1795 and 1995, and the intent is to use them only in exceptional cases. Many may remember their use during the 1992 Los Angeles riots and the 1996 Atlanta Olympics. I was surprised that Major Watson's article did not even refer to the National Response Plan (superseded on 22 March 2008 by the National Response Framework). As officials struggle to revise guidance, the intent of the guidance remains the same: to help all levels of government prepare to respond to any type of incident. The American people want us to be prepared to help. Don't forget that we need to win their "hearts and minds" too. *Posse comitatus* only forbids using federal troops without authorization from the president or Congress, originally because county sheriffs were abusing the privilege of using those troops, which distracted them from their federal mission. In addition, *posse comitatus* applies only to law enforcement, not humanitarian missions or other military roles. These important points were left out of Major Watson's article. Aside from law enforcement, we'd do well to follow the example of Lt Col Hap Arnold's response to the 1933 earthquake in Long Beach, California, that claimed 112 lives. Rather than making quake victims wait for the nearest unit, whose commanding officer was unavailable, Arnold mobilized the Airmen at March Field to provide immediate relief. The National Response Framework won't cover every situation, nor is that the intent. Nothing can replace sound professional judgment and common sense. We need not be

paralyzed by antiquated legislation. Flexibility is the key to effective federal response.

Capt Rick Rutowicz, USAF
Cape Canaveral Air Force Station, Florida

LORENZ ON LEADERSHIP

Anyone who has taken the time to read "Lorenz on Leadership" (Summer 2005) and "Lorenz on Leadership: Part 2" (Spring 2008) is already following General Lorenz's first principle: knowledge is power. That, of course, is the underlying premise for all educational endeavors. But knowledge is also the segue to his second core principle, "understand the mission." Obviously, someone who does not understand the mission is not going to be an effective leader, but this principle has a corollary that everyone who has ever served knows—namely, that leaders must ensure that subordinates understand the mission as well. Collective knowledge is collective power.

Most *Air and Space Power Journal* readers, regardless of rank, have experienced the staff meeting that begins with, "We have been tasked to do X, no later than 10 days from now." As the groans and moans subside and the discussion turns to devising a plan and delegating tasks, it is all too easy for those in charge—the leaders—to fail to ensure that their subordinates "understand the mission."

If we think about what General Lorenz is teaching us—his mission-accomplishment principles (i.e., think "out of the box" when necessary, accomplish the mission with the resources at hand, never give up, and always "do the right thing")—then we must by necessity revert to his principle of "understand the mission." How can any of us "lead" if we cannot or do not make the effort to ensure that our subordinates understand the mission? Simply saying, "General Smith directed us to do this" may be the truth, but it will not eliminate the quizzical looks of those who are being tasked to do something that they may or may not understand. However, there will be some occasions when detailed explanations are inappropriate due to security considerations or other factors. Knowing where to draw the line is the challenge of leadership. Applying General Lorenz's principles to the task at hand—regardless of its size, complexity, or uniqueness—can undoubtedly help all of us make the decisions that our rank or position requires us to make. And sometimes a reminder by a general officer is just what we need.

Lt Col Donald G. Rehkopf Jr., USAFR
Rochester, New York

TRUE CONFESSIONS OF AN EX-CHAUVINIST

I find Dr. David Mets's reasoning and conclusions in "True Confessions of an Ex-Chauvinist: Fodder for Your Professional Reading on Women and the Military" (Fall 2007) very enlightening. While I and other students attended Air Command and Staff College at Maxwell AFB, Alabama, in 1992, we discussed in our seminar the issue of women in combat, and I recall that I was the only one defending the position in favor of women. My point of view was based on the fact that the combat aircraft that I flew for 10 years had been tested and accredited by a woman—Jacqueline Auriol from France. If a product like the Mirage III emerged from the experienced hands of this woman, undoubtedly our arguments against women in combat would have no support.

Col Raul A. Federico, Argentine Air Force
Buenos Aires, Argentina

Editor's Note: Colonel Federico read the Spanish version of that article, available at http://www.airpower.maxwell.af.mil/apjinternational/apj-s/2007/4tri07/mets.htm.

TRUE CONFESSIONS OF AN EX-CHAUVINIST: THE AUTHOR RESPONDS

Thank you for your kind remarks about my article. Certainly your experience at Air Command and Staff College was not unique. Probably, the vast majority of males in the American military then and before opposed women in combat. It is one of the glories of democracy, I think, that notwithstanding their personal feelings, the ones in the Air Force loyally adhered to the tradition established by Gen George Washington

that the military must forever be subordinate to the will of the civilian leadership in the Congress and the executive branch.

Dr. David R. Mets
Maxwell AFB, Alabama

NASH IN NAJAF: THE AUTHOR RESPONDS

I really appreciate Lt Col Peter Farney's feedback ("Ricochets and Replies," Spring 2008) on my article "Nash in Najaf: Game Theory and Its Applicability to the Iraqi Conflict" (Fall 2007). My article represents only a small portion of a two-year research project. As Colonel Farney quite correctly surmised, a number of other potential Nash solutions emerged when we entered our players, moves, and payoffs into the Gambit extensive-form modeling program. While the majority of those solutions remained tightly correlated with the version presented in the "Nash in Najaf" article, Colonel Farney is wholly correct in noting that cooperation among Kurdish, Sunni, and Shiite blocks did present itself as an alternative Nash solution. However, even in this scenario, alignment with US interests was not manifest as a Pareto improved strategy because the United States remains in the role of a strange attractor (as opposed to the role of a player). In fact, short of the United States' taking on the role of a player by remaining in Iraq with large numbers of forces for many, many years; the emergence of a far-greater sacrifice on the part of the American people through rationing; a war tax on gasoline; and so forth (as I addressed in the article), the probability of a cohesive Kurdish/Sunni/Shiite block aligned with US interests falls well below my prior Bayesian analysis with an alpha set at .01. (That is, there is less than a one in 1,000 chance that this solution would come to fruition.)

Moreover, this probability is based on linear analysis, while the current Iraqi model is actually a nonlinear, extensive-form hypergame, so the reality of a "unified" Iraq aligned with US interests is even smaller than this Bayesian determination suggests. Again, as I noted in the article, there are likely many good humanitarian and economic reasons to remain in Iraq. I will also be the first one to acknowledge that the data analyzed for the article were examined prior to the 2007 surge in US forces. However, when dispassionately looking at the calculations, one finds that the most commonly encountered Nash solution was the one presented in the "Nash in Najaf" article.

Dr. Hank Brightman
Jersey City, New Jersey

THE CUBAN MISSILE CRISIS

Mr. Charles Kamps's article "The Cuban Missile Crisis: Forty-Five Years in the Balance" (Fall 2007) ends by saying, "The fact that we were off balance for operations against Cuba offers a lesson for the future" (p. 88). The author meant to warn the US military to learn from this event the lesson of how unbalanced strategy and military developments could cause serious consequences in case of a US-Soviet war. Fortunately, that war was avoided; however, the author's reference to "balance" and "global responsibilities" (p. 88) reminds me of the broad global balance of power.

Since World War II, regional armed conflicts have not stopped. From the Korean War to the Vietnam War, from the Middle East wars to the Iraq-Iran War, from Afghanistan to the Balkans, we find regional imbalances everywhere even though the overall global balance endures. Who then is "responsible" for restoring regional balances in order to keep the overall balance from collapsing?

The world witnesses the United States interfering with other areas at will, the European Union expanding vehemently, Russia actively "recovering," and China developing economically and militarily at an enormous speed. All of these powers appear to be working to maintain the world balance; however, I know that beneath the surface, each big power is pursuing different objectives. I believe that the relative balance between big powers may be more detrimental than beneficial because such a balance is based on arms races that seek new military advantages and therefore pose a real threat to the world balance. The Soviet-US race for military advantages that almost triggered war during the Cuban crisis serves as good evidence.

My view is that a few big powers alone cannot maintain the world balance. Military intervention is no longer a viable solution, as demonstrated by the United States' inability to end the Iraq war. Whether it is the Cuban missile crisis, which almost escalated into a nuclear war, or the ongoing Iraq conflict, the application of military power may succeed in the short term but will never succeed in balancing the minds of people. It is the balance of the populace's mind that provides the fundamental guarantee of world peace. In essence, the big powers' pursuit of balanced strategic and military service development aims to gain military advantages and often results in upsetting the world's overall balance. This global balance, rather than the small balance discussed in Mr. Kamps's article, should make the author think twice.

San Jinsheng
Jiangsu, China

Editor's Note: Mr. San read the Chinese version of that article, available at http://www.airpower.maxwell.af.mil/apjinternational/apj-c/2008/spr08/Kamps_07.htm.

THE CUBAN MISSILE CRISIS: THE AUTHOR RESPONDS

My short piece was meant to highlight the imbalance between strategic nuclear forces and operational forces in the specific case of options for Cuba, but I understand Mr. San's perspective. However, history shows that a few strong nations or alliances always provide the balance of power in the world, without which there would be total chaos.

The four decades of the Cold War featured a nuclear arms race that, in essence, kept the world safe for conventional war—in particular, very limited proxy wars. Additionally, the two major power blocs "kept a lid on" rogue regional powers and movements such as virulent Islamist extremism, which today threaten unchecked violence if not countered through intervention by coalitions of concerned nations.

The "civilized" world is still seeking a post–Cold War "readjustment" of the balance of power. This may take some time to come to fruition and will entail different players than before. As Plato said, "Only the dead have seen the end of war," but a well-recognized balance of power can keep us from repeating the horrific experiences of the first half of the twentieth century.

Charles Kamps
Maxwell AFB, Alabama

DEVELOPING AIRMEN: EDUCATING AND TRAINING LEADERS

I read with interest Lt Col Paul Berg's article "Developing Airmen: Educating and Training Leaders" (Summer 2007). The author asserts that "professional Airmen require a flexible balance between broad education, which teaches them how to think in creative, theoretical terms, and specific training, which teaches them how to perform practical tasks" (p. 26). While this statement certainly talks to the point about the relationship between training and education, the whole article reflects the typical American way of technical thinking (i.e., developing officers the way that a processing line makes products according to a fixed set of steps, which neglects the differences in human potential).

Field Marshal Erich von Manstein, a German Army leader in World War II, supposedly said, "There are only four types of officer. First, there are the lazy, stupid ones. Leave them alone, they do no harm. . . . Second, there are the hard-working, intelligent ones. They make excellent staff officers, ensuring that every detail is properly considered. Third, there are the hard-working, stupid ones. These people are a menace and must be fired at once. They create irrelevant work for everybody. Finally, there are the intelligent, lazy ones. They are suited for the highest office." (See "Von Manstein's 4 Officer Types—Adapted for Managers," *En Avant: The Weblog of Jim Donovan*, http://jimdonovan.net.nz/2008/03/06/von-mansteins-4-officer-types-adapted-for-managers.) The most important consideration here is personal qualities, and Field Marshal von Manstein knew how to use different officers according to their different qualities. In Sun Tzu's *The Art of War*, we read another passage that discusses the human qualities that make a leader. Sun Tzu says, "By command, I mean the general's qualities of wisdom, sin-

cerity, humanity, courage and strictness" (trans. Samuel B. Griffith [Oxford: Clarendon Press, 1963], p. 65). More recent Chinese sayings such as "tutor people to bring out their best gifts" or "put the right people in the right places" further mirror this way of thinking that puts more weight on human qualities.

There is no doubt that in modern wars, military technologies and the knowledge of how to use them play increasingly important roles. Even so, it is a pity that this article focuses on skill training and theory education only, mentioning nothing about educating people and inspiring their different potentials.

Sui Feng
Beijing, China

Editor's Note: Mr. Sui read the Chinese version of that article, available at http://www.airpower.maxwell.af.mil/apjinternational/apj-c/2007/win07/Berg.htm.

MY FATHER AND I AND SABURO SAKAI

I found Col Francis Stevens's article "My Father and I and Saburo Sakai" (*Chronicles Online Journal*, 21 June 2006) quite moving. My father served in the Pacific during World War II. When I was a kid, the Japanese were simply the bad guys until I read Sakai's 1957 memoir entitled *Samurai!* That book humanized the common Japanese man and made me admire Sakai for his bravery and excellence in many areas. I share Colonel Stevens's view that Saburo Sakai was a soldier doing his duty even if he did not relish it.

Steven Perry
Newnan, Georgia

THE MASTER SERGEANT WATERSHED

I do not currently supervise other noncommissioned officers (NCO), but I do get to interact with many of them. After stumbling upon Capt Raymond M. Powell's article "The Master Sergeant Watershed: A Practical Guide for Supervisors of the Enlisted Corps' Critical Stripe" (*Chronicles Online Journal*, 24 April 2003), I quickly tried to disseminate it to other NCOs, specifically brand-new staff sergeants. To adapt the article to my needs, I shifted its use of the master sergeant rank to staff sergeant and saw that Captain Powell's principles worked equally well. I rated my own "level" as described by the article and tried to get other people to discuss which level they fit into. Just as I thought, the brand-new staff sergeants didn't even respond, so they obviously fit into level one because they saw little reason to do anything not required of them. When I approached my flight chief (a master sergeant), he told me that this article is actually taught at the Senior NCO Academy. As I said, this article can fit anywhere with any rank, and I feel that it should be considered for use in all formal professional military education. I was impressed with the article and found it to be quite an eye opener.

SSgt Mark J. Adams, USAF
Luke AFB, Arizona

INTRODUCING THE CHINESE *ASPJ*

Thank you for sending the Chinese edition of *Air and Space Power Journal* to the Third Military Medical College. The journal discusses many topics that are highly interesting to Chinese servicemen, such as leading-edge thinking, military doctrine, strategy and tactics, armed-force development, leadership, military ethics, education, and so forth. Through this journal, we come to know that there exists a high-level military academic forum where interested professionals can exchange views. I look forward to reading more excellent articles and wish this journal success in enhancing international military academic exchange as well as promoting world peace.

Zhou Yan
Chongqing, China

As a librarian at a Nanjing University, I am impressed with the overall quality of *Air and Space Power Journal-Chinese*. University libraries like ours will be delighted to offer such quality journals to our readers. This one, in particular, will help readers gain a very valuable perspective when judging the China-US relationship. Personally, I regard the lack of sufficient exchange as the major cause for numerous misunderstandings and misconceptions. Your journal certainly can play a positive role in this arena.

Mr. Li
Nanjing, China

Lt Col Paul D. Berg, USAF, Chief, Professional Journals

Redefining Air, Space, and Cyber Power

THE MEANING OF the term *airpower* is expanding in ways that will affect tomorrow's US Air Force. In 1925 Gen Billy Mitchell defined it simply as "the ability to do something in the air," but the term now encompasses activities in additional operating domains.[1] Gen T. Michael Moseley, former Air Force chief of staff, said that "21st Century airpower is not merely the *sum but the product* of air, space and cyberspace superiority" and that we must "redefine the Air Force for the 21st Century" (emphasis in original).[2]

General Moseley's definition reflects the Air Force's mission "to fly and fight in Air, Space, and Cyberspace," a multidomain view that has emerged over time. When the US Air Force was established in 1947, one could partition the battlespace into air, land, and sea domains. These domains clearly interacted, yet it was still possible to conceive of semi-independent operations in each of them. Back then, the Air Force could focus on air operations while the Army and Navy concentrated on their respective domains. As long as each service's contributions fit together harmoniously, summing their results might yield overall success.

However, the mere summation of results achieved in separate domains is no longer adequate because today's battlespace features additional domains that interact in ways difficult to comprehend. Space power emerged about 50 years ago, and the Air Force's understanding of the linkage between air and space has fluctuated periodically since then. We have alternately perceived air and space either as separate mediums or as a single aerospace continuum. More recently, cyberspace has emerged as another important military domain. If grasping the linkage between air and space power has proved challenging, then incorporating cyber power into the mix is even more difficult. The five military operational domains may not be equally important, and their relative importance may vary. The Air Force sees cyberspace as fundamental not only to air and space operations but also to those on land and at sea. Although the details of these "cross-domain" interrelationships remain unclear, the Air Force is actively rethinking its role in national defense.[3] General Moseley's redefinition of both airpower and the Air Force seeks to capture synergies among air, space, and cyber power in a more comprehensive manner than previous efforts to blend air and space power.

Time will tell whether our former chief's new definitions prove more convincing than previous attempts to link activities in different domains. At a minimum, his conception integrates rather than divides military activities in various domains; therefore, it may promote better cooperation both within the Air Force and among all the services. If history is any guide, our views about how air, space, and cyber power interrelate will continue to evolve. *Air and Space Power Journal*, the professional journal of the Air Force, dedicates this issue to promoting dialogue about this vital topic. ❑

Notes

1. William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power—Economic and Military* (1925; repr., New York: Dover Publications, 1988), xii.

2. Gen T. Michael Moseley, *The Nation's Guardians: America's 21st Century Air Force*, CSAF White Paper (Washington, DC: Department of the Air Force, Office of the Chief of Staff, 29 December 2007), 3, 2, http://www.af.mil/shared/media/document/AFD-080207-048.pdf.

3. Ibid., 2.

Ira C. Eaker Award Winners

for the top *Air & Space Power Journal* articles of the past year

First Place

Lt Col Bruce K. Johnson

"Dawn of the Cognetic Age: Fighting Ideological War by Putting Thought in Motion with Impact"
(Winter 2007)

Second Place

Maj Bryan D. Watson

"A Look down the Slippery Slope: Domestic Operations, Outsourcing, and the Erosion of Military Culture"
(Spring 2008)

Third Place

Maj Geoffrey F. Weiss

"Exposing the Information Domain Myth: A New Concept for Air Force and Information Operations Doctrine"
(Spring 2008)

Congratulations to this year's winners! The award honors airpower pioneer Gen Ira C. Eaker and is made possible through the generous support of the Air University Foundation. If you would like to compete for the Ira C. Eaker Award, submit a feature-length article to *Air and Space Power Journal* via e-mail at aspj@maxwell.af.mil or cadreaspj@aol.com. All military personnel below the rank of colonel (O-6) or government civilian employees below GS-15 or equivalent are eligible. If *ASPJ* publishes your article, you will automatically be entered in the competition.

The Merge

In air combat, "the merge" occurs when opposing aircraft meet and pass each other. Then they usually "mix it up." In a similar spirit, Air and Space Power Journal*'s "Merge" articles present contending ideas. Readers are free to join the intellectual battlespace. Please send comments to aspj@maxwell.af.mil or cadreaspj@aol.com.*

Reply to "A New Form of Air Warfare"

Col José C. D'Odorico, Argentine Air Force, Retired*

READING THE IDEAS that the enthusiastic and creative French Air Force lieutenant Tim Larribau develops in his article "A New Form of Air Warfare" (Fall 2007) prompted me to outline some thoughts derived from my own vision of *airpower* and *air superiority* and the meaning of those terms in the air and space environment.† Lieutenant Larribau contends that the tragic events of 11 September 2001 (9/11) in the United States led to a truly new way to conquer a fleeting and unexpected degree of air superiority that allowed a small group of terrorists to launch a horrifying attack against American targets in the homeland. But the author goes farther, presuming that we face a new kind of aerial warfare whose procedures and rules of engagement diverge from airpower's historical fundamentals. I would say that Lieutenant Larribau believes he is witnessing the revolutionary birth of a significant new way to dominate the air domain. That is no small thing.

Let us do some analysis. When we judge that an air force achieves air superiority over an opponent, we are in fact acknowledging that the opponent enjoyed that advantage up until a particular moment when it then lost superiority due to the opposing air force's actions. Nevertheless, air superiority is not an ephemeral status, subject to changing hands by means of legerdemain. A full roster of items sustains the side that exercises air superiority over any other challenger. That roster includes doctrines, organizations, resources, and training, all of which contribute to maintaining an advantageous air situation over the long term. A fortuitous or surprising enemy deed does not in a single blow alter the very complex combination of factors that frames the air superiority situation.

Conceiving of air superiority in this manner, I contend that seizing it by means of a mere isolated action would be very difficult. In the final analysis, just four commercial aircraft were involved in 9/11, and only three of them reached their unfortunate targets. Looking dispassionately at the outcome, one must assess the attack as a coordinated act that enjoyed only partial success (one aircraft did not reach its target) due to two factors not always taken into account: initiative and surprise. However, the question is, did this premeditated, savage act put local American air superiority at risk? Frankly, it did not.

We simply need to remember that preserving a measure of air superiority does not preclude an opponent from undertaking suicidal and unexpected attacks, as demonstrated by the Japanese kamikazes of World War II. Yet

*Colonel D'Odorico has logged over 5,000 hours of flying time, has taught at the Argentine Air War College for nearly 40 years, and has written more than 200 articles about military topics.

†Editor's note: Colonel D'Odorico read the Spanish version of Lieutenant Larribau's article, available at http://www.airpower.maxwell.af.mil/apjinternational/apj-s/2007/4tri07/larribau.htm.

whoever holds air superiority has the power to exact a high price from those who make such reckless attacks.

Let me disagree with the young and visionary Lieutenant Larribau, whom I urge to continue his research. These days, because unconventional wars are putting centuries-old theories to the test, our understanding of what is happening will require time, perseverance, and continuous effort. Once again, the events of 9/11 did not inaugurate a new art of aerial warfare. Nor are we seeing the debut of a new concept of air superiority. The terrorists never placed American air superiority at risk. Rather, the Americans found themselves stunned and unsure about what to do in the face of a refined manifestation of terror (the reason I previously mentioned rules of engagement) wherein depraved minds patiently and perversely exploited those two factors—initiative and surprise—that I hope no modern planner ever forgets.

Neither should we mistakenly consider 9/11 only a police saga. No, it was an act of outright, unconventional war. Sadly, therefore, I must warn everybody that this attack will not be the last. We must keep initiative and surprise out of the enemy's hands. ❑

Buenos Aires, Argentina

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The Mission Matters Most

Lt Col Graham W. Rinehart, USAF, Retired*

I READ WITH INTEREST Randall Schwalbe's critique of my article "How the Air Force Embraced 'Partial Quality' (and Avoiding Similar Mistakes in New Endeavors)" (Winter 2006). His critique, "Lean Is No Flavor of the Month" (Fall 2007), is well thought out but somewhat misses the point.

First, I agree with his assertion that "design defines quality" (p. 16), but I would add that design does not determine quality: execution of the design determines the quality of the final product or service. A well-designed widget that is poorly made could still be considered low quality—think of a socket wrench that won't ratchet or that bends under a modicum of force—and a poorly designed widget that is well made could be considered high quality if it gets the job done. (Perhaps its quality level would be considered "high enough.")

Mr. Schwalbe makes the statement about design and quality as a means of saying that the "fundamental flaw" of my article is that I confuse "quality with process improvement" (p. 16). That my article deals with the way the Air Force implemented quality-improvement ideas in the late 1980s and early 1990s, and attempts to show that the ideas themselves were sound but the execution was flawed, does not seem to come through: my execution, apparently, was itself flawed.

Schwalbe spends a large portion of his critique defending the tenets of Lean techniques, which have been proven effective and do not need his defense. In fact his defense is sometimes hard to follow. He tries to differentiate Lean from Six Sigma and then states that "Lean involves reducing *process* variability" (emphasis in original, p. 16)—something that the statistical process-control techniques of Six Sigma do.

In disagreeing with a comparison I make between past quality-improvement implementation and what had been proposed more recently, Schwalbe makes another surprising statement that "TQM [Total Quality Management] has very little relevance in the service sector" (p. 16). I have tried to point out in my writings that the TQM name is unimportant to the issue of quality and in fact may have contributed to the frontline military's rejection of the improvement ethos; rather, quality-improvement principles under whatever name have always been relevant to the service sector even if that sector was slow to accept them.

Schwalbe's umbrage that the "ignominy" of TQM "drags Lean into the depths of ridicule" (p. 16) is understandable, but his attempt to differentiate the two—in effect claiming they are worlds apart—does not withstand close scrutiny. At one point, he quotes something I quoted as if I had written it myself, an indication that he may have confused my meaning. He writes that "the array of inaccurate or misleading statements in the name of Lean is one of the primary reasons that people disdain it" and then seems to prove his own point with the cute statement that, contrary to his earlier assertions, "Lean is the total absence of 'irrashional' policies and regulations" (p. 17).

One area in which it becomes clear that Schwalbe has missed the point of my article is his reference to the Toyota Production System. First, the phenomenon in which "production analysts of major firms study, analyze, fret over, and mimic Toyota's system but continuously come up short" (p. 17) was actually predicted by statistical consultant Dr. W. Edwards Deming years ago. Deming would say that these major firms tried to copy what they did not understand, which is a recipe for failure. Second,

*The author is a writer and editor living in North Carolina.

and more salient to this discussion, the commercial success of Toyota, Ford, Motorola, and so forth, is not the best argument for convincing the military that these new tools and techniques are germane to its mission. Obviously I did not make that point clear enough in my original article, so let me reiterate that, in order for members of the rank and file to see Lean or any other improvement effort as vital to their service's continued success, these efforts must be adapted to the core military mission as much as (if not more than) they are adapted to ancillary functions.

Statistical techniques designed to ensure that repetitive processes produce uniform results; continuous quality-improvement efforts that seek to improve "form, fit, and function" and customer satisfaction; and Lean initiatives that eliminate non-value-added effort and other waste are all highly effective, time-proven ways to make organizations better. But all too often they do not touch the military mission, and therefore they do not reach the military mind. ❑

Cary, North Carolina

The Airman's Creed

I am an American Airman. I am a warr[illegible] I have answered my nation's call.

I am an American Airman. My m[illegible] o fly, fight, and win. I am faithful to a f[illegible] age, a tradition of honor, and a l[illegible] alor.

I am an American Airman, guar[illegible] f freedom and justice, my nation's sword and shield, its sentry and avenger. I defend my country with my life.

I am an American Airman: wingman, leader, warrior. I will never leave an Airman behind, I will never falter, and I will not fail.

Know Your Enemy

Col Thomas E. Snodgrass, USAF, Retired*

COL WILLIAM DARLEY'S article "Strategic Imperative: The Necessity for Values Operations as Opposed to Information Operations in Iraq and Afghanistan" (Spring 2007) exactly frames in a historic context our war arising from the terrorism perpetrated by jihadists in the name of Islam. In laying out the historical framework for war as a contest between cultures, Colonel Darley accurately describes the context of imperial warfare waged by Rome, Spain, Britain, Czarist Russia, Manifest Destiny America, post–Meiji Revolution Japan, Nazi Germany, the Stalinist Soviet Union, and now Islam, to cite the author's examples.

Of course, imperial warfare, which pits cultures in conflict, must be differentiated from the landgrab border wars that plagued Europe for centuries, the objective of which was certainly not to replace the attacked nation's royal culture of kingship and aristocracy. In contrast to the European wars between kings to settle limited and specific territorial or political issues, Darley describes imperial warfare in terms of imposing a foreign "civil religion" on the country/population under siege. In this context of imperialist warfare, civil religion is an amalgamation of "selectively remembered and embellished events, myths of origin, heroic stories, and proclaimed values" that provide a society with an "imagined community."[1] The task for imperialists is to impose their version of civil religion by spreading their imagined community to the conquered in order to seal the victory and preclude a renewed outbreak of war. Darley's description of imposing a civil religion on an unreceptive but subdued society fits the practice of Islamic jihad as it has been waged for approximately 1,400 years.

However, in "We Are at War with Terrorists, Not Muslims" (Spring 2008), Lt Col Michael McGee takes issue with Colonel Darley's analysis that the war with a Sharia-driven Islam (I refuse to use the term *war on terror* because it is so inadequate and misleading) is a cultural struggle. McGee denies that the jihadist terrorism the world experiences daily is born of the religion, arguing instead that it is only the work of "criminals."[2] Unfortunately, McGee provides no further explanation for the motivation of these Islamic criminals but simply cites a facile statement in the US *National Security Strategy* for 2006: "While the War on Terror is a battle of ideas, it is not a battle of religions."[3] But further pursuit of the question of terrorist justification in this document reveals that the bottom-line "explanation" remains unsubstantiated by fact. The Bush administration and, by extension, McGee rest the case for criminal motivation on the following reference to terrorist ideology: "An ideology that justifies murder. Terrorism ultimately depends upon the appeal of an ideology that excuses or even glorifies the deliberate killing of innocents. A proud religion—the religion of Islam—has been twisted and made to serve an evil end, as in other times and places other religions have been similarly abused."[4]

If we are to accept President Bush's justification, it means that the terrorists are motivated just by murder for the sake of murder, while Islam is only an excuse for their mindless killing. It stretches credulity to believe that Osama bin Laden has taken to Neanderthal cave living because he is a crazed, homicidal maniac.

Astonishingly, this explanation of terrorist motivation ignores the words regarding jihad contained in Sharia, a theo-political-legal doctrine based on the Koran (the exact words of Allah as revealed to Muhammad), the Sunna ("the way of the prophet" as contained in Hadith and Sira, collections of experiences and sayings of Muhammad), Ijima (the consensus of

*The author, who retired after 30 years in the US Air Force, including a tour in Pakistan, is currently the director, Military Intelligence and Strategy, Society of Americans for National Existence. He teaches military history at Embry-Riddle Aeronautical University, Prescott, Arizona.

Islamic scholars), Qiya (Islamic scholarly reasoning by analogy), and centuries of clerical debate, interpretation, and precedent. The Bush explanation also ignores the statements of the jihadists themselves, who have made clear their total commitment to implementation of Sharia worldwide.

Sharia encompasses the totality of religious, political, social, domestic, and Muslim private life. Although primarily meant for Muslims, it also applies to people living within a Muslim society as conquered, second-class citizens called *dhiminis* (in Darley's paradigm, the targets of acculturation by Islamic civil religion).

The authority of Sharia is established in Koranic sura (chapter) 45:17: "Then We [Allah refers to himself in the plural when instructing Muhammad] gave you a Sharia [divine law] in religion, follow it, and follow not the wishes of those who have no knowledge." What Sharia has to say about jihad is simple and direct: "The sacred injunction concerning war . . . is established as a divine ordinance, by the word of God, who has said, in the Koran, 'slay the infidels,' and also by a saying of the prophet, 'war is permanently established until the day of judgment.'"[5] Sample quotations from the Koran (followed by parenthetical commentary in italics) unquestionably illustrate the authority for this Sharia injunction:

- Sura 9:5 – "And when the sacred months are passed, kill those who join other gods with God wherever ye shall find them; and seize them, besiege them, and lay wait for them with every kind of ambush: but if they shall convert, and observe prayer, and pay the obligatory alms, then let them go their way, for God is Gracious, Merciful." (*Kill those who do not receive Islam as their faith, but spare those who convert to Islam.*)

- Sura 9:29–31 – "Make war upon such of those to whom the Scriptures have been given as believe not in God, or in the last day, and who forbid not that which God and His Apostle have forbidden, and who profess not the profession of the truth, until they pay tribute out of hand, and they be humbled." (*Fight unbelievers until they are destroyed or submit and pay tax to Islamic officials.*)

- Sura 5:51 – "O you who believe! Take not the Jews and the Christians for your friends and protectors: they are but friends and protectors to each other. And he among you that turns to them for friendship is of them." (*This friendship makes any Muslim an enemy of his own people and deserving of the same fate as that of the unbeliever. In other words, Allah explicitly states that Jews and Christians are enemies of Muslims and that any Muslim who befriends them is deserving of the punishment of infidels, which is usually death.*)

Of course, the suras above represent just a bare sample of thousands of jihad-related injunctions in Islamic theology about subjugating all of humanity to Islam by waging religious-cultural warfare. Throughout Sharia's jurisprudential history, all legal schools (Hanafi, Maliki, Shafi'iyah, Hanabilah, Ashari, Zaydi, and Isma'ili) dating back to the earliest legal rulings on war 1,200 years ago cite these passages and declare that the Umma (the worldwide Muslim community/nation) has a solemn duty to wage war against unbelievers not prepared to convert or be subjugated.

The Sharia command to make religious-cultural war and the Koranic rules of engagement for jihad fit very well in the context of cultural, imperialist warfare to impose an alien civil religion on an unwilling population as laid out by Darley. McGee's failure to confront Sharia and the jihad suras in the framework of a cultural struggle between Islam and all other belief systems on the earth suggests perhaps that more study is in order. I personally see no point in trying to argue and document further what is apparent from a cursory reading of the quotations above and from people such as Osama bin Laden who claim to be Sharia authorities.

However, I would like to register my disagreement with both Colonel Darley and Colonel McGee concerning the appropriate US response to the jihadists. Although their formulations are somewhat different, both officers call for a strategic response that occasions a basic change in Islamic theology. That is, Darley correctly identifies the core belief of Islam: "The Koran places the God of Islam at the center of government and asserts that His words as written in the Koran are unchange-

able, especially by people, and certainly not through popular selection by majority vote."[6] But then in the next sentence he engages in a leap of hope that causes his analysis to go off the rails:

> (Nevertheless, among fundamentalist Muslims of all stripes exists the practice of ceding interpretation of what the Koran means in practice to clerics and Islamic scholars.) As a result, we must realize that we can successfully establish democratic pluralism in countries that have never known it only if we broadly supplant cultural values at a grassroots level that currently makes cultural acceptance of democracy virtually impossible due to Islamic literalism.[7]

Even granting that clerics or contemporary Sharia authorities are ceded the authority to reinterpret the Islamic law of jihad, Darley fails to explain why and how Islamic scholars would reverse 1,400 years of cultural tradition and totally change the basis of Islamic society's politico-religious organizing principle. Throughout Islam's history, attempts to "liberalize" it have never enjoyed the type of success that Darley projects. In fact, Turkey, probably the greatest success in terms of Islamic liberalization, thanks to Mustafa Kemal Atatürk's brute force, is currently in the process of sliding back into the grip of Islamic fundamentalism. In other words, the hope of installing democracy as a strategy to quell jihad rests on a nonexistent historical foundation and is without realistic prospects. Quite simply, Islamic clerics are in the same position that the Soviet nomenklatura were in during the last days of the Soviet Union, in that liberalization means loss of political and cultural control; therefore, liberalization is something to be resisted, not embraced, by the society's power brokers.

Whether McGee realizes it or not, his recommended strategy is flawed in the same manner but is more confused. On the one hand, he quotes "Ten Misconceptions about Islam," which correctly states that "the Islamic state must derive its law from the Qur'an and Sunnah. *This principle excludes certain choices from the Islamic state's options for political and economic systems, such as pure democracy,* [emphasis in original] *unrestricted capitalism, communism, socialism, etc.* [emphasis added]"[8]

However, after setting out this absolutely correct characterization of the systemic resistance to change and modernization in Islamic society, McGee inexplicably rests his strategy on changing Islam!

> If we are to succeed in Iraq (and the Middle East), we cannot simply dismiss those elements of culture and civilization with which we disagree. Instead, we must acknowledge them, find means to discuss their application in new ways, and, finally, help Muslim leaders and their populations use those new methods to solve real cultural (social, economic, educational, etc.) issues throughout the Middle East. The United States should concentrate on helping to transition Muslim culture into the twenty-first century.[9]

In view of the fact that Islamic leadership operates based on the consensus developed by Sharia authorities over 1,200 years, to propose that we are going to "find means to discuss their application in new ways" is a flight of fantasy. Hope cannot be our strategy. Obviously, our strategic thinking needs more work. ❑

Prescott, Arizona

Notes

1. COL William M. Darley, "Strategic Imperative: The Necessity for Values Operations as Opposed to Information Operations in Iraq and Afghanistan," *Air and Space Power Journal* 21, no. 1 (Spring 2007): 34, http://www.airpower.maxwell.af.mil/airchronicles/apj/apj07/spr07/spr07.pdf.

2. LTC Michael R. McGee, "We Are at War with Terrorists, Not Muslims," *Air and Space Power Journal* 22, no. 1 (Spring 2008): 21, http://www.airpower.maxwell.af.mil/airchronicles/apj/apj08/spr08/spr08.pdf.

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Planetary Defense

Potential Mitigation Roles of the Department of Defense

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Maj Douglas Kaupa, USAF*

EARTH'S ORBIT AROUND the sun is a hazardous location, and our collective safety so far has been purely a matter of luck. Despite the image of a pristine "harmony of spheres" that we inherited from the ancients, the solar system is a cosmic shooting gallery filled with leftover debris from planetary formation. This debris, including asteroids and comets, orbits the sun at relative velocities of 11–25 kilometers (km) per second or 10 times faster than a speeding bullet.[1] As our planet transits this dangerous ocean, we have established no worldwide security network to warn of or mitigate collisions with space debris.

Both a position paper by the American Institute for Aeronautics and Astronautics entitled "Protecting Earth from Asteroids and Comets" (2004) and a 2007 planetary-defense conference in Washington, DC, examined the issue of finding a home in government for asteroid defense, designating it a top priority.[2] This article advocates establishing a lead agency, such as US Strategic Command (STRATCOM), for handling mitigation procedures, creating lines of communication, and defining planetary-defense policy for the United States and perhaps for the United Nations.

Background Data

According to the National Aeronautics and Space Administration (NASA), "Every day, Earth is bombarded with about 25 tons of dust and sand-sized particles. About once a year, an automobile-sized asteroid hits Earth's atmosphere, creat[ing] an impressive fireball."[3] US missile-warning satellites annually record as many as 30 bolides (meteoroids that detonate in the atmosphere, otherwise known as fireballs), often releasing as much energy as a nuclear blast (see fig. 1, which includes several years of data superimposed over Earth's surface).[4] Composed of ice-rock mixtures, these bolides range in size from a few meters in diameter up to 50–60 meters. It is important to emphasize that objects smaller than 50–60 meters seldom penetrate the entire depth of the atmosphere to create impact disasters.[5] However, more massive objects occasionally do so, causing greater concern.

We shouldn't become complacent because even larger objects intersect Earth's orbit. The surfaces of the moon, Mercury, and Mars show that debris has hit with relative frequency. Unlike these heavenly bodies, Earth is an active

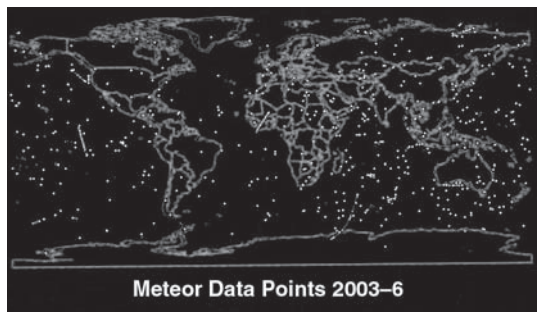

Figure 1. Satellite-observed bolide atmospheric entries. Image courtesy of Air Force Future Concepts.

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planet with tectonic and erosion forces that largely obscure impact craters. Nevertheless, geologists have now confirmed that asteroids or comets have scarred Earth with 160 craters (fig. 2), and they discover more each year. Although we have found impact craters mostly on land (fig. 2), bolides can occur anywhere on our home planet (fig. 1).

This article divides potential Earth-impacting asteroids into four categories. Generally, asteroids with a density less than or equal to that of rock and less than .5 km across can cause "local damage," defined as destruction of an area equivalent to a moderate-sized city, such as Kansas City, Missouri. These "city-killers" would reduce most houses and buildings to rubble, and any combustible material within 8 to 16 km of the impact would burn. Debris would scatter for tens of kilometers, possibly causing widespread fires. If the asteroid fell into the ocean, it could produce tsunamis more powerful than the Indian Ocean earthquake of 2004, leaving thousands dead. Based on lunar-cratering studies, local-damage asteroids collide with Earth every 200 to 300 years, on average.[6] (Other studies indicate every few thousand years. A defined planetary defense would refine such estimates of the danger of impact.)[7] A city-killing asteroid hit Tunguska, Siberia, in 1908, missing Moscow, Russia, by only three hours.[8] This atmospheric explosion flattened a forested area three times as large as the District of Columbia.[9] Definitive research published in *Nature* magazine indicates that the Tunguska bolide had asteroid origins and detonated approximately 10 km above the ground with a force of 10 to 20 megatons of TNT, making it over 1,000 times more powerful than the first atomic weapons.[10]

Asteroids with diameters between .5 and 2 km, known as "nation destroyers," can create

Figure 2. Locations of 160 impact craters on Earth. (From Lunar and Planetary Institute, http://www.lpi.usra.edu/publications/slidesets/craters/slide_2.html [accessed 10 January 2007].) Image created as an illustration for the Terrestrial Impact Crater slide set. Reprinted by permission from the Lunar and Planetary Institute.

"regional destruction," wiping out countries such as the United Kingdom or India. Having the potential of killing and injuring a substantial portion (up to 25 percent) of the human population, these asteroids could significantly disrupt our modern way of life.

Asteroids between 2 and 10 km in diameter could cause "global effects" due to impact casualties and debris thrown into the atmosphere. Clouds of ash and dust might circle Earth, devastating crop production for months or even years. They could also induce acid rain, which would pollute fisheries and contaminate farming. The consequent elimination of more than 25 percent of the human population would greatly affect civilization, setting it back several decades.

Finally, asteroids more massive than 10 km can become "planet killers," imparting kinetic energy equivalent to 100 million megatons of TNT—hundreds of times greater than all the nuclear weapons in the world (fig. 3).[11] Impacts of this size would destroy the entire ecosystem and cause mass extinctions. Earth might have suffered a few of these since life began. An impact nearly 65 million years ago that created the Chicxulub crater off the Yucatan peninsula might have eliminated the dinosaurs.[12]

Zipping near Earth's orbit, most of these potentially hazardous objects travel in predictable orbits, allowing us to spot them decades in advance. However, we have only begun to comprehend the threat. Comets such as Shoemaker-Levy 9 orbit too infrequently for us to characterize them and arrive with very little warning. This particular one hit Jupiter in 1994, raining down approximately 20 fragments several hundred meters in size and delivering several hundred megatons of explosive power per fragment.[13] Furthermore, city killers can arrive without warning due to the spotty nature of our current surveillance. One such minimal warning occurred on 18 March 2004, when an asteroid came within 3.4 Earth diameters or 43,000 km from Earth, having been identified only 48 hours prior.[14] This distance lies just outside the geostationary orbits of satellites circling our home.

Since detection efforts began in the mid-1990s, NASA and supporting teams (using only ground-based telescopes and a meager budget of $5 million/year) have catalogued over 4,000 near-Earth asteroids (NEA).[15] The discovery rate has increased each year during the past decade (fig. 4). We predict that a subset of the total NEAs shown in figure 4—potentially hazardous asteroids (PHA)—will come within 750,000 km of our home, less than two times the distance between Earth and the moon. PHAs are too massive to burn up in

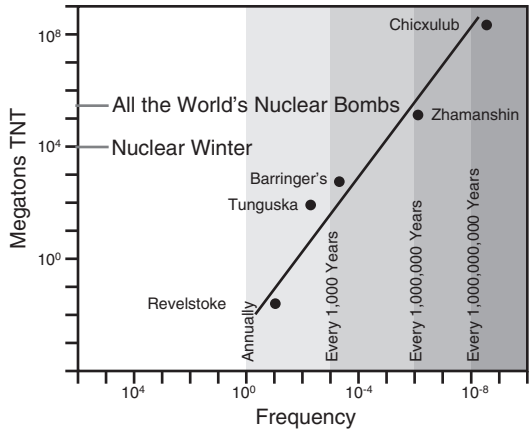

Figure 3. Megatons of TNT compared to impact frequency. (From NASA and National Resources of Canada, "Impact Hazard," 10 February 1999, http://liftoff.msfc.nasa.gov/Academy/SPACE/SolarSystem/Meteors/ImpactHazard.html [accessed 17 January 2007].) Courtesy of NASA and National Resources of Canada. The Zhamanshin crater formed nearly 1 million years ago from an asteroid, leaving a bowl 14 km in diameter near Zhamanshin, Kazakhstan. The Barringer or "Meteor Crater" formed from a small, stony asteroid nearly 50,000 years ago in Arizona, leaving behind a basin 1.5 km in diameter. After examining what was previously thought to be a volcano, renowned geologist Eugene Shoemaker proved that it was in fact an impact crater, based on the presence of coesite and stishovite. These minerals are rare, dense forms of silica, found only where quartz-bearing rocks have been severely compressed. They are not created by volcanic action; rather, an impact event is the only known mechanism for creating these minerals. The Revelstoke fireball flashed across the British Columbian sky in 1965. No impact occurred, but several people felt an atmospheric explosion.

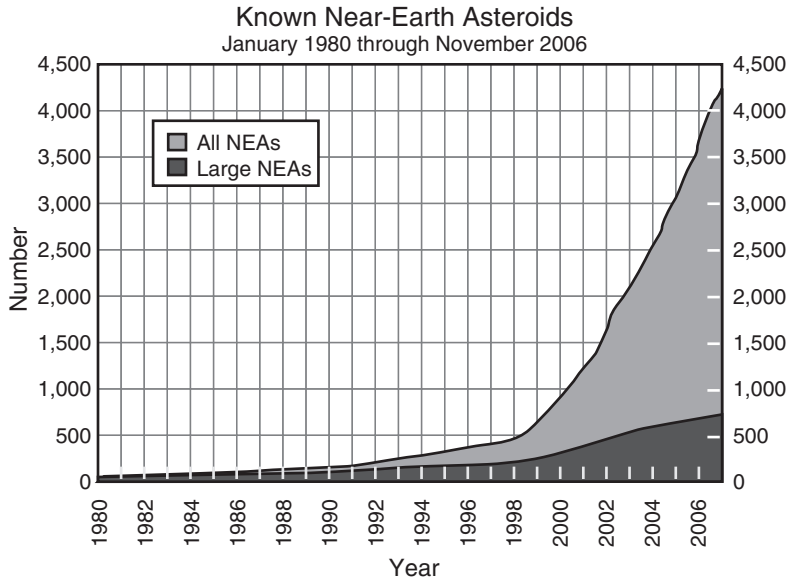

Figure 4. Discovered NEAs. (From Alan Chamberlin, "Near-Earth Asteroid Discovery Statistics," *NASA: Near Earth Object Program*, http://neo.jpl.nasa.gov/stats [accessed 4 February 2007].) Courtesy of NASA/Alan Chamberlin. The gray area shows all NEAs, and the darker area shows only the large ones (those with diameters roughly 1 km and larger).

Earth's atmosphere. As of November 2006, we have detected 843 of them, 700 larger than 1 km and capable of regional destruction.[16]

No known asteroids target Earth now or for the next several years. However, this information can change rapidly. Nobody knows how long Earth will be spared. Our planet has not been so fortunate in the past. With 843 PHAs and counting, we must seriously consider mitigation options. Rather than debate *whether* we need planetary defense, we must determine *when* we will need it. From a policy perspective, we know that at least 843 asteroids prowling our neighborhood could cause local, regional, or global destruction, so we have just begun to understand the total threat. We won't comprehend its full extent until we overcome the "giggle factor" and stop erroneously ascribing such thinking to science fiction. We need to create contingency plans and establish guidelines as an insurance policy—a far less expensive proposition than the consequences of suffering a direct hit.

Policy Perspectives

The good news is that, unlike predicting earthquakes and hurricanes, we can actually see most asteroids and comets arriving years or decades in advance and do something about it. The technology required to avert a catastrophe lies within our reach, at a comparatively modest expenditure. However, no one is in charge, no one owns the problem, and no one has been assigned the mission—not NASA, Air Force Space Command (AFSPC), or the Department of Homeland Security (DHS). We have no on-the-shelf contingency plans, tabletop interagency scenarios, interagency memoranda of agreements, standard operating procedures, or hardware available for a mitigation mission.

Having a decade of advance warning might seem like plenty of time to construct these policies and a mitigation operation, but it isn't. We would need most of this time to slowly affect the velocity of an asteroid with a low-thrust, high-efficiency tug. Reaching a menac-

ing asteroid will take several years of flight time as well. Clearly, we need mission planning, spacecraft development, and testing. Current Department of Defense (DOD) system development and procurement can easily run longer than a decade. The F-22 fighter aircraft alone has taken nearly 25 years to evolve from a list of requirements to initial operating capability.[17]

Asteroids and comets differ significantly. No two are alike. Rotation rates will affect docking techniques, and different densities and surface compositions will call for varying deflection tactics. Given a very short time until impact, we may have only one option: use explosives to reduce the inbound asteroid into smaller pieces. However, the efficacy of this approach remains subject to technical debate and might result in several smaller impacts scattered across the globe. Even if each meteoroid piece is small enough to burn up within the atmosphere, no nation wishes to have fireballs redirected to its backyard. Before we need these proactive approaches that anticipate such problems, we must research and document them. Because we may have only one opportunity to evade an NEA, we must be prepared.

Planetary defense may seem an abstract and unreal national security risk. However, it proved quite a serious problem for the dinosaurs, who previously inhabited our planet, and it poses no less a threat today. No matter how remote some people might think the chances of having rocks fall on their heads, they should at least be concerned that no government or DOD contingency plan exists to counter an impact or mitigate its consequences.

Policy Recommendations

Since no US-assigned or -authorized planetary-defense missions exist, the DOD, as an organization, does not have any "impact defense" operations. Few individuals in the DOD perceive this lack of policy as a problem, and those few who do must contend with the giggle factor. This train of thought suppresses any further acknowledgement or research. Assignment of responsibility would rectify this problem, yet who should assume responsibility for a planetary-defense mission? Readers might wonder why the authors mentioned STRATCOM as a possibility. Why not some other part of the DOD? Why the DOD at all? Perhaps NASA could handle detection, reconnaissance, and mitigation missions while trying to replace the space shuttle and return to the moon. Maybe the DHS or Federal Emergency Management Agency (FEMA) represent a better option since impacts might become a national disaster.

Both NASA and the DOD have expertise in space matters and operate space assets, but NASA's core mission is space exploration. The DOD's core missions are maintaining US security, protecting American lives, and ensuring the security of our allies. Expertise aside, planetary defense is clearly a defense mission. Further, since the DOD maintains a robust space mission, the proposed mission appears more closely aligned with the strengths and scope of the DOD than with those of the DHS.

Within the DOD, possible options might include AFSPC, the National Security Space Office, the Missile Defense Agency, and STRATCOM. Several reasons make STRATCOM the best option. For one, STRATCOM's mission calls for "provid[ing] the nation with global deterrence capabilities and synchronized DOD effects to combat adversary weapons of mass destruction worldwide."[18] The command coordinates DOD capabilities to thwart weapons of mass destruction. We can consider an inbound Earth-impacting rock a weapon, despite the absence of an adversary. A combatant command, STRATCOM has the established lines of communication and the authority to react to strategic-level threats. It already maintains global vigilance and space situational awareness. The former US Space Command has been dissolved and subsumed by STRATCOM. Through AFSPC, the command already maintains daily space surveillance for detecting launches of ballistic missiles and tracking artificial satellites and Earth-orbital debris. Although AFSPC maintains space assets, operational control falls under STRATCOM's authority. It also controls all military nuclear capability, perhaps the only option in certain minimum-warning scenarios. Moreover, STRATCOM is

well practiced and competent with respect to disseminating rapid warnings to civilian leadership and civil defense networks. Finally, the command has years of experience in negotiating and executing collective security arrangements, such as that of the North American Aerospace Defense Command with Canada and those involving the North Atlantic Treaty Organization.[19]

Some detractors have stated that a planetary-defense program is too expensive for the United States to bear alone and that it belongs in the international arena. Although they make a reasonable point, several considerations remain. First, for such a critical survival issue, the United States should not find itself at the mercy of an internationally delayed or incomplete plan. Second, international cooperation would still imply using US resources but with less US control. Third, significant national security reasons exist for having the United States pursue this capability for the defense of others. America has an interest in preserving its democratic civilization and maintaining international security.

The United States reaps significant economic benefits by providing international security. We have the most to gain by maintaining security and the most to lose if it fails. By visibly pursuing the capability to defend the planet, we make ourselves increasingly essential to international security. Furthermore, we will likely have to pay the bill anyway. The humanitarian crisis that could ensue from an impact with a 300-meter asteroid could easily dwarf the Asian tsunami of 2004. The humanitarian supply, airlift, sealift, and rebuilding costs would be staggering. Economic losses to US investors, huge costs to US insurers, and a possible recession or depression resulting from the loss of a city or nation would likely occur.

Despite concerns about the expense of developing such a planetary-defense system, it would translate into a competitive advantage for the United States. Solving difficult problems would create US intellectual capital, industrial capacity, and new technical areas of leadership critical to maintaining our lead in space.

The technology needed to protect the planet offers other advantages besides a contingency plan. Technologies that appear promising for planetary defense are also attractive for civil and defense applications, which include rapid and responsive high-capacity launchers, high-thrust rockets, long-duration power supply, and autonomous docking.

STRATCOM already maintains a space-surveillance system. Creating a robust and automated system to survey the sky continually for asteroids or comets to complement current discovery programs would likely improve space situational awareness. Such systems could use existing military ground-based sites for electro-optical, deep-space surveillance telescopes to provide follow-up tracking of newly discovered NEAs. By having more resources and people examine the planetary-defense mission, we could develop better systems and solutions.

Although merely assigning the planetary-defense mission to STRATCOM would not constitute a complete fix, it represents the immediate next step to address the issue. Following authorization and assignment of the mission to one specific agency, we can start to examine other milestones. One of these entails conducting a tabletop scenario to assess our reaction capability and reveal significant capability gaps in order to determine useful directions for exploration and the development of a concept of operations (CONOPS). An exercise of this nature would expose a much broader level of designers to the problems of planetary defense and possible options. It would also bring together key agencies to begin a dialogue about how to pursue interagency communication and actions.[20]

Although the central player, STRATCOM would never be the only one. Developing proper interagency coordination—a necessary enabler for this mission—would help identify shortcomings, which might include notification procedures for an inbound asteroid, methods and times for informing the press, and international cooperation roles for altering the trajectory of an Earth-bound asteroid. Proper coordination between internal and external agencies supporting mitigation (AFSPC, NASA, a searching program, etc.) and those agencies dealing with consequences should mitigation fail (FEMA, DHS, etc.) could be effectively ex-

plored in the context of a tabletop scenario. Such an effort to coordinate agencies for a massive event would likely bear significant fruit across the full spectrum of operations.

We need to address many adequacy and funding issues. If STRATCOM is tasked with the planetary-defense mission, the command needs to increase space situational awareness significantly in order to characterize the threat. Not only do we need to assess adequacy by analyzing mitigation options, analyzing alternatives, and establishing a contingency plan, but also we must create and execute scenarios between interagency mitigation and disaster response to understand each other's roles. The initial effort need not be large in terms of personnel or dollars. One recommendation calls for establishing an office to create CONOPS plans. Another involves commissioning studies, possibly from major universities, to examine alternative architectures for detection and mitigation similar to the Massachusetts Institute of Technology's Project Icarus.[21] A third would initiate efforts from the Defense Advanced Research Projects Agency and the Air Force Research Laboratory to help establish the best course of action to deflect an inbound asteroid (fig. 5). Further, a small military cadre assigned to NASA and FEMA could aid planning integration and create lines of communication. Funding is less limiting than lack of both authorization and a clear mandate. Much can be accomplished with little investment, which might amount to less than doubling the current $5 million budget utilized to search for PHAs.[22]

Figure 5. Artist's concept of a planetary-defense mitigation spacecraft deflecting an asteroid with Earth and the moon in the distance. (*The Asteroid Tugboat*, painting by Dan Durda, in Rusty Schweickart, "Presentation to NASA's NEO Study Workshop," 26 June 2006, slides 9, 10, 21, http://www.b612foundation.org/papers/AT-GT.pdf.) Courtesy of Dan Durda, FIAAA/B612 Foundation. The B612 consists of a group of scientists and technical people concerned about the current lack of international or government action to protect Earth from an impact of NEAs. They seek to "significantly alter the orbit of an asteroid in a controlled manner by 2015" and to establish procedures and protocol in case an NEA is on a collision course with Earth. "The B612 Foundation," http://www.b612foundation.org/about/welcome.html (accessed 30 October 2007).

Conclusion

The first and most important step in creating a planetary-defense plan is to find a home in the US government for such a program—preferably US STRATCOM. Other organizations would prove dysfunctional or suboptimal for US security. We would enhance our national-defense capabilities by working under STRATCOM auspices to pursue technology that might not be available or easily transitioned if developed by another agency. The United States doesn't need a new dedicated agency or the inevitable duplication of effort that it would create. Once we decide upon a lead agency, we would then turn to developing a CONOPS, including the creation of interagency lines of communication. STRATCOM will not be the lone actor because mitigation policies will demand capabilities found in other organizations. After modifying existing search programs, we would identify the mitigation options that need development and testing. Massive extinctions have occurred in the past and can certainly occur again. Earth is not immune to collisions with asteroids and comets, but we can prepare for these events by establishing a solid planetary-defense plan. ❑

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Notes

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Cyber Flag

A Realistic Training Environment for the Future

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Maj Paul D. Williams, PhD, USAF
Lt Col Robert F. Mills, PhD, USAF, Retired
Lt Col Mark A. Kanko, PhD, USAF, Retired*

Red Flag exercises, well known as training components of air warfare, will also become a staple of cyber warfare.

—Former Secretary of the Air Force Michael W. Wynne

THE RED FLAG exercise, held six times per year at Nellis Air Force Base (AFB), Nevada, and Eielson AFB, Alaska, routinely pits a coordinated team of more than 80 airplanes against numerous, realistic air threats and a robust array of surface-to-air missile (SAM) systems as participants deliver weapons and air-dropped cargo on realistic targets and drop zones. Most participants would agree that Red Flag provides the ultimate peacetime test of joint and coalition air operations, but the Air Force must execute a fundamental paradigm shift if it wishes to meet former secretary Wynne's vision of a significantly enhanced cyber-warfare environment. This change is so monumental that full implementation would fundamentally detract from the critical objectives of Red Flag. In short, the time is right for Cyber Flag.

The Air Force grew out of technology and its employment (in conjunction with people, processes, and doctrine) within the air domain as a means of influencing the outcome of war. Innovation early in the airpower era helped solidify a new war-fighting domain that proved decisive in World War II, ultimately paving the way for the creation of the United States Air Force as the lead service for organizing, training, and equipping an air-minded military capability. Likewise, we now find ourselves in the infant stages of the cyber era, wherein the addition of cyberspace is revolutionizing the way we will fight and win future wars. We face the significant challenge of providing a realistic training environment that reflects this change. This situation differs considerably from the normal evolution of Red Flag over its 30-year history, but technological advancement represents a core element in the history of the Air Force. Air pioneers of the 1920s could not have imagined how airpower would evolve, and the same holds true of today's advocates of cyberspace. In a letter to Airmen, former secretary Wynne highlighted the incredible technological advancements that are yet again transforming the face of war: "Our adversaries realize the asymmetric opportunities of cyberspace. They attempt to access American industrial servers that contain sensitive data, exploit electromagnetic energy to try and jam or misdirect our precision weapons, and use radio transmitters to detonate improvised explosive devices, killing Americans, Coalition allies, and innocent civilians."[1]

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Although the recent emphasis on cyberspace is a step in the right direction, US military preparations pale in comparison to those of other international powers, most notably China. The Chinese have been restructuring their military for over a decade to transform their mechanized People's Liberation Army (PLA) into an "informationalized" force capable of capitalizing on the asymmetric effects of cyberspace.[2] The PLA now focuses on achieving battlefield gains through the full spectrum of kinetic and nonkinetic capabilities. An analysis of Chinese doctrine and recent exercises reveals advanced information warfare (IW) capabilities, such as computer network attack, on par with tanks, artillery, and aircraft in their effectiveness in countering an enemy advance.[3]

Hardly a week goes by without some news report about how Chinese entities (government, military, or individual actors) have compromised computers and networks in the United States. This series of coordinated attacks, beginning in 2003 and dubbed Titan Rain by the US government, is just one indication that the United States has already fallen victim to offensive IW activity by the Chinese.[4] One need also look at the recent public release of the Aurora experiment to understand the effects made possible by cyberspace.[5] Although many details remain classified, Aurora demonstrated how computer network attack could destroy one of the most commonly used power generators within the United States' domestic electrical grid. During this test, the generator responds to a series of malicious computer-control commands by shaking violently and then grinding to a complete halt in a cloud of smoke. Exploitation of this same vulnerability across the nation would produce extended power outages and crippling economic repercussions. Government economist Scott Borg summarizes the consequence of such an attack: "It's equivalent to 40 to 50 large hurricanes striking all at once. . . . It's greater economic damage than any modern economy ever suffered. . . . It's greater than the Great Depression. It's greater than the damage we did with strategic bombing on Germany in World War II."[6]

Cyber threats to the United States range from nation-states to transnational actors to organized crime, each with its own set of capabilities, resources, and objectives. The point is that we must be ready to deal with all of them—and this requires building a force that not only can operate effectively in and through the cyberspace environment but also can integrate capabilities across the various war-fighting domains. This monumental task requires that the Department of Defense (DOD) identify and develop the appropriate skills and abilities of our people and then establish a Cyber Flag to exercise, exercise, exercise!

Cyberspace

In October 2006, the Joint Chiefs of Staff endorsed the following definition of the term *cyberspace*: "a domain characterized by the use of electronics and the electromagnetic spectrum to store, modify and exchange data via networked systems and associated physical infrastructures."[7] Nearly two years later, however, we still have no published service or joint doctrine that defines cyberspace, a situation that has led to differing views about what cyberspace comprises and what constitutes a force operating in that domain. Discussions within and across the services are complicated by the lack of a common lexicon that clearly delineates which forces and capabilities (such as electronic warfare [EW]) fall within the cyberspace domain. China has advanced far beyond these discussions, having already established consistent doctrine—available through open sources—and an accompanying large-scale IW force. Establishment of a tangible exercise environment that reveals these shortfalls would enable development of a common language out of necessity.

An important reality of the cyberspace domain is that it encompasses far more than just computer networks. Cyberspace is a sphere that includes every element of both analog and digital media, just as airspace includes every air molecule. One need only look at the control that these digital elements have over banking, power distribution, and personal communica-

tions to realize the true extent of this domain. As former secretary Wynne wrote, "Cyberspace is a domain, like land, where each of the principles of war applies. To grasp this concept requires a major institutional and cultural shift in war planning and operations."[8]

The Chinese realized this long ago and capitalized on the fact that the United States has not emphasized the enabling capabilities of operations within and through cyberspace. The conduct and resulting effects of information operations (IO) may not be as impressive as kinetic operations involving physical destruction, but an effective IO capability is just as important as the ability to hit targets with bombs. In fact, due to our own dependence on cyberspace, the United States is more susceptible to asymmetric attacks against our cyberspace infrastructure than to conventional attacks. Because the technology that makes our country so powerful represents a giant Achilles' heel, we must develop and train with the most effective and cost-efficient techniques to protect it.

Fighting Force

Keeping this vulnerability in mind, we acknowledged that the proper posturing of forces to wage war in cyberspace is essential to the future of the Air Force and our nation. Thus, 18 September 2007 saw the activation of Air Force Cyber Command (Provisional) at Barksdale AFB, Louisiana, under Maj Gen William T. Lord.[9] An associated force-development effort for this new major command will bring personnel from various career fields (such as EW, communications, and space control) critical to cyberspace operations. With respect to joint operations, Cyber Command complements both the Naval Network Warfare Command and the Army 1st Information Operations Command. The Air Force now fully embraces cyberspace as an operational domain, one in which we attack and defend targets, produce effects, and hold adversary capabilities at risk.

A recent article titled "Defining Information Operations Forces" examines the capability gaps between and within each of the services regarding the IO mission, contending that these gaps exist primarily because previous attempts to define and build a dedicated IO force proved unsuccessful.[10] Cyber Command establishes the leadership to build a robust force encompassing the diverse missions, skills, and capabilities of IO, but, as discussed earlier, pitfalls remain. An effective training environment provides a springboard for avoiding these hazards.

While the Air Force begins organizing, training, and equipping a force for cyberspace operations, it faces the fact that much of the expertise rests with civilians. However, this was true of the air domain as well since most air pioneers were civilian enthusiasts. Leveraging the capability of computer hackers who so often try to penetrate government and civilian networks offers incredible potential. Consider that during the early years of aviation, some of the most respected pilots performed unimaginable aerial demonstrations as stunt pilots and barnstormers. Regarded as renegades, these same pilots pushed aircraft capabilities and performance to their limits, leaving such names such as Charles Lindbergh indelibly stamped in the history of aviation. In a number of respects, hackers test our information systems in many of the same ways and represent an invaluable resource as the Air Force and DOD seek the skills required to gain dominance in the cyberspace domain. Cultivating the capability to defend against the best computer hackers in the world will enable the military to leapfrog the civilian sector's cyberspace capabilities in much the same way that the Air Force now dominates the air domain. The overall goal calls for developing overwhelming expertise, providing a strong deterrent to potential enemies, and assuring that we have the means of taking decisive battlefield actions to minimize damage to US military and civilian personnel as well as their assets. We can integrate this cutting-edge expertise most effectively into our repertoire by creating an environment that highlights, demonstrates, and improves the enabling capabilities of cyberspace.

The Cyber Flag Revolution

Based on this understanding, we can now move on to the task of integrating both civilian and military forces to protect and defend our nation from the pervasive threat enabled through cyberspace. Preventing, containing, and defeating attacks such as Aurora are vital to the DOD's objective of providing adequate defenses for the nation's critical infrastructure.

Although an eye-opening demonstration, Aurora offers only one example of capabilities by means of cyberspace. The Air Force Information Operations Center at Lackland AFB, Texas, created the Black Demon exercise in 2000 to test the defensive posture of our military networks.[11] For many individuals, Black Demon is the equivalent to playing out Red Flag on computer networks. Participants defend critical command and control (C2) nodes from persistent attacks launched by trained adversaries from the 57th and 177th Information Aggressor Squadrons, the 92nd Information Warfare Squadron, and the National Security Agency. In 2006 the exercise, renamed Bulwark Defender, expanded by integrating forces from the Army, Navy, and Marine Corps, focusing on computer network defense and, as such, providing the best venue for joint integration of forces dedicated to this mission area. It does not encompass the other elements of IO (such as EW and psychological operations) to any degree, nor does it provide an environment that integrates cyberspace effects with those achieved by air-breathing or space-based assets. Therefore, to bring this effort to maturity, we must begin developing an environment that combines effects of air, space, and cyberspace into one realistic training environment.

Pentagon staffers with a vision for realistic training first created the concept of Red Flag in 1975. After the commander of Tactical Air Command, Gen Robert Dixon, approved it, the first Red Flag began in November of that year.[12] The exercise continues to train joint and coalition air forces to operate in a realistic air-combat environment to this day. Red Flag has also contributed directly to the overwhelming military success of the United States in recent conflicts.[13]

Red Flag and Bulwark Defender independently provide key realistic training to aircrew and network operators but fall short in demonstrating cross-domain capabilities and effects. We now need to combine Bulwark Defender and Red Flag into an exercise emphasizing cyberspace effects achieved both kinetically and nonkinetically. This Cyber Flag exercise would preserve the effectiveness of existing training while embracing the new domain of cyberspace and integrating capabilities drawn from across the services and coalition partners into one coherent effort. Bulwark Defender enables us to exercise key joint *defensive* capabilities within cyberspace, whereas Cyber Flag offers a training environment that integrates both offensive and defensive cyberspace effects into the mainstream operational and tactical planning effort. A joint force commander in Cyber Flag could call on IO options or capabilities as readily as he or she would select a bomb or other kinetic weapon. Development of such an environment becomes more palatable when divided into a three-year and 10-year vision, fully focused on maximizing the exposure of participants to effects realized within cyberspace.

Three-Year Vision: Best Practices and Worst Scenarios

A starting point for the establishment of Cyber Flag involves combining the best practices of existing training with the worst cyberspace scenarios, thus enabling a single exercise serving as a proof of concept for the future. The Nevada Test and Training Range (NTTR), the center of Nellis AFB's Red Flag exercise, provides approximately 1,000 square miles for participating aircraft to maneuver against realistic air and ground threats. Similarly, the Joint Information Operations Range, the center of cyberspace exercises, offers an isolated network of geographically separated nodes capable of emulating a large number of real-world network topologies. This range isolates cyberspace effects from the public Internet while protecting tactics, techniques, and procedures from observation by potential adver-

saries. In addition, it protects training events from external influences, thus providing a perfect foundation for the Bulwark Defender exercise. Similarities between the NTTR and Joint IO Range environments, as well as between the objectives of the Bulwark Defender and Red Flag exercises, give us an excellent starting point for integration. Adding the appropriate C2 infrastructure enabled by the Joint IO Range makes the defense of networks supporting a tactical exercise such as Red Flag a critical concern as aggressors attack them. The operational-level communications infrastructure exists as part of Bulwark Defender but lacks ties to the tactical-level planning effort; however, the objectives of Bulwark Defender are an important part of evaluating network defenses. Thus, we can now take training to the next level by utilizing the information flowing on the network to realize tactical objectives. The fusion of the Bulwark Defender and Red Flag environments and scenarios into a Cyber Flag would enable aviators and network operators alike to see cyberspace effects played out in real time. Since Cyber Flag emphasizes cyberspace effects, there is no conflict with existing training objectives, as would be the case if a network attack affected Red Flag's flying training. Friendly network-attack forces participating in Cyber Flag would play a critical role in attacking aggressor target arrays, also enabled by the Joint IO Range. Vital to creating realistic cyberspace targets is the ability to replicate threat systems on an IO range that, when incorporated with the physical Cyber Flag target array on the NTTR, would create an integrated war-fighting environment. Cyber Flag scenarios and lessons learned would then adjust to incorporate this enhanced capability. Consider the following example, which highlights the significant operational impact resulting from an underlying distrust of the data feeding a network.

The combined air operations center, which produces the air tasking order for Red Flag, uses an intranet to tie together the many computers coordinating the operational-planning effort. This network contains several links to the outside world in order to enable access to the Internet and Global Information Grid. Using a relatively low level of sophistication, with no long-term damage, an adversary could penetrate the network and cause various computers to display the adversary nation's flag as the desktop background and screen saver. In itself, this action is benign but requires access to the computer file system; successful access would also allow theft or modification of data that users would probably never discover. This can and should result in a loss of confidence in the data and information on the affected machines and the network as a whole. The reaction of the commander would likely range from a simple incident response and forensic analysis to momentary termination of planning activities. Although the primary effect entails delayed production of the air tasking order, there exists a strong possibility of rippling effects in the targeting cycle. This is just one of a multitude of scenarios that requires training to ensure that we do not see these cyberspace effects for the first time during an actual crisis.

The visualization component of this integration will pose a significant challenge. The Nellis Air Combat Tracking System, the window into the Red Flag battle, does little to demonstrate battlefield effects beyond the conventional realm. During postmission debriefing, the system allows for repeated replay of the air war on huge screens so that the hundreds of participants have a true understanding of what transpired during the mission. Initially, skillful use of debriefing slides could compensate for a lack of cyberspace-effects visualization, but we must have a future vision for a more robust capability—to display the real-time effects of the air and cyberspace battle. Until this type of capability exists, warriors will not fully realize the power of this new war-fighting domain and the fact that effects, rather than the attrition of target sets, hold the key to fighting and winning wars.

Ten-Year Vision: Cutting-Edge Dominance

The next decade should focus on building Cyber Flag into a mainstream training exercise. With even a small-scale proof of concept for Cyber Flag realized in the near term and a

constantly improving visualization capability over the next several years, cutting-edge dominance in cyberspace requires multiple, large-scale, annual events to maximize exposure to this critical training. The Cyber Flag transformation strongly resembles the changes that EW brought to the fight, spawning the Green Flag exercise. During the Vietnam War, employment of low-altitude aircraft proved impractical, so we developed medium- and high-altitude tactics. Key to these tactics was the suppression of enemy SAM systems. A training conflict developed when missile systems were electronically jammed during Red Flag, limiting the participants' opportunity to react to those threats. Many aircrew members saw actual indications of a SAM system for the first time at Red Flag. To preserve this critical training requirement, Gen Wilbur L. "Bill" Creech developed the Green Flag exercise in 1978 to emphasize the enabling capabilities of EW.[14] Green Flag was the most robust exercise of EW assets in the world. The breadth and revolutionary nature of waging war in cyberspace extend beyond the goals and objectives of Red Flag, thus suggesting the need for a similar approach. Realization of a cyber attack that brings all exercise operations to a halt would likely drive home the point that we are fighting a much different type of war. Such an exercise would have the goal of demonstrating offensive and defensive cyberspace capabilities. This approach closely mirrors the way the Chinese have trained since the late 1990s in their transformation from a "mechanized PLA force to an informationalized force."[15] As Timothy L. Thomas states in his book *Dragon Bytes*,

> In October 1999, the PLA conducted another IW exercise. Two army groups of the Beijing Military Region conducted a confrontation campaign on the computer network. Reconnaissance and counter reconnaissance, interference and counter interference, blocking and counter blocking, and air strikes and counter air strikes were practiced. The Operations Department of the General Staff said this was the first time that a computer confrontation was conducted at the campaign level between a red army and blue army. Actual field operations of a similar nature were conducted simultaneously in the Jinan Theater. According to one observer, the performance of the high-tech weaponry was like that of a "tiger with wings." The force demonstrated new tactics of using live ammunition to hit enemy cruise missiles and computer technology to hit information networks, links and points.[16]

The training and capabilities of the PLA have likely improved a great deal since 1999, due in part to such credible training. Our future vision for realistic training should rise to meet this level of threat while breaking free of the geographic boundaries imposed by the current exercise arenas.

Most people in the Air Force are familiar with the phase-two employment-exercise environment, which simulates a base under attack. Participation in a future Cyber Flag could have the same flavor, with a base required to launch attacks from home station while under attack from air, space, and cyberspace. Building on this premise, by 2018 we should have a realistic training environment involving a widely distributed war involving multiple bases, conventional ranges, and computer networks. The continual growth of network and communication capabilities makes this a realistic prediction, given the proper emphasis and planning. Unlike the evaluation model of a phase-two exercise, this one would provide training to participants, just as Red Flag has done for years. What better test of training and preparation than an environment where operations are inhibited by compromises of e-mail servers, degradation of mobile and public switched telephones (or their successors), as well as assaults by aggressor aircraft? The Chinese see this type of training as the way to exercise kinetic and nonkinetic options by their informationalized force, as demonstrated in the exercise report mentioned above. In order to dominate air, space, and cyberspace, the United States must do the same. Experiencing such a robust combat environment at one's home station is the ultimate goal of realistic training since it enables the maximum amount of training, using the most realistic forces, in the shortest amount of time, at the least expense.

Although it is difficult to fathom what the world, much less the Air Force, will look like beyond this 10-year vision, we must strive for a cyberspace capability equivalent to the shock-

and-awe campaign of Operation Iraqi Freedom. In order to do so, we must initiate a continuing effort to keep pace with technology and bring the realities of the cyberspace battlefield into our everyday operations.

Conclusion

In light of emerging technology, a pervasive threat, and the conflict with existing exercise objectives, the time is right for Cyber Flag. There is no better training than the hands-on realism associated with participation in an exercise such as Red Flag or Bulwark Defender. Former secretary Wynne had a vision for dominant operations in cyberspace "comparable to the Air Force's global, strategic omnipresence in air and space."[17] This vision requires a combination of joint coordination, skilled forces, and a realistic training environment to bring them all together. Budget constraints and a failure to accept cyberspace as a decisive warfighting domain could put the US military in a disadvantageous position against future enemies. Cyberspace increasingly stitches together the diplomatic, informational, economic, and military instruments of power. Creation of a dedicated Cyber Flag exercise would ensure the preservation of critical learning objectives in current exercises while preparing forces to understand the important role of cyberspace in attaining battlefield success. The US military does not currently have the advantage in cyberspace. The future of the nation depends on our ability to harness the best practices in order to achieve cutting-edge dominance and, ultimately, shock and awe within cyberspace. ❑

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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 use this department to let readers know about items of interest.*

Chinese Airmen Stepping through the International Gateway

Ma Dezu
Yang Chunyuan*

Editor's Note: Delegations from the People's Liberation Army Air Force (PLAAF) visited Europe and the United States in 2007. China Air Force *magazine published a commentary about the visits and graciously permitted* Air and Space Power Journal *to translate and republish an adapted version that focuses on the visit to the United States.*

IMPERCEPTIBLY, THE CONCEPT of multidimensional war covering land, sea, air, space, and cyberspace is spreading into our sight and mind. The world we live in is becoming more and more linked and transparent. Along with this trend, militaries have increased their normal contacts and exchanges.

Soldiers exist for war. They try to approach and understand each other. But in the current era, such contacts and exchanges are not solely because of war. We see black-eyed Asian soldiers and blue-eyed European warriors salute each other; black-skinned war fighters and white-skinned servicemen exercise shoulder to shoulder.

Go Out, and We Shall Embrace the World

The sky was clear and blue above New York's John F. Kennedy International Airport on 15 June 2007. Outside the arrival gate stood several people in trim uniforms. They were the air attachés from the Chinese Embassy in the United States, the US Embassy in China, and the public affairs staff of the US Department of Defense (DOD), and they were waiting for a group of special guests—a military delegation from China's PLAAF Command College. This delegation would stay for 10 days, visiting McGuire AFB, New Jersey; the Pentagon; Air University; and Randolph AFB, Texas. From the unique perspective of Chinese soldiers, members of the delegation would examine, feel, and understand US Airmen at close range. On the same day, under the same clear, blue sky, another Chinese delegation sent by the same college would land in Rome to visit the Italian Air Force. The motto "go out, and we shall embrace the world" has become the consensus among the militaries of the world ever since the first Gulf War.

*The authors serve on the staff of *China Air Force* magazine.

According to various sources, the US military, guided by its global strategy, has considered "going out" an important means of increasing the power of its forces. The experience of overseas deployment is a must for US officers who desire promotion. From the very beginning, these officers are told to keep the strategic picture in mind and are assigned to different fields of study. Some focus on Asia, but others on Europe or other regions. The US military also invests heavily in sending officers out to study in various colleges around the world.

One PLAAF Command College student who had visited other countries commented, "To understand a rival, you have to know that rival's culture because culture is something that has a profound impact on everything." His remark reflects the prevailing view of modern militaries. As such, "going out" has become an important means of developing military professionals in all countries.

In recent years, military-exchange activities between countries have expanded to a new level. The US Air War College dispatches some faculty members and students to China every year. The PLAAF Command College alone has received more than 10 such delegations. The PLAAF, as the most high-tech service, must keep up with this trend. It must go out, broaden its view and mind, and embrace the world and the future.

Books and Imagination Never Replace Eyes and Thoughts

This was the advice of a PLAAF Command College professor after returning from his foreign-study tour. Indeed, everyone who returned from the US visit in 2007 echoed this remark. As one delegation member put it, "We were profoundly jolted by what we saw and heard. There was something out there that you would never believe or imagine until you saw it. Our eyes and minds were just opened that way!"

The US bases contain soldiers of various ethnic backgrounds. One might take it for granted that there must be sharp ideological and cultural conflicts among them, yet to the surprise of the Chinese visitors, such conflicts were not visible. How does the US military educate these culturally diversified soldiers? How do US soldiers come to understand such questions as, why do you serve? and for whom do you fight? Delegation member Sr Col He Meidong brought this question to the US bases and asked it at every opportunity. He admitted that he was unprepared for the answers. Almost all US Airmen who responded mentioned their education on their service's core values. "During the visit, I observed lots of advanced weapons and brilliant demonstrations," said Col He Meidong. "What impressed me most, however, was this core-value education for Airmen, which pulled me into deep thoughts."

Another delegation member, Sr Col Chang Dingqiu, pondered another important and related issue—the relationship between human spirit and the power of a military force. What he observed from his US counterparts only reinforced his belief. He said, "To win a war, weapons alone are not enough. The decisive factor is the human spirit—the national spirit and culture that are embodied by its military forces."

In the notebook that Colonel Chang brought with him, he wrote the English phrase "CAN DO" in big letters. Chang explained that this was the motto of the 305th Air Mobility Wing at McGuire AFB. The wing wanted all of its members to make these words their most frequently used daily greeting. The US escort officers even asked the Chinese visitors to remember this motto. In fact, on the bus, one US officer led the Chinese delegation in reading it aloud several times. This "can do" attitude reminded Chang of many similar scenes he saw in Hollywood movies, as well as on posters and decorations lining the corridors of US bases. This, Chang believed, was how the power of culture and human spirit transformed into the power of a military force.

Late in his report, Chang wrote, "Informationization is the mainstream of current military development. Moving towards high technology and information is our main goal. But

this is not all. To increase the force's power, it is equally important to inherit and magnify our heritage of human spirit."

During the visit to Air University's College for Enlisted Professional Military Education, Sr Col Zhang Zhiyong noted what he later regarded as the most "audacious" soldier in the world. When delegation members entered the gate, they were first greeted not by the school's senior officers but by a lower-ranking chief master sergeant named Sheila Knox, who then introduced the Chinese guests to the waiting senior officers. More surprisingly, in the meeting room, this same sergeant chaired the whole meeting and gave the briefing while those senior officers attended and listened. "How could a mere chief master sergeant be so audacious and capable?" Zhang and the other delegation members felt puzzled.

This mystery remained with Zhang throughout his US trip. Indeed, he found that all US soldiers were equally "audacious." For example, in the Air University school cafeteria, he witnessed a soldier dutifully walking up to the commander of the college and charging him three dollars for his lunch. Zhang recalled, "This same soldier even came to each of us guests and said, 'Sir, please pay three dollars for the lunch.' " Another example happened in the Pentagon when the US DOD assigned only two soldiers to accompany the entire Chinese delegation, and they completed the mission beautifully. Their professional attitude left a deep impression on Zhang because once the Chinese delegation entered their sphere of duty, they immediately functioned as the commander, diligently performing their duties. The two sometimes even ordered the guests to do this or that but never created a feeling that they were low-ranking soldiers and that their guests were senior officers.

From the performance of these "audacious" soldiers, Senior Colonel Zhang distilled one word—duty. In his report, he noted that "when each serviceman assiduously performs duties within his or her scope of duty and does not wantonly meddle with that of the others, there is no reason to worry about low efficiency in the military."

Sr Col Jiang Bangsheng observed his US counterpart from yet another angle—personalized development. He remarked,

> The situation on the battlefield changes every second. No two wars bear the exact same characteristics. Without strong characters and personalities, commanders and war fighters will rarely prevail. The US military puts great stress on personalized development, encouraging each member to make the best of his individual talents and potentials. As a result, soldiers are eager to demonstrate themselves to the best of their ability. It can be easily imagined that a force made up of these soldiers will be creative, adaptive, and flexible—not easily intimidated by crisis. They will bring their potential into full play. All of these qualities will add to the chance of winning the war.

When scrutinizing foreign military developments, modern Chinese soldiers know how to perceive not only strengths but also weaknesses. Sr Col Luan Zhong did exactly that when visiting US Air Force bases. He noted that "the seemingly powerful US military, like the others, also possesses weak points. For example, it relies too heavily on combined/joint operations, a habit which erodes the capabilities of individual services. Also, it trusts too much in high technologies, neglecting the conventional weapons. It overemphasizes individualism and freedom, causing numerous problems in its bases. We therefore should learn from such lessons and guard against them."

Having stepped through the international gateway, Chinese soldiers obviously broadened their field of view, gaining space and courage for out-of-the-box thinking. Although this is certainly an important accomplishment from international military exchanges, a more significant achievement is that these soldiers now feel more keenly the responsibilities on their shoulders. It can be expected that, after returning from foreign visits, they will apply the new ideas to their duties and incorporate them into the Chinese military's force development.

The Rewards of Visits

Most of the PLAAF officers who have had chances to see the outside world will submit reports, hold seminars, and write papers in order to disseminate what they saw, heard, and thought to their fellow airmen. They serve as the center point of a circle that spreads new ideas, new spirit, and new culture.

"Go out, and we will reap the harvest! What matters here is not only broadening our views but also generating effects in many more areas," said Wang Jianmin, the political director of PLAAF Command College, who had just returned from his visit as head of the delegation to the Italian Air Force. Looking at a thick collection of foreign-visit reports, he continued, "We are living in an era featuring not only transparency but also cooperation and codevelopment. Mutual understanding between states promotes better development. Mutual understanding between militaries has deeper implications. Apart from trying to 'know your enemies and know yourself' and to make yourself more powerful, military exchange has a more important mission. That is, to establish friendship, to deepen mutual understanding and trust, and to better defend peace in this world." ❑

Twenty-first Century airpower is not merely the sum but the product of air, space, and cyberspace superiority. Loss of control in any one of these domains risks across-the-board degradation—if not outright failure.

—Gen T. Michael Moseley

Embracing the Joint-Training Enterprise

Dr. William M. Rierson*

HOW DOES OUR predominantly conventional military defeat an unconventional enemy who willingly accepts huge losses and constantly adjusts tactics to counter or avoid our strengths? Clearly, we are fighting an adversary who resorts to asymmetric warfare; insurgents in Iraq and Afghanistan know they cannot defeat the US military on the conventional battlefield. To overcome an innate lack of collaborative supporting arms, the irregular soldier merely resorts to the most basic of warfare tactics: small-unit, decentralized, hit-and-run tactics; ambush; assassination; and simple sabotage. He looks for and attacks our weaknesses. He blends into the civilian population and uses it for cover and concealment. He manipulates information or generates misinformation that can alter the economic, political, and societal landscapes which affect combat operations.

Time can also become our enemy. The Vietnamese fought for 30 years; the Sandinistas for 18. Modern insurgents have an ample reserve of patience, thus giving them a potential advantage over our conventional forces. In opposition to that advantage, our own political and domestic environments require us to find a means to defeat the insurgency quickly or, at a minimum, create conditions that permit the host nation to assume the military lead of the counterinsurgency fight.

Countering our adversary's advantages and unconventional tactics means that US and coalition ground-maneuver units must leverage the joint application of service resources to bring to bear all available combat power in a full and coordinated response. Widely distributed forces, such as those we have in Iraq and Afghanistan, must be able to gather information efficiently and share it rapidly via a secure network at all levels of command and across boundaries. This information superiority, in turn, increases speed of command and opportunities for coordination across the battlespace. It provides our forces the ability to get inside our enemy's abbreviated decision cycle and mitigate the advantages of hide-strike-hide insurgent tactics as well as ad hoc command and control architectures. It sets the stage to defeat the enemy piecemeal: cell by cell, leader by leader.

We are engaged on a nonlinear battlefield that demands resources beyond the traditional Cold War–era air-land battle planning and "combined-arms" operations. We face the challenge of planning and executing timely joint operations. Failure to provide and disseminate timely intelligence that supports surgical, effects-based operations will result in our inability to counter a sophisticated insurgent threat. Our conventional ground and air forces must arrive in-theater prepared for this new asymmetric fight. To do so, units down to the brigade-combat-team and squadron levels must carry out innovative and realistic predeployment training that includes joint-training objectives.

The military cliché used during the Cold War era still applies: "train the way you fight." We need a new, interdependent joint-force training model to take advantage of all the combat multipliers available to the war fighter, even down to the individual trooper. How does a 21-year-old infantry sergeant leading a combat patrol gain immediate access to joint assets that can provide him the supporting firepower he may need to engage an immediate threat? Even more importantly, how does

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that sergeant's commander gain the actionable intelligence provided by those same joint resources that may obviate engaging in close combat or delivering a kinetic response? Removing insurgent threats without high-risk, close-combat action or destructive power (which increases the potential for collateral damage) requires collaboration and interdependency of intelligence resources. When we have no passive solution and need a kinetic response, or when organic weaponry proves inadequate or inappropriate, the maneuver commander should be able to rely consistently on immediate and effective nonorganic "joint" fire support. Such a capability dictates binding service partnerships and integration of service resources to provide joint-training opportunities.

Joint training and realistic mission rehearsals are the key—not only for that sergeant and his commander but also for the supporting assets: the fighter pilots, intelligence analysts, ground-surveillance radar operators, or coordinating staffs. In order for units to accomplish their missions, synchronized tactical-training scenarios should both permit and require joint-force participation. Establishing a persistent, combined-arms, interdependent joint-training model must become the standard, not the exception, for all service combat training centers (CTC); equivalents; and home-station, collective-training events. Innovative training must transcend traditional service-training norms and leverage joint-force capabilities throughout the depth of the battlespace.

We have a potential joint-solution template in the form of the ongoing Brigade Combat Team Air-Ground Integration (BCT A-GI) training concept, a collaborative Army Training and Doctrine Command and Air Force Air Combat Command initiative supported by US Joint Forces Command's (USJFCOM) Joint Fires Integration and Interoperability Team (JFIIT). It is a direct response by the services to US Central Command's request to reduce proficiency gaps in operational planning and to use joint air-ground resources. Hopefully, BCTs would better leverage joint close air support and joint intelligence, surveillance, and reconnaissance assets from the national level on down to help prosecute the tactical fight. The BCT A-GI emphasizes training in both individual skills and predeployment activities during home-station, collective-training events, culminating in a mission-readiness exercise at a CTC. At each step along the way, the services' training coordinators and force providers include joint context, where appropriate, by synchronizing not only training scenarios but also resources.

The JFIIT conducts assessments of each training event, including home-station training and CTC rotations, focusing primarily on the ability to create a realistic joint-training environment. Additionally, the assessments measure the unit's improvement in air-ground integration to determine the efficacy of the training. Based on assessment results and feedback collected by the Center for Army Lessons Learned during training and in the theater of combat operations, the JFIIT writes a collaborative report chronicling the entire concept. Rather than detailing the participants' strengths and weaknesses, this final report determines whether the BCT A-GI concept successfully created a joint-training environment and whether it increased the participants' abilities to conduct joint air-to-ground operations.

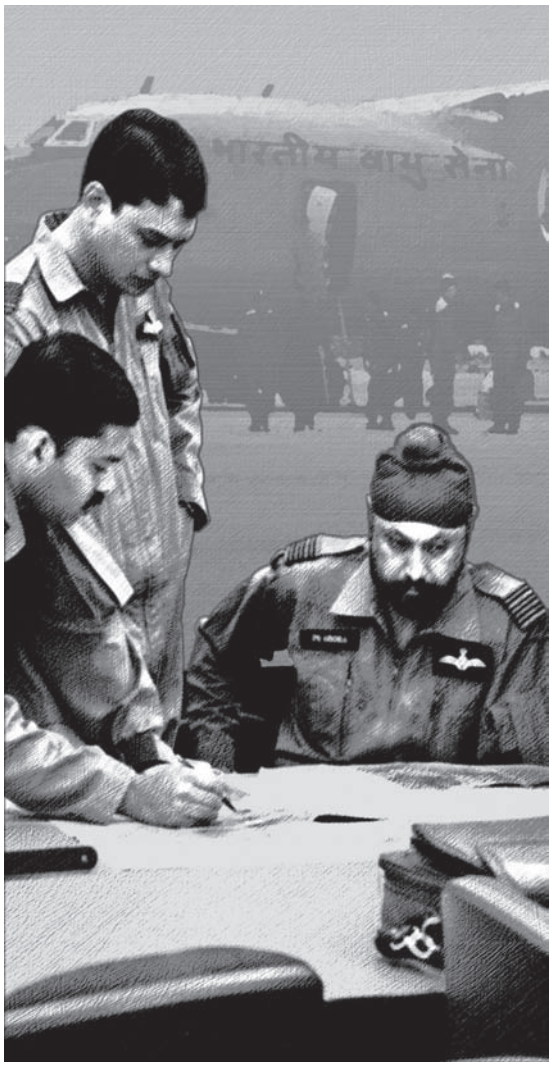
The BCT A-GI training initiative and other synergistic initiatives, such as the joint intelligence, surveillance, and reconnaissance integration for the Western Range Complex, are equal parts of a holistic solution to import a joint-training capability to the services—the "Joint Training Enterprise," as coined by the Army's Maj Gen Jason Kamiya, director of joint training (J-7) and commander of the Joint Warfighting Center at USJFCOM. These collaborative efforts involve the USJFCOM J-7, USJFCOM Joint Capability Development Directorate (J-8), Training and Doctrine Command, Air Combat Command, Army Forces Command, Fleet Forces Command, and Marine Forces Command. Rather than occurring as an anomaly, a persistent joint-training routine will help the maneuver and airpower commanders coordinate the full application of joint combat power and intelligence-gathering capabilities to facilitate a successful counter-

insurgency within the current operational environment. We could apply this same joint-training-capability "template" to any home station, CTC, or collective-training event to provide a viable joint solution to joint air-ground gaps identified in the Center for Army Lessons Learned's *Joint, Interagency, Intergovernmental, and Multinational Lessons Learned Report-2007, Joint Context Training and Knowledge Gaps*, 16 March 2007.

To produce trained, integrated, and interdependent joint forces, commanders at the major service and joint command levels must formally mandate that joint training take place and must create opportunities for the services to exercise joint tasks. Service training venues must embed joint training as part of the predeployment training sequence—not simply offer or program it into occasional joint-training exercises. Until senior leaders dictate joint training as a requirement rather than an option, the services and subordinate tactical-level commanders at the street-fighting level will continue to focus on the immediate needs of individual and unit collective training. They perceive their plates as full, with no room for another task—for most, an accurate perception. There is only so much time for training between deployments. Consequently, commanders will often ignore joint training until they find themselves in-theater and then must conduct on-the-job training under fire. Embedding joint-training tasks within currently existing service training is the only real option—and BCT A-GI offers a start. ❑

To succeed—indeed, to avoid catastrophic failure—we must redefine the Air Force for the 21st Century.

—Gen T. Michael Moseley



The Strategic Role of Airpower

An Indian Perspective on How We Need to Think, Train, and Fight in the Coming Years*

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Editorial Abstract: Recent advances in precision airpower systems, hardware, and weapons have engendered an effects-based approach to conducting combat with increased speed as well as reduced attrition and collateral damage. The author posits that to enter this new realm, the Indian Air Force is now undergoing a radical change in mind-set and reorienting its force structure so that it will be capable of simultaneously influencing operations at the tactical, operational, and strategic levels.

The Indian Air Force has been focusing on "strategic reach" as a major factor of its transformational process. It has been acquiring the wherewithal for expanding that reach in recent years to trans-continental ranges not only with its transport fleet but also with its combat aircraft.

—Air Commodore Jasjit Singh

*This article is derived from the author's prize-winning article published by the Indian Centre for Air Power Studies in *Air Power: Journal of Air Power and Space Studies* 3, no. 4 (Winter 2006): 13–32, http://www.aerospaceindia.org/Journals/Winter%202006/02subramaniam.pdf.

THE APPLICATION OF airpower to further a nation's strategic objectives has gained momentum over the last few years, ever since it was used with telling effect in Operations Desert Storm, Allied Force, Iraqi Freedom, and Enduring Freedom. The advent of sensors that provide accurate target intelligence, coupled with precision-guided munitions (PGM), has led to effects-based operations' gaining predominance in speedy conflict resolution, with minimum attrition and collateral damage. The Indian Air Force (IAF) is in the midst of a radical change in mind-set and reorientation of its force structure that will enable it to conduct parallel warfare and simultaneously influence operations at the tactical, operational, and strategic levels. In light of these developments, we need to think, train, and fight with a strategic focus.

Conceptual Development

The use of airpower to further a nation's strategic aims and objectives has come a long way since the pounding of Nazi Germany's ball-bearing factories by Allied bombers and the obliteration of Hiroshima and Nagasaki, both of which events had a significant effect on the outcome of World War II. Subsequent aircraft such as the B-52 in the 1950s and the Russian Tu-126 bomber in the 1960s could deliver nuclear missiles and warheads. This capability added a new dimension to strategic airpower—that of deterrence.[1] Barring the odd failure, the application of airpower to attain strategic objectives and engage in coercive diplomacy has seen tremendous success over the last 40 years. Without constantly harping on the contribution of strategic airpower at Hiroshima and Nagasaki as the prime catalyst for the surrender of Japan, one can cite numerous examples that cut across different intensities of conflict to push the case for reappraisal of the swift benefits of the strategic air campaign. Whether in Operations Linebacker I and II, which helped the United States draw North Vietnam back to the negotiating table in 1972, or during the surgical strikes on Arab airfields by the Israelis in 1967, target selection proved key to achieving strategic objectives.[2] Conversely, poor target selection during Operation Rolling Thunder from 1965 to 1968 led to the total failure of that operation. The strategy of targeting the Ho Chi Minh Trail and centres of population in North Vietnam proved to be blunders rectified in Linebacker II, which targeted only military and infrastructure elements of national power.[3]

Next came the redefinition of platforms to prosecute the strategic air campaign and the consequent understanding that the campaign became better focused when one looked at the effect of destruction on a nation's ability or will to wage war rather than concentrating on the target and platform itself. The choice of attack platforms today also represents a radical shift from the strategic-bomber concept. Role reversal of strategic and tactical aircraft commenced in Vietnam, where B-52s carried out missions in support of ground operations while F-4s and F-105s flew against strategic-interdiction targets deep inside North Vietnam. Years later, eight F-16s, primarily considered tactical platforms by the United States Air Force (USAF) and Israeli Air Force, destroyed the Iraqi nuclear reactor at Osirak in a classic strategic strike.[4] The final fillip to the case for strategic airpower is, without doubt, the emergence of highly accurate PGMs, coupled with real-time intelligence and just-in-time targeting, which enable a nation to exert its will on another without committing ground forces, thus paving the way for negotiated settlement of conflicts without unnecessary collateral damage and loss of life. An apt example of this redefinition, perhaps not palatable to the counterair purists, would be the destruction of Arab aircraft on the ground in 1967 during the counterair campaign launched by the Israeli Air Force. Were not the effects strategic in terms of breaking the Arab coalition's ability and will to fight? Enough has been written over the years about the spectacular success of the coalition air forces in Desert Storm, wherein an effects-based strategic air campaign, conceived by Col John Warden and executed by Gen Charles Horner, helped achieve Pres. George H. W.

Bush's strategic objective of driving Iraq out of Kuwait with minimum attrition.[5] If one were to pinpoint one failure of the use of strategic airpower in recent years, it would be that of the USAF to eliminate Osama bin Laden and the top Taliban leadership—one of the main strategic objectives of Enduring Freedom. If mass, tonnage, widespread area bombing due to lack of hard intelligence, collateral damage, and indiscriminate loss of life were the prime characteristics of the strategic air campaign of yesteryear, then stealth, precision, intense shock effect, speedy capitulation of the enemy, and achievement of objectives characterize the twenty-first-century strategic air campaign.

Skeptics may say that the next few generations may not see a world war and that force structures of developing countries like India need to focus on waging local wars under hi-tech conditions, low intensity conflicts, and counterinsurgencies. They could not be farther from the truth because the coming years will see a struggle for strategic resources, strategic points, and strategic markets, most of which are spread across the globe, thousands of miles from a country's geographical boundaries. A threat to these assets would warrant speedy intervention, something that only airpower in tandem with space-based reconnaissance, surveillance, targeting, and acquisition capability can achieve. Obviously, all of these capabilities would have to be networked and secure—a difficult task without dedicated satellites and bandwidth for military use. One cannot overemphasize the case for further developing the IAF's strategic air capability in the coming years in light of India's emergence as a potential economic superpower with global energy interests and markets. Only synergistic joint operations can provide swift, precise, and decisive intervention in potential hot spots spread across continents, with airpower used as a springboard or launchpad for further intervention by land and naval forces.

Understanding Paralysis, Asymmetry, and Parallel Warfare

The three main objectives of any military campaign—coercion or intimidation, incapacitation or dismemberment, and annihilation or destruction—have always focused on achieving a nation's geopolitical goals in any dispute or conflict. Warfare in the twenty-first century is slowly moving towards using annihilation or destruction as a last resort in legitimate warfighting scenarios. That said, two airpower theorists from the USAF—Col John Boyd and Colonel Warden—propounded path-breaking theories of paralysing the enemy by strategic application of airpower.[6] While Boyd talked about paralysing the enemy psychologically and weakening his will to fight, Warden emphasized the need to paralyse the adversary physically by attacking leadership, infrastructure, communication links, and fielded forces as part of his now-famous "Five-Ring Theory," based on Clausewitz's centres of gravity, which formed the heart of the air campaign in Desert Storm. The cornerstone of this process is the high probability of pounding an enemy into submission without inflicting too many casualties and reducing the intensity of battles by driving his leadership underground, blinding him, rendering his senses (eyes and ears) ineffective, and destroying his reserves as well as follow-on forces by carrying out deep precision strikes. Although the strategic air campaign that aims at paralysis is based on the overwhelming asymmetrical technology advantage that US forces will likely enjoy in any conflict scenario, policy and strategy planners in India must understand the tremendous advantages of creating an asymmetry vis-à-vis potential adversaries by building up a potent strategic air capability built around technology, force multipliers, and multitheatre capability.[7] That does not mean that airpower and strategic air campaigns alone can win wars, but by applying the principles of asymmetry and paralysis, we can hasten the capitulation of an enemy by incapacitating him and reducing his military potential, as mentioned earlier, rather than destroying him. Airpower can do all this—and simultaneously support the surface campaign by conducting parallel warfare at the tactical, operational, and strategic levels.[8] Building such an ability calls for a change in mind-set and significant alterations in asset allocation. In the Indian context, we cannot restrict build-

ing up asymmetry to the acquisition of technology, force multipliers, and space-based sensors, as many would believe, in order to justify a leaner air force. We would need to supplement these factors with sufficient numbers of aircraft and platforms to conduct parallel warfare on multiple fronts. This obviously calls for a strong case to progressively beef up the number of combat squadrons in the IAF from a projected 29–30 by the end of 2008 to at least 40 by 2015.[9] The progressive induction of additional Su-30 MKI squadrons and 126 Medium Multi-Role Combat Aircraft (MMRCA) will likely fill the void created by phasing out platforms such as older variants of the MiG-21 and -23.

Role Definition in the Twenty-first Century

The emergence of invisible enemies, such as terrorists, and unconventional targets involving material and human resources will increase the difficulty of classifying the roles performed by strategic air assets over the next few decades. Perhaps the most critical characteristics of airpower that might occupy centre stage for the IAF in years to come would include flexibility, reach, precision firepower, and interoperability, with other characteristics such as surprise and shock effect serving as age-old, time-tested corollary benefits. What aspects of these four characteristics make them the focus of a study to define the IAF's strategic-airpower roles for the twenty-first century? The ability of a platform to switch effortlessly from a tactical to a strategic role is an inescapable imperative, as is its reach in performing interventionist roles with appropriate combat-support elements, thousands of kilometers away from its launch base. Having reached its target, the platform must be able to neutralise it with precision attacks and minimum collateral damage. The platforms and crews used for prosecuting the strategic air campaign must operate in international airspace with varied sensors and possibly with aircraft/aircrews of multinational task forces, especially in conflicts involving United Nations or multinational forces. They also need to be well integrated with elements of the surface forces involved in strategic interventions so as to synergistically apply the principles of asymmetry in conflict resolution. Having broadly spelled out the framework, we can now turn to the broad strategic roles and missions that the IAF can take on with a force structure that utilizes aircraft such as the Su-30 MKI, MMRCA, Mirage 2000 (M-2000), IL-78, IL-76, and Airborne Warning and Control System (AWACS). Although we could easily ape the USAF by formulating a strategic air campaign and force that emphasize centres of gravity, nothing would be more divorced from the reality of the Indian situation. The IAF would need to answer two major questions:

1. Do we have the resources to prosecute such a campaign?
2. Are we likely to be faced with an Iraq-like situation of waging war in a foreign land and over such a prolonged period?

The answer would obviously be *no*! Until now, people have viewed the IAF as a predominantly tactical air force with limited deterrent capability. The advent of platforms such as the Su-30 MKI, weapon systems such as the Brahmos cruise missile, and force multipliers that include aerial-refueling platforms, unmanned aerial vehicles (UAV), and AWACS creates a need to "think big" and "think far." We must replace conventional roles with those that cater to the following scenarios:

- power projection
- strategic intervention over limited distances and duration
- proactive strikes and elimination of threats
- humanitarian intervention
- peacekeeping/enforcement missions in a lead role
- protection of energy and economic resources as well as the Andaman, Nicobar, and Lakshadweep island territories
- antiterrorist and antihijacking operations

- protection and evacuation of human resources
- enforcement of no-fly zones

In many of the scenarios and roles indicated above, the navy and army would continue to form key components of a joint task force, but airpower would provide immediate intervention. Although the tsunami-relief efforts of 2004 highlighted the speed and responsiveness of Indian airpower in terms of providing succour to the affected areas at home as well as in neighbouring countries such as Sri Lanka, they also revealed the need for additional resources such as heavy-lift helicopters and transport aircraft for disaster-relief operations. This assertiveness and articulation of the IAF's strategic reach may not appear very large from a US perspective; however, one must view it in the light of India's emergence as a responsible regional power and global economic powerhouse with expanding markets and interests.

Targeting for Strategic Air Strikes

Targeting philosophy has also changed significantly over the years, dictated mainly by the nature and duration of wars, capability of platforms, accuracy of munitions, and quality of intelligence. The slow and sequential effect of strategic bombing during World War II—and to some extent during Vietnam—did contribute significantly to the final outcome, owing to repetitive attacks. This involved thousands of sorties against the same target sets without worrying much about civilian casualties and collateral damage. The main aim called for systematically undermining industrial capability and psychologically numbing an adversary into submission. Closer to home, the surgical strike by IAF MiG-21s on the governor-general's residence in Dhaka in December 1971 did make a significant dent in the morale of the East Pakistani leadership, ultimately resulting in its capitulation only days later. Conventional wars and conflicts in the twenty-first century are likely to be short and swift, necessitating extremely quick and effective targeting without having to resort to repetitive attacks. The same, however, cannot be said of subconventional wars, which could last several years. One need look no further than the conflicts in Jammu and Kashmir, Iraq, and Afghanistan. The demands on airpower to shift focus from conventional strategic targeting to subconventional targeting at short notice would have to be met by leveraging the same strategic characteristics of airpower, discussed earlier in this article, and adapting them for irregular warfare.[10] Terrorist or insurgent leadership, communication networks, and safe havens in sympathetic countries would comprise typical strategic targets in subconventional scenarios. The USAF and Israeli Air Force actively engage such targets, but the IAF has not yet done so, primarily because the limited availability of precision weapons hampers operations in densely populated urban environments; the real-time intelligence needed to speed the sensor-to-shooter loop is unavailable; and the IAF realizes that most nonstate actors, actively aided by neighbouring states, operate in Indian territory, mingling freely with the local population. These factors also help explain why Indian political leadership is hesitant to use offensive airpower to address subconventional targets. We may have to reassess this mind-set in years to come if India has to effectively prosecute the war on terror. Typical changes in target profiles over the years include the following:

World War II	*Gulf Wars of 1991 and 2003*
population centres	enemy leadership
industrial capability	command, control, communications, and intelligence (C3I) systems and sensors
manufacturing centres	fielded forces and reserves
hydroelectric and power generation	sites for nuclear weapons and weapons of mass destruction

Thus, the targeting focus has shifted from people and the economy to leadership and military capability.[11] Operations Desert Storm

and Allied Force greatly redefined targeting for the strategic application of airpower, with significant additional refinements occurring during Enduring Freedom in Afghanistan and Iraqi Freedom in 2003. The Gulf War of 1991 featured a fairly rigid set of targets defined by perceived centres of gravity and folded into a largely individualistic and much publicised strategic air campaign. The "Shock and Awe" strikes unleashed during Iraqi Freedom, however, saw simultaneous engagement of a number of strategic targets by platforms as varied as the B-2 bomber and the F-16, armed with PGMs and a wide variety of smart weapons. The estimated 42,000 sorties flown during Desert Storm expended approximately 210,000 unguided bombs and around 17,000 PGMs.[12] This low percentage of PGMs (less than 10 percent) stands in stark contrast to the bombing during the initial part of Iraqi Freedom, when PGMs made up more than 65 percent of the air-to-ground weapons used by coalition forces.[13] Another interesting change in US strategy has lessons for the IAF; specifically, rather than tying the strategic air campaign during the 2003 Iraq war to a traditional timetable, as in Desert Storm, planners instead fit it like a glove around simultaneous land and naval campaigns, giving more impetus to the importance of synergy and joint operations.[14] Another interesting lesson from Iraqi Freedom for the IAF concerns the role played by PGMs in reducing the size of strike packages and the number of revisits to a target system, as compared to related actions during Desert Storm. This resulted from improved weapon performance and enhanced real-time battle damage assessment facilitated by advances in space-enabled reconnaissance, surveillance, targeting, and acquisition technologies.[15]

Bolstering Indian Strategic Air Capability

The present IAF force structure offers limited capability for strategic intervention. Only aircraft such as the Su-30 MKI, M-2000, and IL-76/-78 meet the various criteria laid down for such intervention. Given India's growing global aspirations, we need to address our force-structure requirements for strategic force projection, intervention, and even coercive diplomacy. While delivering the Air Chief Marshal P. C. Lal Memorial Lecture in March 2006, Mr. Pranab Mukherjee, defence minister of India, acknowledged the primacy of airpower in future conflicts and linked the reorientation of the IAF to India's rapid economic growth and the need to protect its security interests extending from the Persian Gulf to the Strait of Malacca. He went on to highlight the need to emphasize strategic thinking, joint operations, and asymmetric warfare, all of which have been discussed in this article.[16] Some of the essential ingredients for bolstering our strategic air-war-fighting capability include not only tangible assets such as hardware resources and technology, but also intangibles such as leadership and political will.

Platforms

Amongst the numerous aerial platforms presently in use worldwide as part of strategic forces, the most important ones from an Indian perspective are fighter aircraft, heavy-lift/medium-lift transport aircraft, multirole helicopters, and force multipliers such as the AWACS, air-to-air refuelling (AAR) platforms, and early warning aircraft. We need to back up these platforms with providers of real-time information such as satellites with image resolution of less than one meter and rapidly deployable UAVs with multiple sensors, adequate loiter time, and even limited firepower. Although the Su-30 MKI, with its phenomenal reach, awesome firepower, and multicrew/multimission capability, is an ideal platform to prosecute a strategic air campaign, we must clearly understand that we can neutralise strategic targets by effectively employing essentially tactical platforms such as the M-2000 and the MMRCA, 126 of which are in the pipeline. Even older platforms such as the Jaguar can supplement the Su-30, M-2000, and MMRCA; however, their use in strategic air campaigns would require greater coordination, support, and precision. Strategic strike capability without strategic airlift capability leaves a gaping

hole in a nation's ability to project, sustain, reinforce, and, if required, extricate strategic forces over vast distances. The IAF's only strategic airlift platform, the ageing IL-76, needs to be supplemented by a newer-generation heavy-lift aircraft in the same or larger category and a medium-lift aircraft with a payload of 15–20 tons. As far as helicopters are concerned, destruction of C3I nodes, elimination of leadership, insertion/extrication of special forces, and interdiction of reserves and follow-on forces are all strategic tasks in the context of effects-based operations. We must quickly address the yawning deficiency in this area.

Force Multipliers

With the induction of the IL-78 AAR platform and impending induction of the AWACS, the IAF will take the first step to becoming a truly self-reliant air force with global-intervention capability. However, this should not lull us into a false sense of bravado that the journey ends here. A look at the geographical extent of our country reveals that the number of refueling and AWACS aircraft would barely suffice to address tactical needs in multiple theatres, leaving very little for any meaningful strategic intervention. We need to fill this limitation and void with additional platforms to create an exclusive force that thinks, trains, and fights strategically. The introduction of UAVs into the IAF and exploitation of civilian space technology also add significant punch to our capability and require careful integration into our intelligence framework.

Intelligence Gathering to Support Strategic Air Operations

Presently, sharing of intelligence between the military and other agencies leaves much to be desired, and turf battles have resulted in less-than-optimal sharing. No longer static, targets for strategic intervention range from elusive enemy leadership to highly mobile tactical weapon systems whose destruction can break an enemy's will to continue fighting. Classic examples include the continued US air attacks against mobile al-Qaeda leadership, with limited success, in conjunction with special forces, and the destruction of Serb surface-to-air-missile sites during Allied Force by airpower alone. Too many agencies currently receive, process, interpret, and disseminate intelligence, and a pressing need exists for a lean intelligence structure to support strategic air operations. (See the figure for a broad requirement that doesn't dissect the structure too critically.)

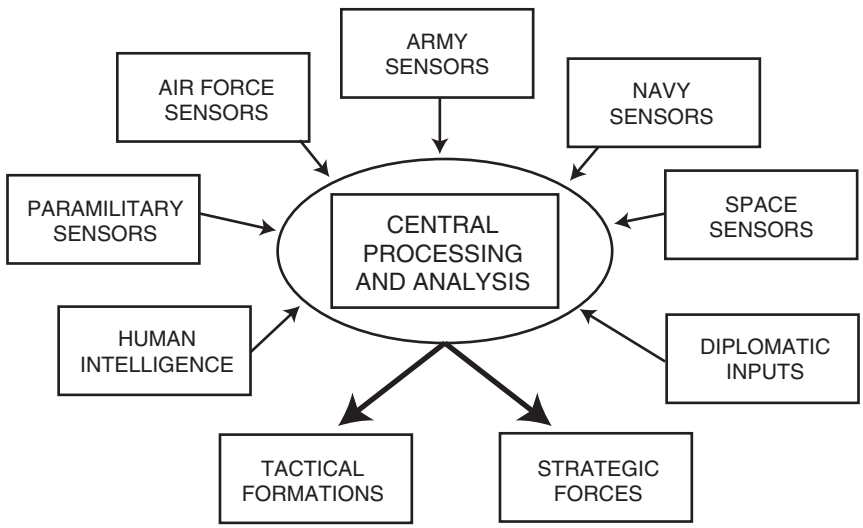

Figure. Intelligence network for strategic air operations

With the phasing out of the MiG-25 strategic reconnaissance aircraft, the onus of providing accurate intelligence for strategic targeting has shifted to space-based sensors. Even in the absence of dedicated military satellites, capabilities of civilian remote-sensing technologies like the Ikonos (US) and the Indian-technology experimental satellite permit resolutions as low as one meter.[17] With possibilities of further improvement in resolution, the gap between civilian and military capability is diminishing. (For typical resolutions required to examine possible strategic targets, see the table.)[18]

According to Prof. U. R. Rao, a pioneer of India's satellite programme, the only way to exploit space for strategic intelligence in the absence of a dedicated military satellite programme is to foster greater synergy between the Indian Space Research Organisation (ISRO) and defence users such as the three services, the Research and Analysis Wing, and the Intelligence Bureau.[19] He goes on to say that all requirements for strategic reconnaissance have to be met indigenously, with the ISRO capable of satisfying the need for enhanced resolution. Needless to say, the success of any strategic air campaign depends on the accuracy of intelligence and training in a realistic environment similar to that conducted by coalition forces in Desert Shield, prior to Desert Storm. Common sensor and communications programs in UAVs, manned aircraft, and even satellites are vital to mission effectiveness, along with a single processing, analysing, and disseminating agency such as the aerial common-sensor programme being adopted by the US armed forces.[20]

Communication Requirements

Transfer of real-time information between aerial weapon platforms and ground/airborne sensors is essential to the successful execution of any mission. It assumes even greater relevance in the case of a strategic air operation, wherein the flexibility to abort the operation or assign a new target location minutes before the time over target is imperative to the emerging concept of just-in-time targeting, which significantly shortens the sensor-to-shooter loop. The ingredients of a secure, effective, and flexible system include a satellite-based defence-communication system with encryption and sufficient bandwidth, and a Link 16–type of data link that gives aircrews and mission coordinators a clear picture or situation report of both the tactical and strategic air situations.[21] This would involve elaborate linking up of surveillance platforms, ground-processing sensors, AWACS, other airborne platforms, and even special forces, who could serve as terminal designators against mobile and elusive targets such as enemy leadership in mountainous terrain.

Political Will and Intent

Prosecution of strategic air campaigns requires strong political will, clarity of intent, ability to gather domestic public support/approval, and ability to absorb international criticism. The only way to gather public support in a democracy like India is to encourage widespread debates to make our strategic interests widely known and accepted so that when these interests are threatened, we can easily make the

Table. Typical resolution requirements (in meters) for targeting

Target	Detection	General Identification	Precise Identification	Description	Technical Analysis
C3I Headquarters	3.0	1.5	1.0	.15	.10
Nuclear-Weapon Components	2.5	1.5	1.0	.15	.05
Missile Sites	3.0	1.0	1.0	.3	.05
Airfield Facilities	6.0	4.0	3.0	.3	.15
Bridges	6.0	4.0	1.5	1.0	.3
Radars	3.0	1.0	0.3	.15	.02
Supply Dumps	2.0	1.0	0.3	.03	.03

Reprinted from U. R. Rao, "Exploitation of Space for Conduct of Military Operations," *Trishul*, Spring 2004, 3.

decision to use force. This is a weak area in our country that we need to address at the earliest. The organisation for speedy decision making exists, but we must exercise it more often in the assessment of our strategic interests and potential interventions. Unlike the United States, where a large number of ex-servicemen make up part of the political leadership, India has very few politicians with military backgrounds. For this reason, airpower proponents must educate the political leadership on airpower's strategic capabilities.

Changes in Philosophy and Doctrine

Probably the most difficult part of change entails altering a mind-set. Recent decades have shown that airpower has the ability to decisively influence the course of any conflict by strategic application of force, be it in the Arab-Israeli conflict of 1967, the Bekaa Valley in 1982, or Desert Storm, Allied Force, and Enduring Freedom. Lebanon and Iraq have also taught us lessons about the limited strategic impact of airpower in subconventional scenarios. It is time to embrace a doctrinal shift towards building up a Strategic Forces Command that recognises the need to develop intervention capability across the spectrum of conflict spearheaded by airpower. Naval and land forces would complete a synergistic troika without needlessly engaging in turf battles regarding command and control of theatre forces, something that has so often stunted the development of strategic doctrine within the Indian armed forces. We need to adopt the techniques of parallel warfare, in which the payoffs of strategic applications of airpower, when applied simultaneously with tactical applications, act as a decisive force. Lest the surface forces feel that strategic air strikes have no effect at the tactical or operational levels of war, one need only travel a short distance back in history to see otherwise. The use of tactical platforms such as A-10s, AV-8Bs, and F/A-18s to destroy elements of the two Iraqi armored divisions that maneuvered offensively to influence the abortive Iraqi offensive at Al-Khafji offers a classic example of a tactical operation that ultimately had tremendous strategic significance in that it became the proverbial nail in the coffin for Iraqi ground resistance in 1991.[22] The concept of the strategic air campaign today focuses on attacking targets that surface forces can subsequently attack or exploit with reduced forces and casualties. Current air force doctrines seek to serve the overall effort by leveraging the impact of strategic strikes and interdiction, not by waging independent wars.[23] This in itself should be enough to assuage any apprehension amongst the surface forces that airpower is trying to usurp their primacy. Such a belief—a total nonissue—only undermines synergy and jointness.

The key issue, however, involves fostering an understanding of the capabilities of strategic strikes and interdiction. Despite the politico-strategic procrastination over using airpower during the Kargil conflict of 1999, the IAF's "never done before" high-altitude interdiction air campaign did contribute significantly to the strategic objective of evicting Pakistani regulars and mujahideen from the heights that they had stealthily and audaciously occupied.[24] The application of airpower against tactical targets such as dug-in troop emplacements and mountain supply dumps at elevations of 16,000–18,000 feet created a strategic effect and forced the intruders to vacate all the dominating heights and retreat into Pakistan. It also forced the Pakistani military leadership to reassess its apparent strategy of waging a proxy war against India. Offensive air operations also silenced critics within India who felt that airpower was essentially escalatory in nature. In fact, the introduction of airpower proved decisive in de-escalation and conflict resolution. With that as a template, nothing prevents the formulation of a cohesive interdiction campaign, even in subconventional scenarios, provided that surface forces realise the tremendous payoffs of a well-planned strategic-interdiction campaign.

Training

The next logical step, after displaying political will and changing existing mind-sets regarding the advantages of airpower in the furtherance of India's strategic objectives, calls for

training and thinking to fight strategically. The present IAF training pattern for aircrews, controllers, and support elements is heavily skewed towards a tactical orientation and rather defensive in nature due to our reactive doctrine since we have never wanted other nations to see us as an aggressive and expansionist country. Without drastically altering our training methodology, we need to train continuously in strategic roles. We can introduce a strategic orientation at the training stage itself after implementation of the Hawk advanced jet trainer, which we can use to expose trainee pilots to AAR and long-distance missions in the final phase of their instruction. Additional training areas that demand immediate attention include the following:

- Creation of simulated target systems like those in the Negev Desert of Israel, which cater to scenarios ranging from evacuation of personnel to destruction of key installations and elimination of terrorists. Our aircraft should engage these targets across the country in different seasons and terrains.
- Formation of a pool of aircrews specially trained on varied platforms. Primarily, they should have tactical proficiency but should also undergo periodic specialist capsules and training in execution of strategic missions. This core group needs periodic exercising and frequent international exposure.
- Conducting of periodic exercises involving joint task forces at varied locations, ranging from deserts to hilly terrain and island territories. We should regularly plan long-distance missions involving AAR as well as change in control zones, altitudes, and time zones. Such exercises should also introduce sleep deprivation and fatigue orientation at regular intervals.[25]
- Introduction of multiple aerial refuelings and engagements spread across theatres at various levels of squadron training.
- Encouragement and periodic exercising of strategic airlift capability and helicopter operations with special forces.
- Continuation of exercises with a few foreign air forces, with simulation of contingencies in mutually acceptable third countries.
- Creation of strategic task forces with centralised decision making, independent component commanders, and decentralised execution.

Conclusion

If a battle can be won without suffering loss, surely this is the most economical, if not the most traditional, way of gaining the strategical object.

—John Frederick Charles Fuller

The IAF finds itself in the midst of a modernization process likely to take 10–15 years, by which time it will possess significant strategic capability in terms of platforms and force multipliers. The upgrading of infrastructure and communications requirements to support such operations is accompanying this modernization. The IAF's mind-set is also shifting from that of a tactically oriented and proficient force to one that has the confidence to influence strategy and doctrinal changes. At a time when nations are increasingly reluctant to commit ground forces due to the likelihood of mounting casualties, the ability to engage strategic targets with minimum collateral damage and maximum effect has made airpower a most preferred option in swift, conventional conflict resolution. From the imprecise aerial attacks of World War II to the precision with which modern aircraft engaged targets in Afghanistan and Iraq in 2003, the strategic air campaign has come a long way. Having realized that the strategic effects of airpower application make themselves felt across the spectrum of conflict, ranging from limited and high-intensity conventional warfare to subconventional and irregular warfare, we know it is time for the IAF to put together a blueprint for building a credible strategic aerial-intervention capability over the next decade. ❑

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Since the air, space, and cyber domains are increasingly interdependent, loss of dominance in any one could lead to loss of control in all.

—Gen T. Michael Moseley

Rethinking the Combined Force Air Component Commander's Intelligence, Surveillance, and Reconnaissance Approach to Counterinsurgency

Lt Col Michael L. Downs, USAF

Editorial Abstract: Counterinsurgency (COIN) operations in Iraq and Afghanistan generate unique and complex intelligence, surveillance, and reconnaissance (ISR) requirements for lower-echelon commanders who face a multitude of different insurgent groups fighting with asymmetric means. The air component finds itself ill equipped to handle the ISR challenges of COIN since it still adheres to a doctrine of major theater war. The author provides historical context, offers an alternative approach to managing ISR, and recommends changes to doctrine.

IN THE counterinsurgencies (COIN) in Iraq and Afghanistan, commanders of brigades, battalions, companies, and special forces all conduct daily missions in their respective areas of operation (AO) to secure neighborhoods and seek out insurgents. As noted by Lt Gen Thomas Metz, former commander of Multi-National Corps-Iraq, "From small unit to theater level, intelligence provide[s] the basis for every mission."[1] These missions range from cordon and search to direct action, but all require high levels of intelligence, surveillance, and reconnaissance (ISR) support to assist in target development, mission planning, and execution. Increasing the amount of ISR available to conduct an operation improves the probability of mission success. Mission planning by COIN units relies heavily on intelligence to help answer certain questions: Where is the enemy located? What does he plan to do? Where does he plan to act? Where might improvised explosive devices (IED) be located? Moreover, intelligence provided to units during execution helps them identify infiltration routes and possible ambush locations, gives commanders one more look at a target before moving against it, and enables decision makers to monitor enemy responses to friendly actions.[2]

Although human intelligence (HUMINT) is a key source for much of this data, imagery and signals information collected from ISR as-

sets such as unmanned aerial vehicles or U-2 reconnaissance aircraft often complement information gleaned from HUMINT operations, providing commanders with a multidimensional intelligence perspective of the enemy and the objective area. Maj Dan Zeytoonian and others write that "in COIN, intelligence operations strive to fuse intelligence from nonorganic collection sources [multiple sources] into a seamless picture of the insurgency networks and to provide *corroborating* intelligence for targeting" (emphasis added).[3] The operational component charged with providing much of the ISR to support COIN operations in Iraq and Afghanistan is the combined force air component commander (CFACC).[4] The CFACC provides thousands of hours of ISR support each month to joint task forces (JTF) and other component commanders in US Central Command's (USCENTCOM) area of responsibility, but the net effect of these missions, though helpful, is significantly less than it could be. Specifically, in the words of Col Teresa Fitzpatrick, 548th Intelligence Group commander, "We [the CFACC] have only one airborne ISR [tactics, techniques, and procedures]: [major theater war]."[5] *Were the air component to position itself more appropriately for COIN operations, the ISR it provides ground commanders would prove more useful in helping maneuver units accomplish their missions.* To understand the cause and extent of the CFACC's deficiencies in providing effective ISR for COIN operations, we need to appreciate the historical context of the CFACC construct itself, the nature of COIN operations in Iraq and Afghanistan, and the way that ISR required for these operations differs from that in conventional operations. This foundation helps reveal how the CFACC currently conducts ISR operations in support of COIN efforts in Afghanistan and Iraq and how we could retool these operations to increase their effectiveness. Although COIN operations are incredibly complex and involve extensive diplomatic, governance, information, security, economic, and psychological efforts, this article largely focuses on ISR support to security operations in the COIN environment.

Historical Context

In the post-Vietnam era, the Air Force dedicated a substantial effort to developing its ability to fight at the operational level of war through the CFACC and attendant air and space operations center (AOC) constructs.[6] Beginning in the early 1990s, CFACC principles were developed, based upon the threats of conventional wars in the Middle East and Asia. As "information" increasingly became a significant warfare medium and as weapons became more technology dependent, relying on precise information to guide them, the Air Force placed a premium on fielding a robust fleet of ISR assets that could locate the equipment that our conventional adversaries might possess.[7] From fixed enemy command and control (C2) facilities to mobile surface-to-air missiles, tanks, and fighter aircraft, the CFACC construct evolved to the point that the AOC could C2 a constellation of ISR assets capable of detecting enemy threats, while directing strike aircraft to destroy them day or night in all weather conditions. "The rigid nature of these [conventional] operations allowed our [ISR] systems and intelligence personnel to apply templates to probable [enemy] actions" and place our collection systems over optimal points in the battlefield to detect projected enemy activity.[8]

To C2 this lethal force, AOC processes gradually developed into a carefully crafted 96-hour air tasking order (ATO) cycle, complete with meetings, processes, checklists, and products—all codified in joint doctrine and commonly practiced in each theater.[9] We not only created these processes based on a conventional-war assumption but also predicated them on the notion that we would direct friendly operations from the operational level. This level of focus essentially required the CFACC to have a macroview of the ground scheme of maneuver. For instance, the combined force land component commander (CFLCC) would develop battle plans that employed large ground forces, such as corps and divisions, moving against similar-sized enemy units. The scheme of maneuver for these ground operations could be visually depicted on a map by sweeping arrows indicating the friendly axes of advance. To plan

for and conduct these operations, the CFLCC would request ISR, interdiction, close air support (CAS), and a range of other support missions from the CFACC. To plan an ATO, the AOC had to understand what the ground component hoped to accomplish during an ATO period but did not need detailed information about lower-echelon operations.

In addition to the focus on conventional war and the operational level, the ATO cycle was based on a hierarchical request process that involved long lead times to incorporate requests into the ATO. In essence, if a division, brigade, or even battalion wanted its requests for ISR or CAS from the CFACC approved by higher headquarters, it had to forecast that requirement 72–96 hours in advance, typically based on templating friendly and enemy movements. The CFLCC would collate validated air-support requests and forward them to the CFACC for injection into the ATO process. The consolidated CFLCC list would then compete against the JTF's and other components' requests for inclusion in the ATO.[10] Ultimately, the 96-hour ATO battle rhythm worked well in a conventional framework since battle fronts, rates of advance, and enemy actions were relatively predictable. The ground unit could forecast consequent requirements for CFACC ISR and other support with an acceptable degree of certainty.

Although this operational C2 approach to air warfare, developed after Vietnam and perfected in time for Operation Iraqi Freedom, proved successful, it was designed to fight conventional wars. Unfortunately, with regard to ISR, for the most part we are applying the same conventional AOC processes in COIN efforts in Iraq and Afghanistan today, resulting in an ineffective use of CFACC ISR.

Counterinsurgency Operations in Afghanistan and Iraq

Understanding how the CFACC can provide more effective ISR support to COIN operations demands an intimate understanding of the types of missions conducted by forces during Operations Enduring Freedom and Iraqi Freedom, as well as the manner in which these forces operate. COIN operations in Iraq and Afghanistan have many characteristics, but we can describe them as highly complex, unpredictable, and dynamic—generally differentiated from conventional operations by the nature of the enemy.[11] As opposed to a conventional foe with all the trappings of a modern army, insurgents in Iraq and Afghanistan often wear civilian clothes, do not use traditional military equipment, and conduct a variety of irregular, small-unit actions. They do not operate from customary bases or in large formations, and, like many insurgent forces, they blend in with the population for protection. Trying to detect this enemy with ISR assets, therefore, differs considerably from looking for conventional weapon systems.

Insurgents in Iraq and Afghanistan conduct a variety of missions to disrupt coalition operations. They rarely engage coalition forces in anything resembling pitched battles, instead using suicide bombings, sniper attacks, ambushes, and IEDs against military and civilian targets to inflict damage and create instability.[12] Insurgents also conduct sabotage against key infrastructure, such as oil pipelines and power lines, and smuggle contraband into Iraq and Afghanistan from countries such as Pakistan, Iran, and Syria. The ISR challenges associated with detecting these types of activities are much different than those in conventional war.

Complicating the task of fighting insurgents in Iraq is the fact that they are not a unitary enemy. Rather, coalition forces face multivariate violence from dozens of insurgent groups, all employing different combat techniques. As such, two enemy groups may differ in their employment of the same method against friendly forces (e.g., the use of IEDs). Therefore, each brigade and battalion must become intimately familiar with the enemy in its AO and develop a strategy to defeat that enemy. Eliot Cohen writes that the "mosaic nature of an insurgency means that local commanders have the best grasp of their own situations" and, as such, must determine how best to deal with them.[13]

As a result, the true supported commander for COIN operations is not at the JTF or

CFLCC level, as in conventional operations; rather, according to Col Kirk Mardis, former intelligence-collection manager of Multi-National Force-Iraq, "The war is being fought at the brigade and battalion levels."[14] This has the effect of highly decentralizing coalition operations, with each unit conducting its own—often independent—war in its AO.[15] Moreover, fighting the war at the brigade level and below means that taskings to the CFACC for ISR support originate there. A quick perusal of any day's CFACC ISR collection deck reveals that the vast majority of requirements do not come from Combined Joint Task Force 76 in Enduring Freedom or Multi-National Force-Iraq in Iraqi Freedom, though these C2 nodes validate and submit lower-echelon requests for ISR to the CFACC.[16] Nor is the collection deck populated with targets from USCENTCOM or the CFACC, as it might be in a conventional war. Rather, maneuver units generate the vast majority of ISR requirements.[17] Lt Justin Mahoney, who recently served as a collection manager at the combined AOC (CAOC) at Al Udeid Air Base, Qatar, estimates that 80–85 percent of collection requests in Iraqi Freedom come from the battalion and brigade levels and that in Enduring Freedom, this same level initiates nearly 100 percent of collection requests.[18]

Without a fundamental understanding of who generates ISR tasking and who the true supported commander is, the CFACC cannot fully optimize C2 of ISR to support COIN operations. Ultimately, in the COIN fight, the focus for CFACC ISR support—unlike that in a conventional war—is not the combatant command, JTF, CFACC, or even the CFLCC but the company-, battalion-, and brigade-sized unit.

What Counterinsurgency Commanders Need from Intelligence, Surveillance, and Reconnaissance

To counter the insurgent threats in Enduring Freedom and Iraqi Freedom, coalition forces conduct a variety of missions. They may conduct cordon-and-search missions in a particular village or area of town, looking for weapons caches, insurgents, or insurgent hideouts. Prior to a mission, they may request ISR to surveil an objective area to locate enemy ambush points or determine insurgent patterns of activity. ISR may also provide overwatch of a convoy as it heads into a village searching for IEDs, ambushes, or other suspicious activity. Further, ISR assets can give commanders the situational awareness necessary to defend against enemy operations or reactions to friendly missions, such as detecting egress actions, reinforcing movements, or locating sniper positions.[19] These assets can also monitor critical infrastructure for sabotage or surveil border passes for illicit activities such as transshipment of weapons or drugs.

We task ISR platforms to image a spot on the earth for two primary reasons, one of which involves detecting enemy activity. When a ground unit requests that an ISR platform image a target, it does not just pick a spot in Afghanistan or Iraq and hope that an unmanned aerial vehicle will find enemy activity there—something comparable to searching for insurgents through a soda straw. Instead, the requestor increases the probability of detection by having ISR confirm activity identified by other intelligence sources.[20] For instance, a ground unit might receive a HUMINT tip indicating presence of the enemy in a certain location. To confirm the tip, a battalion may request ISR support from the CFACC to locate that activity. AOC collection managers then use the initial HUMINT tip to cue signals-intelligence and imagery-intelligence sensors on ISR platforms for that purpose. Ground-unit requests could include anything from locating an IED, to confirming the presence of high-value targets, to monitoring border crossing points for insurgents.

After detection of the enemy, ISR serves the second purpose of facilitating action against him. Intelligence gained from HUMINT or ISR missions may result in the planning and conducting of friendly operations against targets. General Metz writes that "in more cases than not, intelligence drives most of the bat-

talion and brigade-level operations."[21] To be sure, much of this actionable intelligence in Enduring Freedom and Iraqi Freedom initially comes from HUMINT sources. However, we then use these initial tip-offs to guide other ISR assets (signals intelligence and imagery intelligence) to further refine the intelligence picture. Ground-unit planning for the upcoming operation thus requires additional targeting and planning data to conduct its mission. Intelligence analysts with the ground unit request ISR support from the CFACC and fuse that intelligence with their HUMINT to "gain the best possible understanding of the insurgent network" and prepare for the upcoming operation.[22] Thus, intelligence plays a key role in both initiating friendly operations and then supporting their planning and conduct.

The traditional paradigm for collecting intelligence in conventional operations is inversely related to the collection approach needed in COIN operations. Whereas the requirements of the operational-level commander drive collection in conventional wars, General Metz writes that "the intelligence effort in Iraq is a 'bottom-up' process."[23] Vice Adm Lowell Jacoby, former director of the Defense Intelligence Agency, expands on this paradigm shift by noting,

> There's [an] issue that's desperately important. We grew up in a world where the echelon above us always had better information than we did, and it cascaded down. We need to be thinking about how we can have information flow up. Today, the platoon or company that is on the ground in Afghanistan and patrols the same area regularly for an entire deployment has a far better idea of what's happening in that sector than someone who is further removed.[24]

Admiral Jacoby's point is clear—successful intelligence operations necessitate close interaction between the tactical and operational levels, which in this case means between the CFACC and the maneuver units it supports at the brigade and battalion levels.

Col James Waring, who served as the CFLCC's chief liaison officer to the CFACC in 2004, highlighted the need for CFACC integration with the maneuver unit, stating that "we have learned that the macro-view of the ground scheme of maneuver that is echelons-above-battalion level provides insufficient situational awareness to the CFACC and his aircrews."[25] Moreover, for the CFACC to provide value-added ISR support for COIN operations, it not only should have links to the maneuver unit but also must have access to the ground unit's knowledge about the enemy in its AO. The AOC can then use this information to guide its ISR-collection efforts. For example, Army major Charles Baker explains that "utilizing [unmanned aerial vehicles] to find explosives or ambushes requires either luck or good intelligence to direct the unmanned aircraft, since the region is too large to maintain constant surveillance."[26] By working with ground units to cull out their relevant knowledge about the AO and the enemy's actions there, the CFACC can employ his or her ISR assets more effectively to increase the probability of detecting priority information needed by the maneuver unit to conduct its COIN operations. The CFACC must therefore understand how to employ ISR appropriately to find enemy activity, maintain connection with the supported unit to understand the enemy that he or she seeks to find, become adept at passing actionable intelligence in a timely manner to key decision makers at the battalion and brigade levels, and remain highly responsive in providing ISR to support resultant operations.

The CFACC's Intelligence, Surveillance, and Reconnaissance Support to Counterinsurgency Operations

Unfortunately, the current CFACC approach to providing ISR support to COIN does not meet the requirements for this form of war. AOC ISR processes were developed so that CFACC ISR assets could locate enemy equipment and report hostile locations to the AOC, which, in turn, could direct air assets to destroy enemy threats. Given the nature of the insurgencies in Iraq and Afghanistan, the types of collection challenges presented by insurgents, the variety of missions conducted by coalition

forces, and the timelines they require to plan for operations, how does the CFACC currently approach ISR support to COIN?

For the most part, current COIN operations still use the timelines and processes employed during the conventional phase of Iraqi Freedom. CFACC timelines for conventional wars necessitate that components submit their ISR requests approximately 48 hours prior to ATO execution. This deadline has not changed for the COIN phase of either Iraqi Freedom or Enduring Freedom.[27] The CAOC at Al Udeid generally directs that the JTFs (Multi-National Corps-/Force-Iraq and Combined Joint Task Force 76) have their requirements to collection managers 48 hours prior to ATO execution.[28] Simple math highlights the flaw in this system. The commanders of the 2d Brigade Combat Team of the 4th Infantry Division in Iraq or Task Force Devil in Afghanistan, for instance, have to generate their ISR requirements at least 72 hours prior to ATO execution so that the JTF has time to massage and approve them before sending them to the CAOC 48 hours prior to execution. Often, the subordinate battalion must submit its requirements to the brigade level 96 hours out to give the brigade time to prioritize its own as well as the subordinate battalions' ISR requests before sending them to higher echelons. Predicting what the enemy will do, knowing the exact nature of the upcoming friendly mission, and understanding exactly how ISR will be employed that far in advance all pose a challenge in the extremely dynamic COIN battlefield. Moreover, this burdensome process simply discourages many units from submitting requirements and creates a mind-set at the tactical level that CFACC assets, such as the Global Hawk or U-2, are unavailable to support them.[29]

The CFACC also follows conventional procedures for determining targets for imaging. For instance, a collection manager in the AOC will gather all of the ISR target requests from Iraqi Freedom, rank them according to theater priorities, and then draw a "cut line" above which assets will image the targets. This line is based upon a number of factors but depends upon the number of targets that a given ATO's ISR assets can image. For example, units in Iraq may put in requests for 900 targets for imaging, but the CFACC may have the capacity to image only 500. In this case, ISR assets will image the 500 highest-ranking targets. This collection-management method, known as "peanut-butter spreading," divides ISR among a large number of requestors by giving each a portion of the collection it asked for. This method has the advantage of supporting a significant number of customers and imaging a sizeable number of targets. This process works fine in a conventional fight, but it is woefully inadequate for COIN, in which it is often preferable to dedicate an ISR asset to a specific problem for a long period of time in order to detect activity more clearly. Admiral Jacoby noted that "we need to be in an environment where we can achieve persistent surveillance, which means being able to linger on the problem as long as it takes to understand it."[30]

The CFACC's current approach to persistence involves thinking of the problem in terms of space rather than time. Sprinkling ISR around all of Iraq or Afghanistan rather than focusing it on a limited number of areas creates the illusion of persistence. For example, daily ISR update briefings to commanders depict various colored circles representing an assortment of collection assets covering most of the country.[31] However, in a COIN, ISR must often remain persistent over a single problem set for an extended period of time in order to develop the intelligence picture and tease out actionable intelligence. Clearly, the trade-off with this type of approach is that the CFACC can image only a small number of targets. The litmus test for success is not the number of targets imaged but the actual intelligence derived from these missions and the resultant impact on friendly operations.

Not only has the AOC failed to change its tasking timelines and collection-deck procedures to meet the demands of COIN, but also it has failed to adequately facilitate the integration of ISR into coalition schemes of maneuver. As discussed earlier, many ground operations are time sensitive and driven by intelligence. If, for instance, HUMINT indicates that Taliban fighters will cross the bor-

der from Pakistan into Afghanistan in the next 24 hours, the ground commander will require ISR support to search for and locate this possible activity. Because the tasking process is so hierarchical, the responsible brigade may not have its requests for ISR assistance approved in time to support planning for its operations.[32]

Additionally, no formal mechanism exists to link the actual ISR units to the supported ground units. As mentioned earlier by Colonel Waring, this link is necessary so that the ground unit can clearly tell the CFACC unit—in this case, the collection unit—how the enemy functions in its AO, how ISR can detect insurgent activity, and how ISR can integrate into friendly operations. For example, a battalion planning for an upcoming cordon-and-search mission might request ISR to search for IEDs and ambush locations. By linking the two parties (ISR unit to ground units directly), the collection unit can learn from the supported battalion where insurgents typically place IEDs (e.g., near street corners) in their AO, which, in turn, focuses the search patterns of the ISR unit on the areas most likely to contain IEDs. Again, in the multivariate violence in Iraq and Afghanistan, each battalion knows best how the enemy in its AO operates. Because a typical collection unit will be tasked to fly over and support multiple units during a single mission, it must be able to schedule the collection so that it completes the data gathering in time to support friendly operations. Once again, the collection unit must stay in touch with the supported unit to facilitate this level of integration.

Ensuring that such integration occurs is the responsibility of the CFACC. As the provider of ISR, the AOC must meet the needs of the requestor. To do so, the AOC tasks ISR units to perform collection in support of maneuver units. Unfortunately, the tasking mechanism is based on a conventional model which largely assumes that ISR would support operational-level commanders, and, as such, no mechanism exists to provide the level of tactical granularity needed by ISR units to execute effective collection in support of COIN operations.

Recommendations

Because the conventional collection-management processes now employed by the AOC undermine its ability to optimize ISR support to COIN efforts in Afghanistan and Iraq, the CFACC must reevaluate his or her approach to this nontraditional form of warfare. Specifically, the CFACC should shorten ISR-request timelines, change the tasking process, synchronize ISR collection with the ground scheme of maneuver, and codify the changes so that the AOC can employ ISR across the range of military operations.

Changing the ISR request-and-tasking process will result in the greatest improvement in the CFACC's ISR support to COIN. To truncate the timelines associated with requesting ISR support, the CFACC can adopt the same process used for CAS requests, whereby ground units submit air-support requests to the AOC, typically 36 hours prior to ATO execution.[33] That is, the ground unit requests CAS support for a specific mission during a block of time for a general area. The AOC prioritizes the requests and determines which ones it can satisfy. However, the ground unit decides how to use that CAS asset once it checks in with its ground customer. Applying this methodology to collection not only would shorten the timelines for requesting collection but also would allow the tasking of ISR assets for imaging the most current and important targets of the ground commander and put the asset in a direct-support role. For example, a Global Hawk could be assigned to support a brigade for two hours during a given operation. Prior to departure, the aircraft's team could contact the supported ground unit and receive an update on its operation as well as additional information about the enemy. Before entering the brigade's AO, the Global Hawk pilot could check in with the brigade for a tasking update. The supported unit could then elect to have ISR targets collected as planned, drop irrelevant targets, or add those required by changes in enemy movements or friendly operations. Employing the CAS air-support-request method for ISR does not preclude the use of collection decks. Units and operational headquar-

ters could still submit targets to the AOC for standard collection. The AOC would simply have to determine the amount of time a platform would spend collecting deck targets versus providing direct support to ground units. However, by adding the air-support-request method and allowing units to submit requests for direct support 36 hours in advance, ground units could continuously update the targets they want collected. The AOC could thereby ensure that the targets for intelligence collection were relevant to the situation on the battlefield as opposed to determining them 72–96 hours earlier.

Though some might argue that the CFACC would lose control of his or her theater assets through the use of the air-support-request method, the alternative is to peanut-butter-spread them over large areas, imaging potentially irrelevant targets in an attempt to service as many collection-deck targets as possible. Although for conventional wars, we must often image large numbers of targets, doing so dilutes the effectiveness of ISR in COIN. Of note, the AOC would still maintain direction of the asset in the tasking process by determining which units to assign it to and for what duration. Furthermore, the AOC would keep divert authority for the collection asset, retaining the ability to shift the platform to higher-priority operations during execution, when required. In the final analysis, this air-support-request method would greatly increase the flexibility and relevance of CFACC ISR by providing current, direct support to COIN operations.

The CFACC can also improve ISR support to COIN and optimize collection by facilitating the integration of ISR units with the ground scheme of maneuver prior to and during mission execution. The CFACC currently uses the reconnaissance, surveillance, and target acquisition annex, produced for every ATO, to pass the collection game plan to ISR units. Unfortunately, this product has evolved into a generic, high-level document that communicates very little information of tactical relevance. We should amend the annex to provide ISR units with contextual guidance for their mission. The document should link collection units with the ground units they support to provide contact information and as much enemy and friendly information as possible. Doing so will integrate CFACC collection with ground operations and move it from a target-centric to a mission-focused model.

Finally, changes to AOC ISR procedures that reflect COIN requirements should be codified in joint doctrine and in Air Force tactics, techniques, and procedures documents to enable operational commanders to request and use ISR according to the type of war they are fighting. Current joint and Air Force AOC documentation focuses solely on major theater war.[34] By providing conventional and COIN methodologies for operational ISR, the CFACC will be able to support operations across the spectrum of warfare.

Conclusion

Success in the COINs in Iraq and Afghanistan is critical to securing our nation's defense. Key to achieving victory are the synchronization and optimization of all resources the United States commits to Iraqi Freedom and Enduring Freedom. The CFACC must also optimize the effectiveness of the ISR provided to US forces as these troops pursue their goals in the security arena of these COIN operations.

Unfortunately, the air component finds itself ill equipped to handle the ISR challenges of COIN because it still adheres to its heritage of major theater war, which emphasizes the detection and destruction of conventional targets, a lengthy planning process, and support to operational-level commanders. However, the COINs in Iraqi Freedom and Enduring Freedom, centered around lower-echelon commanders who face a multitude of different insurgent groups fighting with asymmetric means, differ greatly from major theater war. US ground commanders, therefore, need flexible, time-sensitive ISR support from the CFACC to assist them in combating an unconventional enemy. The current CFACC collection-management system does not meet the COIN needs of ground commanders, but truncating request timelines, adjusting the ISR tasking process to mirror the CAS-request process,

synchronizing collection with ground operations, and codifying these changes in joint doctrine would greatly increase the system's utility.

By revamping the ISR approach to COIN, the CFACC will increase the value of the intelligence provided to ground commanders and play a valuable role in assisting supported JTF, land, and special operations forces components as they establish security in Iraq and Afghanistan. Moreover, developing a successful CFACC ISR methodology for COIN not only will benefit the current operations in Iraq and Afghanistan but also will serve the joint force well as it deals with the range of military operations in the long war and beyond. ❑

Notes

1. Lt Gen Thomas F. Metz, Col William J. Tait Jr., and Maj J. Michael McNealy, "OIF II: Intelligence Leads Successful Counterinsurgency Operations," *Military Intelligence Professional Bulletin* 31, no. 3 (July–September 2005): 10, http://www.universityofmilitaryintelligence.us/mipb/article.asp?articleID=172&issueID=12 (accessed 26 February 2007).

2. Ibid.

3. Maj Dan Zeytoonian et al., "Intelligent Design: COIN Operations and Intelligence Collection and Analysis," *Military Review* 86, no. 5 (September–October 2006): 33, http://usacac.leavenworth.army.mil/CAC/milreview/English/SepOct06/Zeytoonian.pdf (accessed 26 February 2007).

4. The CFACC in US Central Command's area of responsibility plans and conducts operations at the combined air operations center (CAOC) at Al Udeid Air Base, Qatar. The CAOC at Al Udeid simultaneously supports Operations Iraqi Freedom, Enduring Freedom, and Joint Task Force Horn of Africa.

5. PowerPoint briefing, Col Teresa Fitzpatrick, 480th Intelligence Wing, Langley AFB, VA, subject: Centralized Control, Decentralized Execution of Airborne ISR, 1 June 2006.

6. See Air Force Tactics, Techniques, and Procedures (AFTTP) 3-3.60, "Operational Employment: Air and Space Operations Center," draft, September 2006, 1-2. "The AOC is the operational-level command and control (C2) center that provides the JFACC with the capability to direct and supervise the activities of assigned and attached forces and to monitor the actions of both enemy and friendly forces. . . . In a joint or combined environment, the AOC will be designated either as a joint air operations center (JAOC) or a combined air operations center (CAOC) and manned accordingly." Ibid.

7. The information in this section regarding the AOC is based on the author's multiple years of service in AOCs in the Pacific, Europe, and Middle East. The author has served in a variety of AOC positions in the Strategy, Combat Plans, and ISR divisions as well as in the Special Operations Liaison Element.

8. Metz, Tait, and McNealy, "OIF II," 10.

9. AFTTP 3-3.60, "Operational Employment," 1.4–1.5.

10. To determine which stage in the collection-tasking process generated requirements, the author interviewed multiple JTF, Army, and special operations personnel in Iraq and Afghanistan (intelligence-collection managers and analysts assigned to tactical and operational-level units) during trips to war zones there in 2004 and 2005.

11. Eliot Cohen et al., "Principles, Imperatives, and Paradoxes of Counterinsurgency," *Military Review* 86, no. 2 (March–April 2006): 52, http://usacac.leavenworth.army.mil/CAC/milreview/English/MarApr06/Cohen.pdf.

12. Metz, Tait, and McNealy, "OIF II," 10.

13. Cohen et al., "Principles, Imperatives, and Paradoxes," 49.

14. Col Kirk Mardis, collection-management chief, Multi-National Force-Iraq, Baghdad, Iraq, July 2005–July 2006, discussion with the author, December 2005. A collection manager, potentially located at every level from tactical through strategic, is responsible for determining which intelligence problems commanders want answered and then matching the appropriate collection asset—whether HUMINT, signals intelligence, imagery intelligence, and so forth—to collect against that requirement.

15. Metz, Tait, and McNealy, "OIF II," 12; and Cohen et al., "Principles, Imperatives, and Paradoxes," 52.

16. A collection deck is a list of ISR targets compiled by the collection manager.

17. 1st Lt Justin Mahoney, collection manager, USCENTCOM CAOC, Al Udeid Air Base, Qatar, September 2006–January 2007, interview by the author, 17 April 2007. Based on his experience as the collection manager at the CAOC in Al Udeid, which simultaneously supports operations in Iraqi Freedom, Enduring Freedom, and JTF Horn of Africa, Lieutenant Mahoney estimated that 80–85 percent of collection requests in Iraqi Freedom were generated from the battalion/brigade level and that nearly 100 percent of collection requests in Enduring Freedom were generated from this same level.

18. Ibid.

19. Lt Col Ahmed Hashim, 3d Armored Cavalry Regiment, Tal Afar, Iraq, interview by the author, 16 April 2007.

20. Metz, Tait, and McNealy, "OIF II," 13.

21. Ibid., 11.

22. Zeytoonian et al., "Intelligent Design," 34.

23. Metz, Tait, and McNealy, "OIF II," 11. The term *bottom up* refers to the idea that actionable intelligence in COIN is often collected at the lowest level (e.g., company) rather than at the corps level.

24. Vice Adm Lowell E. Jacoby, "Intelligence Collection, Handling and Analysis Undergo Fundamental Change" (lecture, Joint Warfare Conference, Arlington, VA, 25–26 October 2006).

25. Col James M. Waring, Lt Col Carl L. Giles, and CW3 John A. Robinson, "The 19th BCD in Counterinsurgency Operations," *Field Artillery*, July–August 2005, 17, http://sill-www.army.mil/FAMAG/2005/JUL_AUG_2005/JUL_AUG_2005_FULL_EDITION.pdf.

26. Quoted in Robert Wall, "Finding the Needle: Pentagon Intelligence Agency Expands Fleet of Unmanned Aircraft," *Aviation Week and Space Technology* 159, no. 25 (22 December 2003): 28.

27. Mahoney, interview. CAOC procedures still require units to submit their imagery needs 48 hours prior to kickoff of the ATO. However, for full-motion-video assets such as the Predator, ground units can change their requirements up to 12 hours prior to ATO execution, provided the change in tasking won't affect aircrew or aircraft timing or the overall route of the mission.

28. Ibid.

29. Col Kirk Mardis, telephone conversation with the author, 12 April 2007.

30. Jacoby, lecture.

31. The information in this section regarding persistence and the AOC's approach to this requirement is based on the author's multiple years of service in AOCs in the Pacific, Europe, and Middle East. The author has served in a variety of AOC positions in the Strategy, Combat Plans, and ISR divisions as well as the Special Operations Liaison Element and has been present in dozens of daily update briefs to the CAOC director that include the daily ISR game plan.

32. Units can submit an ad hoc request via the JTF to the CAOC for time-sensitive, unplanned collection requirements. The CAOC will accept some of these requests, but it is hesitant to do so very often unless the priority is extremely high. Tasking an airborne ISR asset with an ad hoc requirement generally means that it will not be able to collect all of the taskings assigned prior to takeoff. Therefore, the CAOC must weigh the value of ad hoc and preplanned taskings. Ultimately, the CAOC wants to dissuade units from overusing the ad hoc tasking method.

33. Maj John Vincent, chief, USCENTCOM CAOC Master Air Attack Plan Night Shift Cell, Al Udeid Air Base, Qatar, November 2007, telephone conversation with the author, 14 November 2007; and Joint Publication 3-30, *Command and Control for Joint Air Operations*, 5 June 2003, GL-3, http://www.dtic.mil/doctrine/jel/new_pubs/jp3_30.pdf.

34. Amy Ryder, to the author, e-mail, 12 April 2007. Mrs. Ryder is a consultant working on the development of training and documentation related to CAOC tactics, techniques, and procedures.

Revisiting South African Airpower Thought

Considering Some Challenges and Tensions in Southern Africa

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Editorial Abstract: Known for its low-tech forces and unconventional wars, Africa lacks the financial flexibility to employ costly, information-based airpower assets. The authors contend that the supporting roles of airpower are most compatible with the evolving strategic landscape of Southern Africa. Within that region, the fundamental challenge involves keeping airpower in step with defense arrangements and establishing stepping-stones for an airpower culture amidst ongoing integration.

TRADITIONALLY, TWO CLEARLY identifiable precepts shape the use of airpower—technology and conventional war. Without technology, there is no such thing as airpower. Technology was instrumental in the creation and development of airpower and to this day remains one of the primary drivers in its use—to the extent that small, incremental advances in technology can still decisively influence the balance between offence and defence in aerial warfare.[1] The love affair between technology and airpower also gives rise to airpower's being a costly instrument of military power. In the post-modern war-fighting environment, leading-edge airpower technology lies beyond the reach of the second- or third-rated powers of the African continent, given the extreme rise in its cost. Even if they are able to purchase these air assets, these lesser powers are not always willing to risk using them.[2]

Technology shapes the organisational as well as command and control (C2) ethos of air forces in general. High technology requires highly skilled, intelligent, and individually minded personnel for aerial war fighting. The need for highly skilled personnel not only adds to airpower's cost but also gives rise to a

very elitist, discriminatory organisational ethos rooted in the ultimate idea of an air ace. In addition, the need for such personnel underpins the intricate relationship between officers responsible for fighting and other ranks who serve as members of the ground crew. In most cases, officers have minimal command authority over other ranks until they reach the level of squadron commander.[3] This stands in stark contrast, for example, to the C2 arrangement of armies that are personnel-driven instruments of power and, subsequently, C2 intensive.

The centrality of conventional warfare in airpower comes to the fore when one considers airpower's counterproductivity in unconventional wars.[4] Stated differently, the contribution of airpower in unconventional wars is primarily concerned with sustaining and supporting terrestrial operations through strategic and tactical transport capabilities. The use of airpower in "nasty little wars of the weak," typical of African conflicts, is a matter of debate. The counterproductivity of conventional airpower in unconventional operations underpins all the different kinds of air campaigns, including counterair and strategic bombing. The unconventional soldier either does not have any airpower or simply has no interest in getting involved in symmetrical fights for air superiority. Lengthy, low-intensity wars are normally fought in terrain that does not present strategic targets with the enemy's centre of gravity, located in the hearts and minds of the people.

Known for its low-tech forces, Africa lacks the financial flexibility to buy and employ costly, information-based airpower assets and is characterised by unconventional wars. How then should one understand the use of airpower by Southern Africa in general and South Africa in particular?[5]

South Africa, Africa, and the Utility of Military Force

As long as no vital interests are compromised, preventing wars—rather than fighting them—appeals to most societies the world over. Conflict prevention also came to dominate the South African political agenda towards Africa as its main area of interest and influence. This is a reflection of the extreme political nature of armed conflict as underpinned by the Clausewitzian notion that conflict has its own grammar but not its own logic.[6] Consequently, for an understanding of the grammar of airpower as part of South African military involvement in Africa, one must consider the political logic behind South Africa's emphasis on the prevention of conflict.

A number of considerations shape South African political logic towards Africa. South Africa is the regional if not the continental power in terms of its political stature, economic power, and military capability. South Africa, however, follows a cautious approach in dealing with Africa in general and the Southern African Development Community (SADC) in particular. The strategic plan of the South African Department of Foreign Affairs clearly spells out the principles that underpin this approach. It includes a commitment to Africa as the focal point, to human rights and democracy, to justice and international law, to peace and international mechanisms for solving conflicts, to multilateralism, and to international economic integration and cooperation.[7]

South Africa does not configure its approach to dealing with Africa around a traditional realist paradigm with national interests and power as the primary drivers—important as these may be. South Africa's historical, cultural, economic, and political predispositions, nonetheless, do provide some interesting insights about its involvement in Africa. Laurie Nathan, in particular, points out that under Pres. Thabo Mbeki, South Africa's foreign-policy outlook is shaped by three paradigms: democratic, Africanist, and anti-imperialist.[8] African solidarity and the assumption that the military is not the primary policy instrument in dealing with Africa's problems are implicit in these paradigms. The example of the negotiated revolution in South Africa serves as the blueprint for the government's pacific or "silent" approach to conflict resolution and peace building on the African continent—an approach leaving little leeway for instruments such as airpower.[9]

Although the realist perspective cannot adequately explain South Africa's involvement in Africa, it does serve a purpose in bringing the domestic agenda into consideration. That agenda shows a clear understanding of poverty, unemployment, and crime as the most salient political and security challenges confronting South Africa. In the domestic political environment, the South African government has to contend with rising expectations of a conflicting nature—balancing, for example, reconciliation, transformation, and capacity building in state departments with the need for increased delivery of public service. In addition, balancing the budget between domestic and foreign-policy agendas represents, to say the least, a huge challenge for the South African government.

The foreign-policy context confronts the South African National Defence Force with some real challenges in its efforts to support government initiatives on the African continent. The most prominent in this regard is the absence of a coherent security strategy in support of the government's theoretical and political paradigms and visions.[10] In addition, the South African military has trouble operationalising the notion of human security as the primary organising concept of governmental security thinking.[11] Within South Africa, the idea of human security is firmly rooted in the 1996 white paper on defence as an example of a defence policy based primarily on the ideas of nonoffensive and nonthreatening defence in general and within the region in particular.[12]

However, the ideas of nonoffensive and nonthreatening defence also brought to the fore some anomalies in South African defence thinking and implementation. How, for example, does one explain the link between the ideas of human security and nonoffensive defence on the one hand and the procurement programme of largely offensive conventional weapon systems on the other? The nature of these weapons also led to some inconsistencies. Primarily, the offensive capability of the Navy and Air Force benefited from the recent arms procurement. Yet, the South African government's agenda for peace on the African continent largely depends upon the availability of infantry-based forces and a need for air and maritime forces that can support these land forces. Or is this simply a testimony of the ability of the Air Force and Navy to mobilise support for their more domestically and defence-oriented roles—or a focus upon deterrence?

The South African military faces some serious challenges in the conduct of peace missions on the African continent. On a political level, South Africa is committed to a multilateral approach. However, one can characterize some of the countries needed to coimplement such an agenda as reluctant partners at best. And one may link this reality to the traditional divide between the doves and hawks in the Southern African political landscape, as illustrated in the impasse of political and other support and enthusiasm for the creation of an African Standby Force.[13] On an operational level, African militaries in general and the South African military in particular have to deal with very long lines of communications characterised by a lack of infrastructure wherever military forces are deployed on the African continent. Compare that, for example, to the infrastructure available and the distance over which the North Atlantic Treaty Organisation had to deploy in Kosovo.

Airpower rests upon a strong technological imperative, but utilising its conceptual underpinnings brings to the fore much of its value as a policy tool. Emergent concepts act as the guiding intelligence and display a traditional nexus with the technological base of aerial war fighting as it has developed since the early twentieth century. The most spectacular developments and progress in airpower are therefore located in the progress from a mere recreational activity and reconnaissance role to an instrument with strategic potential. This progress came about through both technological development and intellectual endeavours to interface technological systems in order to cover rising military needs and changes in the conduct of war.

Regional arrangements call for countries to have interoperable airpower capabilities. Interoperable airpower evolves alongside politico-economic progress as patterns of amity displace

enmity.[14] Advancement regarding regional integration thus paves the way for and includes progress on military interoperability.[15] Within the integration continuum, airpower has to move alongside the political shift from enmity and threats, unilateral defence, and aggression, to amity, cooperation, and the rejection of force to resolve conflict. Keeping airpower in step with such regional dynamics includes new technologies but relies largely upon norm stretching and intellectual progress.

Norm stretching refers to modifying conventional behaviour dictated by established norms but not breaking or ignoring the set norms.[16] Therefore, is airpower in the Southern African region business as usual, or does it call for altered structures, strategies, or operations to satisfy new politico-strategic demands? In any case, this necessitates some adjustments in the SADC of the traditional airpower paradigm. Changes to an established norm result from responsiveness to politico-military threat perceptions and, in addition, to (1) perceived benefits for the organisation, (2) pressures from material or social conditions, and (3) adapting to new demands, whether deemed appropriate or useful or both.[17] In essence, variations in threat responsiveness emanate from politico-military threat perceptions by decision makers.[18] In addition to norm stretching, hard and soft technologies also play a role.

Material needs and physical systems drive hard technology while soft technology relies on the intellectual constructs of human beings.[19] In combination, hard and soft technologies underpin the diffusion and contributions of technological innovations. However, airpower theorists have to contend not only with the technological imperative and the things that air forces traditionally do but also with newly declared politico-strategic demands. In this regard, regional organisations have to resolve complex issues and infuse new rules and norms to deal with, among other matters, the void between technology-driven conventional thinking on airpower and the political preferences and expectations emanating from regions such as the SADC.[20]

Taking Airpower to the Southern African Region

Dennis Drew noted that the essence of airpower is the ability to apply great power quickly to any target on the planet or, in the case of the SADC, any target in Southern Africa.[21] The use of airpower in a particular environment is rooted, Drew argues, in understanding the two key words in the definition, namely *quickly* and *power*. Neither land nor maritime power can compete with the reaction speed of airpower, especially in an infrastructure-deprived continent such as Africa, so airpower can make positive contributions in the non-combat and peacekeeping realm, based on its ability to rapidly deliver humanitarian aid such as food, medical supplies, peacekeepers, and diplomats trying to solve or avoid conflict.

The contribution of airpower stems from the swift employment of appropriate types and numbers of air assets for the correct reasons.[22] This represents a unique challenge to Southern African air forces, which differ vastly in terms of doctrine and air assets, and which do not exercise together regularly to ensure tactical and operational interoperability. The swift employment of appropriate air assets is rooted in access to timely and accurate strategic and operational intelligence about *what* airpower should do and tactical intelligence about *how* airpower should do it.[23]

Airpower has become so valuable to so many in so many different ways that the demand for it is virtually unlimited.[24] In Southern African countries, with their scarce resources and small defence budgets, this simply means that airpower cannot be everything to everybody. It obligates air forces to prioritise their air assets, operations, and structures. However, beyond the military realm, political will remains the most important requirement for the successful employment of airpower. Political will is even more crucial when airpower has to contribute to conflict prevention and peacekeeping. Such contributions originate in political conditions allowing for effective strategic intelligence and early-warning systems, effective cooperation and coordination of political will, and efficient C2 systems

that facilitate effective multinational actions. The existence of a common political will in the SADC, however, is questionable because a common culture of bringing regional assets to bear is either absent or effectively disrupted by political bickering.[25]

Since its inception, and particularly during the twentieth century, airpower made regular detours through the low-intensity-conflict environment. These detours lured both theorists and military practitioners into reconsidering traditional thought on airpower. Several articles attend to shifting the role, or at least accentuating the non-war-fighting roles, of air forces. One striking fact is the absence of literature regarding airpower in the Southern African region.

In part, demands from the low-intensity-conflict environment were (and perhaps still are) viewed as aberrations, so they did not attract much attention from airpower theorists.[26] However, since the second half of the twentieth century, an airpower domain dawned that increasingly played out beyond the conventional confines.[27] South Africa and most of the countries in the SADC now have to contend with this conventional-unconventional interface of airpower, and political guidance is crucial for its employment. Ideally, policy directs the preparation and employment of the military instrument, and South Africa and the SADC are not exceptions. Multilateralism and cooperation within the SADC and political will direct much of what military decision makers have to adhere to, and this raises or lowers the role of airpower in the region.

Several academics emphasise the difficulty of building and maintaining airpower in Africa. As early as 1968, Ross Baker highlighted the dominance of ground forces in African states as a stumbling block.[28] The colonial armies, from which many African armed forces stem, had no significant airpower assets that could instil a lasting airpower culture. Even though later leaders introduced some high-tech airpower systems into new African states, they did not foster a systemic culture to raise and maintain this expensive and complex strategic tool. As a result, small air forces dedicated to transport, disaster control, and patrol functions still characterise many SADC countries. The absence of a historic exposure to and embracement of the true role of airpower bodes ill for a mature airpower culture in the SADC. In the absence of a mature security community with a mature security culture to direct the use of policy instruments, it is perhaps unsurprising that airpower appears immature as well. Bjørn Møller avers that Southern African armed forces are instruments more of internal than foreign policy and that the postapartheid SADC reflects a limited need for national defence.[29] Diverse origins of Southern African militaries are important as well, for they stem from colonial, postcolonial, and liberation cultures, none of which portrays any significant airpower profiles. Colonial armies and guerrilla legacies with a strong landward focus seem to dominate, with only South Africa and Angola offering noticeable islands of airpower.[30]

SADC airpower also falls victim to the reality that in the procurement of equipment, African armed forces often unduly emphasise technology appropriate for conventional warfare. Mismatches develop because relatively low educational and technical standards often do not properly shape the eventual procurement and later employment of sophisticated equipment. This is especially true of technology-driven instruments of power such as air and maritime power. A mismatch between weapon systems and available operators is an obvious consequence. In addition, Herbert Howe pointed out that service-determined instead of joint-coordinated purchases often worked against interoperability, standardisation, and regularity of supply in African militaries—and the SADC is no exception.[31] Given the specialised character of airpower, the aforementioned factors give some indication of the SADC dilemma or inherent tension within the SADC.

Airpower in Southern Africa: Some Tensions, Some Progress

Airpower in the SADC hinges upon two questions. Firstly, can airpower, with its technology-based, conventional war-fighting profile, be

adjusted to suit the regional security agenda? Secondly, can air defence in the region be "everything for everybody" and satisfy expectations from both the military and political domains? In fact, what is the political requirement, or is it up to airpower theorists and military decision makers to compile this profile? Clear political guidelines are of great use. However, such guidelines are rare and further eroded when they have to be operationalised in a regional context where declaratory statements of intent seem to rule. Bearing in mind the matter of norm stretching, one can formulate a number of alternatives for configuring airpower in the SADC:

- traditional airpower for the SADC, standing as defence against aggression and in support of the Mutual Defence Pact, as well as the African Standby Force of the African Union;[32]
- traditional airpower providing limited "residual capacity" for nontraditional contributions as located within certain elements of airpower;[33]
- selection and exploitation of airpower capabilities that have a natural interface with the regional realities and demands and reconfiguration of these capabilities to serve new roles; and (perhaps at the extreme)
- corruption of airpower in order to fulfil nontraditional roles in response to political demands.[34]

As new demands intrude upon the traditional technological and war-fighting character of airpower, the more important soft technologies can lessen the misapplication of airpower through uncoordinated regional demands.[35] Soft technologies are therefore important to shaping airpower without losing critical capacity amidst a culture of apprehension more attuned to continental strategic thought than the air and space domain. One pathway for decision makers is to consider pooled intellectual and operational thought on the role of airpower in the SADC region. Institutionalisation, research and publishing, conferencing, training, schooling, and experimentation promote common thought. In this regard, Thomas Smith points to the planning of air operations to remain within the accepted parameters of civilian casualties and destruction by limiting the lethality of munitions and their means of delivery.[36] These efforts are bound both to raise difficult questions and provide some answers regarding a common airpower culture within the region.

Airpower in the SADC also turns upon shared and integrated resources. In addition, airpower rests upon centralisation as the best way to employ air assets in a theatre of operations.[37] SADC leaders have to abdicate some sovereignty over the airpower instrument amidst a political culture that prefers a national hold on military resources. Given the early stages of integrating SADC military assets and leaders who do not always share common approaches to security matters, ideas on shared and integrated resources need close attention. In this regard, soft technologies bring about innovative thought, new institutions, and policies to loosen an undue national hold on power.[38] SADC decision makers should comprehend that common defence is more important than unilateral efforts and that collective, rather than national, capabilities promote regional security.[39] In this regard, the SADC Standby Brigade is very immature but representative of an emergent regional pathway to pledge and validate military resources (including air elements) for future contingencies. These national pledges are already validated as to their tenability if called upon. However, very little is available on the specifics of air elements for the brigade whilst the elements should not be viewed as comprehensive. Airpower elements in the SADC remain very limited.[40]

The SADC cannot view airpower in isolation from the role of the African Union, whose Peace and Security Council views regional military capabilities as building blocks for continental standby forces. However, moving from national to regional security corresponds with progress towards amity between member states. In parallel, one is bound to also find progress towards military cooperation and eventual interoperability (see figure).[41] Although the SADC

has some way to go, migration to a mature security community is not simple and raises new demands to which conventional airpower also has to adjust. Subsequently, airpower in the SADC has to remain in line with emergent regional needs, and we should consider some of the following matters:

- Are air forces in the SADC mere army air wings?
- Can a full spectrum of SADC airpower capabilities be maintained?
- How can we temper persistent obsolescence for SADC airpower assets?
- How can we keep equilibrium in the difficult supply, training, and maintenance triad?
- Which systems that fit SADC needs do we have to develop?[42]

Institutionally the Standing Aviation Committee (SAC) of the Inter-State Defence and Security Committee oversees SADC airpower cooperation. The SAC has two objectives: to promote regional stability through secondary airpower roles and to defend against aggression that leans towards the primary war-fighting role of airpower.[43] Inherently, the declared outlook offered by the SAC covers the full spectrum of airpower, albeit somewhat idealistically. However, the SADC, being quite explicit about its preference to avoid war fighting, would rather opt for preventative and other, more constructive roles with humanitarian security as a priority.[44] In effect, the normative SADC preference for a more pacifist approach to conflict inadvertently raises the non-war-fighting roles of airpower, and it appears that these more humanitarian roles receive most attention.

Wyn Elder, as well as the SAC of SADC, points to several additional roles that stem from airpower.[45] Surprisingly, air superiority through the mature war-fighting profile of airpower is acknowledged to ensure safe airspace over a theatre—a capacity available in the SADC region if one considers the collective regional air capabilities.[46] However, unless a conventional conflict erupts, airspace control is more likely to be based on deterrence and ground-to-air systems than on other air assets in the region. Nonetheless, given the capability to maintain an aerial safe haven to offset local opponents, it becomes a question of bringing to fruition the spectrum of nonlethal airpower capabilities within the soft security and humanitarian preferences of SADC leadership.

Airlift in the SADC has to assume both humanitarian and military faces. The cyclones in Mozambique in 2000 and 2007 once again accentuated the necessity to have sufficient airlift to serve humanitarian security needs.[47] Airlift contributes towards overcoming long

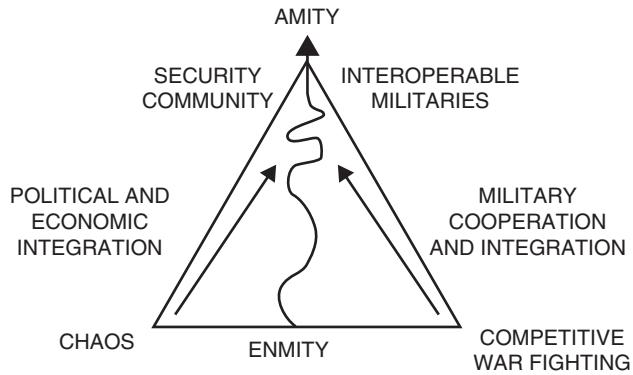

Figure. Pathways to regional integration

distances amidst infrastructural voids, avoiding threatening groups, and securing lines of communications.[48] If hostile groups deny access and mobility and thus threaten vulnerable societies, airlift offers alternative pathways to counter or overcome such threats and vulnerabilities. Air mobility is of crucial importance in a conflict domain without frontiers requiring infantry-styled forces to act as preventative and even fighting forces on short notice. Potential and current theatres of operations in the SADC, such as the Democratic Republic of the Congo, require an operational airlift capability to serve both the military and humanitarian agendas of decision makers. If pooled, civilian and military airlift assets of SADC countries (such as the South African A-400 Airbus orders) can contribute to both the humanitarian and military facets of Southern African security.[49]

The SADC's emphasis upon early warning and prevention rather than intervention highlights the importance of reconnaissance.[50] Although traditional airborne reconnaissance is underdeveloped, new developments entail new outlooks. Unmanned technologies now feature prominently but seem underutilised in the SADC region, with unmanned aerial vehicles (UAV) available but perhaps blocked more by political apprehension than by technological limitations.[51] Nonetheless, UAV possibilities are extensive since their sophistication offers multiple alternatives in a highly unstructured and unpredictable SADC strategic environment.[52] In practice, UAVs offer opportunities in the air, land, and maritime domains, with a low intrusive profile amidst the political sensitivities and sovereignty preferences.[53] Reconnaissance and the unmanned option serve several agendas: a pathway towards much professed early warning, less exposure to harm, and, eventually, low political and financial costs. The explicit emphasis upon prevention and human security accentuates the benefits that UAVs offer for surveillance and reconnaissance. The overview of SADC air capabilities shows a limited reconnaissance capability that the introduction of UAV capabilities can significantly augment.[54]

Communications are important between diverse SADC actors spread across a large geographic region. Although satellite communications are available, fixed- and rotary-wing communications platforms within the SADC airpower environment feature as well.[55] Military contingents operating amidst diversity require good tactical and operational communications as well as peace operations to stem internal conflicts that challenge decision makers. Elder points out three communications difficulties: interoperability due to equipment diversity brought into the theatre, ad hoc communications arrangements to overcome the lack of permanent facilities, and the need to deal with deliberate disruption of the means of communications.[56] Airpower can mitigate these difficulties. Locating communications in the airpower domain also confers a sense of autonomy and protection against host interference and opposing parties. An air and space communications regime provides robustness in theatres known for their complexity and diversity.

Nonlethality and limited destruction form part of a growing line of thought that ties in closely with the SADC's emphasis on human security. Making use of both technological artefacts and intellectual skills promotes nonlethality. Beyond the combat roles of airpower, supportive roles such as transport, communications, reconnaissance, and search and rescue offer nonlethal contributions. A range of nonlethal munitions is also becoming available.[57] In addition, new rules have to be absorbed, especially in the war-fighting role. Although certain roles are inherently nonlethal, intellectual endeavours of laws, tactics, and technical arrangements temper the war-fighting roles.[58] In the SADC, international law and human security remain central tenets, and these tie in with the international best practice of keeping the growing role of airpower within international legal limits.

Speed is a factor closely associated with the airpower option; however, Steven Metz notes that speed is no longer only about the tactical and operational levels but about organisational and conceptual adaptation in the shortest possible time to deal with new insecurities

and warfare forms through airpower.[59] Organisational change also has to keep pace with new strategic needs. The soft-technology triad of innovation, concepts, and diffusion, together with acceptance or rejection of new systems and capabilities, produces new understandings about how to deal with new insecurities. Speed on and beyond the battlefield underpins the successful application of airpower. Mastering speed through organisational and conceptual adaptation to fit the regional need is perhaps the single most important factor faced by airpower in the SADC realm. If the SADC is the eminent security arrangement with a military component, airpower needs to be adjusted quickly and appropriately.

Precision and airpower have become synonymous. Precision, however, requires an understanding of physical and psychological precision.[60] If we adapt Metz's ideas, this implies that airpower in the SADC needs adjustment to reflect a SADC strategic culture, a certain level of technological development, and threat perceptions. These aforementioned matters involve much more than physical precision and its technological basis. Elder further emphasises psychological operations through airpower and its successes in peace operations, but understanding their success depends even more upon the psychological precision referred to by Metz.[61] Airpower in the SADC needs to satisfy the almost diffuse threat perceptions of the regional leadership and, in conjunction, promote human security and destroy aggressors when required.

Airpower is also characterised by adaptation to technological shifts—a crucial domain for soft and hard technologies to interact and for norm stretching to cover the rising need for uniquely styled airpower in the region. The choice lies between maintaining traditional roles and thus limiting airpower, and stretching airpower to cover new regional demands. In the SADC, nonmilitary policy instruments are partially successful and leave room for airpower assets.[62] If decision makers merely embrace new technological shifts, so-called second- and third-order effects in the political, ethical, and legal domains arise. One should therefore always consider decisions to employ new technologies against this backdrop. One example is whether precision bombing is in fact more humane if encased in legal stipulations. Another is whether sophisticated surveillance interferes with individual rights to privacy or whether the use of UAVs intrudes upon sovereignty. Decision makers and experts have to accentuate the softer contributions of airpower assets. It is easy to become enchanted by the technological war-fighting profile of airpower, but this very profile hardly contributes to the SADC's security agenda.

The privatisation of even traditional military functions is a growth industry, and airpower cannot escape this encroachment. To what extent therefore can airpower roles be outsourced to the private sector?[63] The last option is to outsource the primary war-fighting role. However, privatisation also forms part of the air threat to the region through private and even rogue means. Merely buying air assets (including the aircrews) is possible. Less than a decade ago, Ethiopia rapidly purchased new aircraft and aircrews in its war with Eritrea, while Angola used hired pilots to fight the National Union for the Total Independence of Angola (UNITA) guerrilla group.[64] Augmenting airpower through private means is quite conceivable and can rapidly change the airpower balance within the region. However, privatisation is a solution for some difficult endeavours but an obstacle when moving closer to the conventional airpower domain. The SADC should consider public-private symbioses to augment its secondary and more humanitarian and constructive contributions, as well as the new offering from outer space. Some airpower roles such as airlift, communications, and reconnaissance therefore offer opportunities for private partnerships, but there is a limit.

Conclusions

Tensions in airpower brought about by modern developments in both technological and strategic affairs formed the central focus of this article. Traditional airpower thought,

well developed and both conceptually and technologically diffused, lies at the heart of modern military campaigns. However, the inherent optimism about airpower is not universal, and airpower theory culminating in spectacular battlefield success has a less spectacular side. Hence, airpower in unconventionally styled conflicts in Africa, and the SADC region in particular, draws attention to ideas of high-tech airpower's not being an instrument for all scenarios.

In the aftermath of the Cold War, militaries had to transform themselves in one of two ways. They could "go high tech" to capitalise on the worldwide growth in information and communications technology in order to improve the conventional fighting instrument of states, or "go low tech" to improve their capability to deal with multiple threats emanating from the low-intensity intrastate environment through counterinsurgency and peacekeeping capabilities. Airpower did not escape the dilemma of being competent at both levels, and neither did the airpower debate in the SADC. As a benevolent hegemonic power in the SADC, even South Africa is not sure whether it has the ability, luxury, and political latitude to do both. Inherently, few if any countries in the SADC have a strategic culture that steers them towards airpower in the first instance, and one must also understand that embracing high-tech airpower would actually offer diminishing rewards for the region. The SADC is not a mature security community and therefore has to cope with difficulties as leaders slowly cultivate fertile conditions for politico-military integration.

The supporting roles of airpower offer more compatibility with and utility for the evolving strategic landscape of the SADC region and require close political and military attention. The fundamental challenge is to keep airpower in step with regional defence arrangements and establish stepping-stones for a regional airpower culture amidst regional integration. Whilst it is difficult to dispute the niche role that airpower can play in the SADC, the political leadership is the primary agent to move from a declaratory to an operational airpower in the region. Airlift, communications, reconnaissance, speed, and reach, as well as privatisation, now compete with traditional preferences for the priority of aerial combat and ground attack. Stretching airpower concepts to address the tensions between conventional and unconventional strategic landscapes and using soft technologies to embed more constructive aerial roles are now more relevant to maintaining security within the SADC than ever before. ❑

Notes

1. Andrew G. B. Vallance, *The Air Weapon: Doctrines of Air Power Strategy and Operational Art* (New York: St. Martin's, 1996), 29.

2. Ibid., 34–36.

3. George R. Mastroianni, "Occupations, Cultures, and Leadership in the Army and Air Force," *Parameters* 35, no. 4 (Winter 2005–6): 77–79, http://www.carlisle.army.mil/usawc/Parameters/05winter/mastroia.pdf.

4. See discussion of Russian airpower in Chechnya: Timothy L. Thomas, "Air Operations in Low Intensity Conflict: The Case of Chechnya," *Airpower Journal* 11, no. 4 (Winter 1997): 51–59, http://www.airpower.maxwell.af.mil/airchronicles/apj/apj97/win97/thomas.pdf (accessed 26 April 2007).

5. Within Africa the tendency is to have a regional perspective based on regional structures (i.e., Southern, Western, Eastern, and Northern Africa). The following countries are part of the Southern African Development Community: South Africa, Lesotho, Swaziland, Namibia, Botswana, Zimbabwe, Tanzania, Mozambique, Angola, Zambia, Malawi, and the Democratic Republic of the Congo.

6. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 605.

7. *Strategic Plan, 2006–2009* (Pretoria, Republic of South Africa: Department of Foreign Affairs, n.d.), 7–8, http://www.dfa.gov.za/department/stratplan06/part1.pdf (accessed 24 May 2007).

8. Laurie Nathan, "Consistency and Inconsistencies in South African Foreign Policy," *International Affairs* 81, no. 2 (March 2005): 363.

9. We should note that some circles have doubts about this softhanded approach by South Africa towards serious

foreign-policy challenges. For example, South Africa's silent diplomacy towards Zimbabwe is based on the notion that the latter should solve its own domestic problems without external pressure. One can challenge this approach from an ethical perspective, considering the foreign pressure mobilised by the ruling African National Congress against apartheid South Africa during the 1970s and 1980s.

10. The Office of the President is responsible for security coordination by means of the so-called Security Cluster. This coordination takes place without any coherent security policy or strategy. Since democratisation in 1994, the South African government, ruled by the African National Congress, has not developed a national security strategy.

11. Rialize Ferreira and Dan Henk, "Military Implications of Human Security: The Case of South Africa" (paper presented at the 45th Anniversary Biennial International Conference of the Inter-University Seminar on Armed Forces and Society, Chicago, 21 October 2005), http://www.au.af.mil/au/awc/awcgate/awc/human_sec_henk_21oct05.pdf (accessed 5 October 2007).

12. *Defence in a Democracy*, White Paper on National Defence for the Republic of South Africa (Pretoria, Republic of South Africa: Department of Defence, as approved by Parliament on 14 May 1996), http://merln.ndu.edu/whitepapers/SouthAfrica1996.pdf. In his study of South African defence policy, Evert Jordaan provides an excellent exposition of the influence of nonoffensive defence and nonthreatening defence thinking on South African defence since 1994. Evert Jordaan, "South African Defence since 1994: A Study in Policy-Making" (thesis, Stellenbosch University, Matieland, South Africa, December 2004).

13. Laurie Nathan, "SADC's Uncommon Approach to Common Security, 1992–2003," *Journal of Southern African Studies* 32, no. 3 (September 2006): 610. Nathan notes that by the late 1990s, the SADC was polarized by incompatible pacific and militarist visions of the Organ for Politics, Defence, and Security. Botswana, Mozambique, South Africa, and Tanzania were known for their pacifist view, while Angola, Namibia, and Zimbabwe had a more militaristic orientation.

14. Ibid., 608.

15. Francois Vreÿ, "Eradicating African Wars: From Political Ambitions to Military Leadership and Constructive Military Forces," *African Journal on Conflict Resolution* 5, no. 2 (April 2005): 77.

16. Theo Farrell, "World Culture and Military Power," *Security Studies* 14, no. 3 (2005): 451.

17. Theo Farrell and Terry Terriff, eds., *The Sources of Military Change: Culture, Politics, Technology* (Boulder, CO: Lynne Rienner, 2002), 458.

18. Ibid., 459.

19. Zhouying Jin, "Soft Technology: The Essential of Innovation," *Futures Research Quarterly* 18, no. 2 (Summer 2002): 2, http://www.acunu.org/millennium/beijing-0702.PDF (accessed 9 May 2007).

20. Jurgen Haacke and Paul D. Williams, "Comparing Regional Arrangements: The Significance of Security Culture" (paper presented at the Standing Group of International Relations Conference, Turin, Italy, 13–15 September 2007), 3–4.

21. Col Dennis M. Drew, USAF, retired, "The Essence of Aerospace Power: What Leaders Need to Know," *Aerospace Power Journal* 15, no. 2 (Summer 2001): 24–25, http://www.airpower.maxwell.af.mil/airchronicles/apj/apj01/sum01/drew.pdf.

22. Ibid., 25.

23. Ibid., 26.

24. Ibid., 30.

25. Nathan, "SADC's Uncommon Approach," 621.

26. Ian F. W. Beckett, *Modern Insurgencies and Counter-Insurgencies: Guerrillas and Their Opponents since 1750* (London: Routledge, 2001), 24.

27. Beckett also describes earlier experiments to use airpower against unconventional opponents. Ibid., 43.

28. Dr. Ross K. Baker, "The Air Forces of Tropical Africa," *Air University Review* 19, no. 2 (January–February 1968): 64–67, http://www.airpower.maxwell.af.mil/airchronicles/aureview/1968/jan-feb/baker.html. See also Herbert M. Howe, *Ambiguous Order: Military Forces in African States* (Boulder, CO: Lynne Rienner, 2001), 42.

29. Bjørn Møller, "Raising Armies in a Rough Neighbourhood: The Military and Militarism in Southern Africa," working paper, rev. version, March 2003, 16, http://www2.ihis.aau.dk/~bm/SARIPS2001-rev.doc (accessed 19 June 2007).

30. Ibid., 36.

31. Howe, *Ambiguous Order*, 42.

32. The SADC is responsible to set up a regional standby brigade for service with the African Standby Force of the African Union. During the August 2007 summit of the SADC in Lusaka, Zambia, the first elements of this brigade were demonstrated to the SADC heads of state. See David Masango, "Southern Africa: Stand-by Brigade to Maintain Peace in SADC," *BuaNews*, 17 August 2007, http://allafrica.com/stories/200708170705.html (accessed 22 August 2007).

33. Providing air support during natural disasters and airlift during other crises is perhaps the most salient of these roles. See Col Les Weyer, "Peaceful Application of Air Power," *South African Soldier* 10, no. 5 (May 2003): 24–25, http://www.dcc.mil.za/sasoldier/2003/May2003.pdf (accessed 17 May 2007).

34. See arguments by Emily O. Goldman and Richard B. Andres, "Systemic Effects of Military Innovation and Diffusion," *Security Studies* 8, no. 4 (Summer 1999): 79–125.

35. Zhouying Jin, "Soft Technology," 13.

36. Thomas W. Smith, "The New Law of War: Legitimizing Hi-Tech and Infrastructural Violence," *International Studies Quarterly* 46, no. 3 (December 2002): 359–60.

37. A lesson again noted by the coalition forces during the 1991 Gulf War against Iraq.

38. Zhouying Jin, "Soft Technology," 17.

39. Hussein Solomon, ed., *Towards a Common Defence and Security Policy in the Southern African Development Community* (Pretoria, Republic of South Africa: Africa Institute of South Africa, 2004), 134.

40. Senior South African National Defence Force official, telephonic interview by the authors, 10 December 2007.

41. Barry Buzan, *People, States and Fear: An Agenda for International Security Studies in the Post–Cold War Era* (Boulder, CO: Lynne Rienner, 1991), 218.

42. Mike Hough, "The Challenge of Effective Air Power in Sub-Saharan Africa," in *Protecting Sub-Saharan Africa: The Military Challenge*, ed. Louis du Plessis and Mike Hough (Pretoria, Republic of South Africa: HSRC Publishers, 1999), 124–25.

43. Ibid., 136.

44. Maxi Schoeman, "Developing an Integrated Approach to Human Security," in *From Warfare to Welfare: Human Security in a Southern African Context*, ed. Mari Muller and Bas de Gaay Fortman (Assen, Netherlands: Van Gorcum, 2004), 71.

45. Maj R. Wyn Elder, "The Role of Non-Lethal Airpower in Future Peace Operations: 'Beyond Bombs on Target,'" research report (Maxwell AFB, AL: Air Command and Staff College, 2003), https://research.au.af.mil/papers/ay2003/acsc/03-1413.pdf. See also decisions by the SAC during the Botswana meeting on secondary roles in "Aviation Response Most Effective," *Daily News* (Republic of Botswana), 15 June 2007, http://www.gov.bw/cgi-bin/news.cgi?d=20070615&i=Aviation_response_most_effective (accessed 30 September 2007).

46. See the chapter by African Strategic Alternatives titled "An Audit of Southern African Development Community Defence Policies" in Solomon, *Towards a Common Defence and Security Policy*, 85, 125.

47. M-Net TV South Africa, *Carte Blanche*, documentary on the floods in northern Mozambique (Cyclone Fabius), 10 March 2007.

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49. "South Africa Facing Transition Problems in Air Transport Budget," *Defence Industry Daily*, 18 August 2005, http://www.defenseindustrydaily.com/south-africa-facing-transition-problems-in-air-transport-budget-01039 (accessed 2 October 2007).

50. See the emphasis on early warning in the *Strategic Indicative Plan for the Organ on Politics, Defence and Security Cooperation*, Southern African Development Community, 26, http://www.sadc.int/english/documents/sipo/sipo_en.pdf (accessed 17 July 2007).

51. LTC Lim Kok Siong, CPT Stanley Chua Hon Kiat, and CPT Teh Hua Fung, "Airpower in Non-Conventional Operations," *Pointer: Journal of the Singapore Armed Forces* 30, no. 3 (2004), http://www.mindef.gov.sg/imindef/publications/pointer/journals/2004/v30n3/features/feature4.html (accessed 22 July 2008); and Brig Gen John Wesley, South African Air Force, retired, Council for Scientific and Industrial Research, electronic interview by the authors, 28 and 29 March 2007.

52. See Elder, "Role of Non-Lethal Airpower," 15–16, for new remotely piloted vehicle and UAV systems and capabilities entering the surveillance domain.

53. Nathan, "SADC's Uncommon Approach," 614.

54. See the analysis in "Audit of Southern African Development Community"; LTC Lim Kok Siong, CPT Stanley Chua Hon Kiat, and CPT Teh Hua Fung, "Airpower in Non-Conventional Operations"; and Wesley, interview.

55. See airpower tables in "Audit of Southern African Development Community," 85, 97, 125.

56. Elder, "Role of Non-Lethal Airpower," 18.

57. Ibid., 24.

58. Smith, "New Law of War," 355–75.

59. Steven Metz, *Armed Conflict in the 21st Century: The Information Revolution and Post-Modern Warfare* (Carlisle, PA: US Army War College, Strategic Studies Institute, April 2000), xv, http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB226.pdf (accessed 13 June 2007).

60. Ibid., xv–xvi.

61. Elder, "Role of Non-Lethal Airpower," 16–17.

62. Metz, *Armed Conflict*, xvii.

63. Ibid., 19–20.

64. Tom Cooper and Jonathan Kyzer, "Ethiopian-Eritrean War, 1998–2000," *Central, Eastern, and Southern Africa Database*, Air Combat Information Group, 2 September 2003, http://www.acig.org/artman/publish/article_189.shtml (accessed 30 September 2007); and National Union for the Total Independence of Angola—UNITA, Standing Committee of the Political Commission, "1999—Year of Generalised Popular Resistance: Communiqué no. 38/CPP/99" (Angola: Kwacha UNITA Press, 2 October 1999), http://www.fas.org/irp/world/para/docs/unita/en0510991.htm (accessed 30 September 2007).

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Strategy and Cost

A Gap in Our Military Decision-Making Process

Lt Col Lawrence Spinetta, USAF

Editorial Abstract: The current structure of the military decision-making process assumes that end-state goals have been determined and that strategy is developed in isolation from cost considerations. The author proposes revamping this system by having military strategists develop a menu of options for civilian policy makers. With cost considerations factored into planning, this approach would enable elected leaders to better navigate the many competing demands for public resources.

War was no longer a matter of hoplite arms, but of money.
—Thucydides

THE PRESIDENT AND Congress are the ultimate arbiters of whether the United States goes to war and how the military conducts operations. Sometimes, civilian authorities entrust their military commanders with determining operational strategy (i.e., the selection of forces to employ, the way to employ them, and the timing and tempo of operations). Pres. George W. Bush, for example, is proud of saying that he will continue to defer critical decisions in Iraq to the judgment of the generals; indeed, the president frequently refers to the surge in Iraq as Gen David Petraeus's strategy rather than his own.[1] At other times, civilian leaders take a more controlling role in directing operations and rely on military professionals for advice. Either way, military officers play a large role in influencing policy options and shaping strategy.

Unfortunately, the structure of the current military decision-making process (MDMP) is deficient in at least two major respects as re-

gards preparing military leaders to fulfill that role (i.e., the role of determining or advising appropriate courses of action). First, it assumes the existence of an established objective or clearly stated end, when in fact this is often unsettled. When evaluating a course of action (COA), the current MDMP often presupposes the very issue to be decided: what do we want to accomplish? Stated otherwise, it presupposes consensus and direction when the very issue to be decided is what the objective should be. Second, the structure of the current MDMP encourages war fighters to develop strategy in isolation from cost considerations. Because the current MDMP focuses primarily on how we can most effectively fulfill any given objective, war fighters produce robust plans without considering expense.

Civilian policy makers, however, are interested in knowing more than just the most effective military option. Because they must manage disparate interests that compete for limited financial resources, these policy makers are most concerned with evaluating efficiency and effectiveness trade-offs among various alternatives. They may opt for a less effective military option that provides better value for their investment, given other demands on public resources. Consequently, civilian policy makers need to know the likely cost before they set political objectives so they can better manage competing public interests. Our elected leaders would be better served by a new military decision-making approach that provides a range of options, including low-cost alternatives to strategic challenges.

Why Neglecting Cost Is a Problem

Military planners consider financial factors when deliberating matters related to organizing, training, and equipping forces. But they ostensibly neglect the monetary cost of action when formulating strategy and employing military power. Simply stated, war fighters view cost-benefit and other financial analysis as budgetary tools rather than an integral part of force employment. Yet, the success of a campaign or war is often a function of economics. Even a nation as rich as ours has finite resources, and the public has a limited appetite for absorbing the costs of war.[2] In fact, the judicious use of resources becomes even more critical during long, expensive conflicts.

The administration's war-funding request of $93 billion during fiscal year 2007 approached 20 percent of the total Department of Defense budget. The global war on terror (GWOT)—a conflict that President Bush and others believe will last a generation—is poised to eclipse the cost of the entire war in Vietnam. So far it has cost the United States more than $672 billion.[3]

From an institutional perspective, the cost of the war has been staggering. The Air Force has been cutting personnel in an effort to fund both contingency operations and force modernization. Even with this manpower reduction, Air Force leaders expect to absorb another $120 billion budget shortfall, roughly the equivalent of a full year's budget, over the next six years. Commenting on the service's budget crunch, Gen Ronald Keys, head of Air Combat Command, said, "I'm at a point when I can barely pay for meat and potatoes."[4] Similarly, Gen T. Michael Moseley, former Air Force chief of staff, remarked, "We face increasing financial challenges."[5]

In theory, defense budgets are built around valid requirements. In practice, however, Congress "come[s] up with an acceptable budget amount and expect[s] the armed forces to live within it."[6] Consequently, service budgets are squeezed in order to fund operations and the rising cost of other public services. Retired general Barry McCaffrey told Congress that "the monthly burn rate of $9 billion a month in Iraq and $[1] billion in Afghanistan has caused us to inadequately fund the modernization of the US Air Force and Navy by diverting funds (as much as $55 billion) to support the on-going ground war."[7]

War fighters should not necessarily shy away from a strategy simply because institutional or other costs are high. Certainly, our nation would bear any burden to defend its survival. "No cost would have been too high if the United States faced an imminent threat

from an Iraq armed with weapons of mass destruction, the war's stated justification," notes Martin Wolk, MSNBC's chief economics correspondent.[8] Even so, incorporating cost considerations when thinking through military action helps frame the desirability of various levels of effort. Additionally, identifying the costs of continued action may help decision makers reevaluate their initial political objectives, based on battlefield realities and the strategic situation.

The idea is not to suggest that we can monetarize all costs and benefits and therefore reduce the complexities of strategy into a simple mathematical ratio (i.e., select the COA with the lowest cost-benefit ratio). It is impossible, for example, to determine the dollar value of a democratic Iraq. Marine Corps Doctrinal Publication (MCDP) 1-1, *Strategy*, aptly points out that, "given the nature of war, however, such cost-benefit analysis is more easily described than accomplished. . . . [Furthermore,] it is often difficult to perceive the point at which the cost of fighting exceeds the value of victory."[9] Nevertheless, the challenge associated with valuing "victory" does not mean that war fighters should summarily dismiss or exclude cost considerations when developing strategy. Aaron L. Friedberg, a former deputy assistant for national security affairs and director of policy planning in the Office of the Vice President, emphatically writes, "The first and most fundamental task of any strategic planning operation is to develop alternative courses of action and to assist policymakers in conducting a systematic evaluation of their potential costs and benefits."[10]

A Deficient Military Decision-Making Process

Unfortunately, the current MDMP fails to capture cost considerations adequately. The process generally starts with the assumption that civilian leaders have established clear objectives and defined a desired end state. Then, strategy cells offer several alternative COAs for a combatant commander to consider that satisfy overarching political guidance. One problem with this approach is that it narrowly focuses on how to realize a given objective most effectively rather than provide policy makers with a menu of choices. If the cost of pursuing an objective is high, relative to other competing public interests, policy makers may decide that the objective is not worth pursuing or may opt to change the objective in search of an alternative COA that offers better value.

Current doctrine encourages commanders to mass all available combat power rather than explore less costly responses. For example, US Army Field Manual (FM) 3-0, *Operations*, states that "when the time comes to execute, all elements should have tasks to perform."[11] This doctrinal mandate to employ all available forces is rooted in the Clausewitzian notion that unemployed resources are wasted in total war. According to Carl von Clausewitz, "If a segment of one's force is located where it is not sufficiently busy with the enemy, or if troops are on the march—that is, idle—while the enemy is fighting, then these forces are being managed uneconomically. In this sense they are being wasted, which is even worse than using them inappropriately. When the time for action comes, the first requirement should be that all parts must act."[12] When less-than-vital interests are at stake, though, sending a large contingent of forces into action may not be politically acceptable, and/or the cost may be prohibitive.

Citing a "requirement" for overwhelming force, commanders sometimes request more assets than needed, thereby limiting political options.[13] Mackubin Thomas Owens observes that "when the army did not want to do something—as in the Balkans in the 1990s—it would simply overstate the force requirements: 'The answer is 350,000 soldiers. What's the question?' "[14]

The current MDMP structures strategy development in such a way as to convert challenges to a force-allocation problem. Commanders are allotted assets for a campaign, and they will use those assets if they marginally contribute to the overall goal, regardless of whether the marginal return of using those assets exceeds the cost. The situation is analogous to how a factory in a command economy

uses resources. The government allots the factory certain resources, and the factory will employ them even if the product does not add much value.

Joint Publication (JP) 5-0, the document governing joint operation planning, largely neglects the issue of cost when it outlines steps in the joint planning process. JP 5-0 fails to include cost as a criterion of interest when commanders complete COA analysis and war gaming, COA comparison, and COA approval. Moreover, it fails to require planners to compare the relative costs associated with each COA. Instead, it urges commanders simply to select the "one [COA] with the highest probability of success."[15] Commanders are encouraged to consider cost only as a subcriterion when evaluating the validity of a proposed plan. In that regard, a commander's staff makes a binary judgment (i.e., yes or no) regarding whether a COA is "worth the expected costs" in terms of military effectiveness.[16] There is no recognition that civilian policy makers may choose to employ less optimal military action in favor of employing the nation's limited capital elsewhere.[17]

Providing guidance similar to that of JP 5-0, the Chairman of the Joint Chiefs of Staff Manuals (CJCSM) that address joint planning—CJCSM 3122.01A, CJCSM 3122.02C, and CJCSM 3122.03C—fail to direct staffs to consider the relative costs of proposed actions.[18] Staff estimates, step three of the concept-development process, are meant to provide "key estimates" of the suitability of proposed actions, yet they do not require compilation or analysis of cost information. Likewise, the commander's estimate, step four of the concept-development process, is supposed to compare the desirability of each proposed COA, yet it does not direct an evaluation of the cost of action. Moreover, the chairman's manual prohibits the release of any estimates to other US government agencies.[19] This provision discourages cost transparency early in the concept-development process. The last step, the CJCS estimate review, asks key players to examine whether the proposed COA is "worth the expected costs," but again, this is only in terms of its military effectiveness and calls only for a yes or no evaluation. Financial information is not included in any plan appendix, nor are the relative costs of alternative COAs presented for review.[20]

The limited consideration given to cost in the current MDMP is reflected in a number of other ways. Generic war plans contain 36 annexes, but none details the expected cost of executing these plans.[21] Financial officers are nowhere to be found in military strategy cells such as combined air operations centers. Air Force Operational Tactics, Techniques, and Procedures (AFOTTP) 2-3.2, the manual detailing AFOTTPs for air and space operations centers, fails to include any discussion on how cost factors should be included in strategy formulation. Giving planners only one tip when it comes to cost considerations for employing forces, AFOTTP 2-3.2 cautions that "Unmanned Aerial Vehicles do not have an aircrew onboard . . . [but] a fully equipped RQ-1 Predator air vehicle costs in excess of $3.2 million, and an RQ-4A Global Hawk costs in excess of $12 million . . . [so] high-risk mission taskings into heavily defended areas where loss of the air vehicle is very likely should be approved by the JFACC [joint force air component commander]."[22]

To battle insurgents in Iraq, directors of combined air operations centers authorized $35 million F/A-18As flying from a carrier that costs $2.5 billion to drop $190,000 laser-guided weapons on the position of a single insurgent armed with an AK-47, while our enemy uses old artillery shells and a cell phone to build an improvised explosive device to destroy one of our Humvees, which cost $150,000 apiece.[23]

Cost control during insurgencies or battles against terrorism is particularly important since the enemy can deliver effects disproportionate to the effort. Lawrence Freedman writes that "car bombs are stealth weapons that are a cheap and operationally straightforward way of getting explosives to a target, and they make enough noise that they cannot be ignored. For these reasons, they are the ultimate in asymmetry."[24]

Defenses against improvised explosive devices and other asymmetrical attacks are costly. The terrorist attacks of 11 September 2001 cost between $400,000 and $500,000,

yet the hijackers were able to inflict billions of dollars in direct damage and an exponentially larger amount in indirect damages.[25] Additionally, the attacks caused the United States to spend billions more on expensive homeland-defensive measures.

In *Making Twenty-First-Century Strategy*, Prof. Dennis Drew and Prof. Donald Snow worry that enemy strategists will devise asymmetrical ways to bleed the United States into expending economic resources at politically unacceptable levels.[26] Even though the "US economy is much larger and more vigorous than it has been in times past, fewer of the government's economic resources are available for military purposes."[27] The military portion of the economic pie has shrunk, relative to the nonmilitary portions of the budget. And that trend will likely continue as Congress looks for ways to pay for skyrocketing entitlement payments, especially as the baby-boomer generation retires. The "discretionary" Defense Department budget will likely bear the brunt of future cuts.[28]

Our enemies today do not so much seek our military defeat as they do our internal political collapse and reluctance to continue the struggle. Unfortunately, our current MDMP's failure to take cost into account in determining strategy plays right into their hands.

A Better Approach

Civilian policy makers, who must arbitrate among competing public interests, would be better served if they had an improved understanding of costs before they set political objectives. To support this construct, military strategists need to be prepared to offer a strong mix of policy options, including inexpensive responses as well as more robust alternatives. This construct involves varying both the objective and desired end state as well as the potential responses. In essence, this new approach would provide policy makers with a larger menu of choices.

War fighters should frame for civilian policy makers what various military options "buy" in terms of relative returns. What will the country get in return for its sacrifices and expenditures? At what risk? The key lies in varying the scale of effort and outlining the associated cost of action so that civilian policy makers can choose the best value. In other words, war fighters should identify and outline efficiency and effectiveness trade-offs among various alternative actions. For an estimated cost of X in terms of men, money, and materiel, we can expect to achieve certain effects. For a cost of Y, we expect to deliver different effects. We may be able to achieve a 90 percent solution for 10 percent of the cost. For instance, the price tag for a democratic, well-functioning Iraq may be astronomical, whereas a secure, relatively stable Iraq may be possible at a fraction of the cost. The United States may be able to keep the country from imploding for a tenth of the cost and commitment of other plans.

Strategic guidance is not static. The president may choose to change his goals, based on opportunities or limiting factors that emerge after first contact with the enemy. Strategy formulation is an iterative process with the goal of creating a plan for continuing advantage.[29] Decision makers need to remain mindful of costs before they set initial objectives; they also need cost visibility to evaluate whether to continue with their initial strategic vector or modify the objective and select an alternate game plan. Accordingly, war fighters should explicitly include cost considerations when thinking through the COA comparison-and-selection steps in the MDMP. Unfortunately, many commanders are neither trained nor interested in the economics of action. Yet, cost during long wars such as the GWOT is particularly important since it affects sustainability of action and public support.

Learning from Churchill

During World War II, Winston Churchill famously remarked, "We shall defend our Island, whatever the cost may be."[30] Earlier in his career, though, when the stakes were less vital, he recognized that the price tag (i.e., the cost in terms of men and materiel) for proposed operations was more than just a second-

ary consideration. After World War I, England struggled to maintain its colonial empire at a time when its treasury was more or less broke. Then serving as the war minister, Churchill had to devise cheap, innovative strategies to maintain control of England's overseas territories.

In 1919 the emir of Afghanistan declared jihad against Britain's forces in the Northwest Frontier Province. The British sent a single Handley Page biplane bomber to Karachi. The aircraft dropped four 112-pound and 16 20-pound bombs on Kabul, causing the emir to sue for peace shortly thereafter. Basil Liddell Hart, a military historian and strategist, declared that "this aeroplane seems to have achieved more than 60,000 men did."[31]

A year later, Mohammed bin Abdullah Hassan, the "Mad Mullah" of Somaliland, reemerged as a threat to British interests in the region. The fanatical mullah had been a thorn in the side of the British for decades. Previously, the British sent four expeditions, the last of which involved 15,000 troops, to Somaliland; all four failed. The mullah was able to regroup his forces and terrorize local tribesmen who had accepted British rule. Ultimately, he slaughtered a third of the territory's inhabitants.[32]

The English parliament balked at repeating the expensive ground invasion, so Churchill sent six small aircraft to East Africa. They bombed the mullah's fort for two days and brought the immediate crisis in Somaliland to a conclusion. Churchill boasted that the previous land expedition had cost the treasury £6 million—about £120 million ($220 million) in today's money—but the Royal Air Force did the job for £77,000.[33]

Churchill also managed to maintain British influence in Mesopotamia and other lands in the Middle East and Southwest Asia using similarly cheap methods. In August 1919, he warned Parliament that England's large Mesopotamian garrison was prohibitively expensive, and he advocated drastic cuts. Churchill suggested that British power could be maintained if he replaced some mechanized forces with fewer foot soldiers. By early 1920, the previously 25,000-strong British garrison was cut nearly in half. Even so, sustaining this reduced force required £18 million a year, a sum the War Office could ill afford to continue to pay. "Driven by a financial imperative [to cut costs], Churchill now began to think along more radical military lines," notes David Omissi in *Air Power and Colonial Control*. "Churchill persisted in his attempts to find cheaper methods of holding Mesopotamia."[34] He mostly relied on a strategy that leveraged the promise of airpower and employed a combined-arms approach. In Iraq, Churchill "chose to save cash by running the country through a puppet ruler," installing Faisal I as king in 1921.[35] Churchill's efforts helped maintain the power of the Arab kingdoms in Mesopotamia and dominate other populations under British sway.

The point of chronicling these historical events is not to argue the merits of air policing. On the contrary, British political hopes for the region were never entirely fulfilled. The Mad Mullah, for example, was never captured, and 700 of his followers escaped to fight another day. Rather, the intent is to show how Churchill incorporated cost considerations into his strategy development and was able to construct politically feasible and fiscally sustainable COAs successfully.

Conclusion

Instead of planning to employ all available combat power automatically, war fighters should explore ways of making our armed response less costly and more efficient. All too often, commanders limit their aim to ensuring "overwhelming combat power" and devoting "maximum effort" towards achieving primary objectives.[36] This is too one dimensional. War fighters should focus more on the "judicious employment and distribution of forces."[37]

In *Carnage and Culture*, Victor Davis Hanson states that "ultimately, war is a question of economics, in which the options of all states are confined by their ability to produce goods and services; thus every armed force calibrates the greatest military power for the least cost. Armies in the Dark Ages and medieval era, like their classical predecessors, were not immune from such constraints, and so learned

quickly that man for man, infantry could be provided for at a tenth of the expense of mounted troops."[38] But incorporating cost considerations into strategy goes beyond simply tinkering with the force mix.

While helping to preserve the British Empire, Churchill employed a combined-arms team to reduce cost. More importantly, he elevated cost considerations beyond an ancillary concern and presented policy makers with a range of employment options. Since civilian policy makers are most interested in advancing and managing broader notions of public interests, military strategists need to present alternatives that do more than just offer robust operational solutions. That is, they should provide a menu of choices, including low-cost options that may produce a range of politically acceptable outcomes, so that our elected leaders can better arbitrate among competing demands for public resources. This approach does not necessarily demand that commanders employ their resources stingily, but it does require them to have a firm grasp of cost fundamentals, a willingness to think beyond narrow operational concerns, and the courage to propose a broad range of measured applications of power. ❑

Notes

1. Editorial, "Hiding behind the General," *New York Times*, 9 September 2007, http://www.nytimes.com/2007/09/09/opinion/09sun1.html. See also Lawrence Korb, "Bush Must Stop Blaming Military Leaders for Failed Strategy," *Huffington Post*, 22 July 2007, http://www.huffingtonpost.com/lawrence-korb/bush-must-stop-blaming-mi_b_57317.html.

2. Martin Wolk, "Cost of Iraq War Could Surpass $1 Trillion," *MSNBC.com*, 17 March 2006, http://www.msnbc.msn.com/id/11880954.

3. The cost of $672 billion is based on a fiscal year (FY) 2006 Congressional Research Service estimate added to the cost of operations annotated in the FY 2007 federal budget. Ann Scott Tyson, "Bush's Defense Budget Biggest since Reagan Era," *Washington Post*, 6 February 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/02/05/AR2007020501552.html; and John A. Tirpak, "The $120 Billion Cut," *Air Force Magazine* 89, no. 10 (November 2006): 28–33, http://www.afa.org/magazine/nov2006/1106cut.pdf.

4. Quoted in Tirpak, "$120 Billion Cut," 33. Gen John Corley took the reins of Air Combat Command from General Keys on 2 October 2007.

5. Gen T. Michael Moseley, "The Future of Air and Space Power" (address, Air Force Association's Air and Space Conference and Technology Exposition, Washington, DC, 27 September 2006), http://www.af.mil/library/speeches/speech.asp?id=276.

6. Robert S. Dudney, "Second Opinion," *Air Force Magazine* 90, no. 1 (January 2007): 2, http://www.afa.org/magazine/jan2007/0107edit.pdf.

7. Senate, *Testimony of General Barry R. McCaffrey (USA, Ret.), Adjunct Professor of International Relations, United States Military Academy, before the Senate Armed Services Committee*, 110th Cong., 1st sess., 17 April 2007, 6, http://armed-services.senate.gov/statemnt/2007/April/McCaffrey%2004-17-07.pdf.

8. Wolk, "Cost of Iraq War."

9. Marine Corps Doctrinal Publication 1-1, *Strategy*, 12 November 1997, 43, http://www.dtic.mil/doctrine/jel/service_pubs/mcdp1_1.pdf.

10. Aaron L. Friedberg, "Strengthening U.S. Strategic Planning," *Washington Quarterly* 31, no. 1 (Winter 2007–8): 49, http://www.twq.com/08winter/docs/08winter_friedberg.pdf.

11. Field Manual 3-0, *Operations*, June 2001, 4-13, http://www.dtic.mil/doctrine/jel/service_pubs/fm3_0a.pdf.

12. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984), 213.

13. The Powell Doctrine, for example, demands that the United States use "every resource and tool" in the country's inventory to employ "overwhelming force." See also Michael Gordon, "A Nation Challenged: Military Analysis, a New Kind of War Plan," *New York Times*, 7 October 2001, http://query.nytimes.com/gst/fullpage.html?res=9C0CE0D7123CF934A35753C1A9679C8B63&sec=&spon=&pagewanted=print.

14. Mackubin Thomas Owens, "Failure's Many Fathers," *Foreign Affairs* 86, no. 5 (September/October 2007): 149, http://www.foreignaffairs.org/20070901faresponse86511/richard-b-myers-richard-h-kohn-mackubin-thomas-owens-lawrence-j-korb-michael-c-desch/salute-and-disobey.html.

15. Joint Publication 5-0, *Joint Operation Planning*, 26 December 2006, III-33, http://www.dtic.mil/doctrine/jel/new_pubs/jp5_0.pdf.

16. Ibid., III-50.

17. When business leaders perform net present value (NPV) analysis to make long-term capital decisions, they do not pursue every opportunity that offers a positive NPV (i.e., opportunities that offer benefits that exceed estimated costs). Rather, they recognize that firm capital is limited and choose to pursue only projects that maximize value. Likewise, civilian policy makers do not neces-

sarily make public policy decisions based on whether projected benefits exceed costs. Public resources as well as their own political capital are limited. Therefore, they ideally seek to pursue only those policies that maximize the collective good and/or their constituents' interests.

18. Chairman of the Joint Chiefs of Staff Manual (CJCSM) 3122.01A, *Joint Operation Planning and Execution System (JOPES)*, vol. 1 *(Planning Policies and Procedures)*, 29 September 2006; CJCSM 3122.02C, *Joint Operation Planning and Execution System (JOPES)*, vol. 3 *(Crisis Action Time-Phased Force and Deployment Data Development and Deployment Execution)*, 19 June 2006; and CJCSM 3122.03C, *Joint Operation Planning and Execution System*, vol. 2 *(Planning Formats and Guidance)*, 17 August 2007.

19. According to CJCSM 3122.01A, "Planning information is not authorized for release to other U.S. government agencies at this point in the process." However, the manual does authorize the supported commander to "highlight issues for future interagency consultation, review or resolution" in order to present them eventually to the secretary of defense (C-9).

20. Ibid.

21. Prior to the war in Iraq, the Congressional Budget Office (CBO) tried to inform the policy debate when it released a report on the expected cost of the war. But the report failed to link that cost to various strategies. The CBO report listed critical cost drivers such as "strategy employed" and "force size deployed" as "unknown." "Estimated Costs of an Iraq War: War in Iraq Could Cost up to $9 Billion Monthly, Says CBO," *About.com*, n.d., http://usgovinfo.about.com/library/weekly/aairaqwarcost.htm.

22. Air Force Operational Tactics, Techniques, and Procedures 2-3.2, *Air and Space Operations Center*, 13 December 2004, 4-41.

23. Thomas Lienhard, letter to the editor, "The Pentagon Crisis of 2015," *American Legion Magazine* 163, no. 2 (August 2007): 5.

24. Lawrence D. Freedman, review of *Buda's Wagon: A Brief History of the Car Bomb* by Mike Davis, *Foreign Affairs* 86, no. 3 (May/June 2007): 144, http://www.foreignaffairs.org/20070501fabook86325/mike-davis/buda-s-wagon-a-brief-history-of-the-car-bomb.html.

25. National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks upon the United States: Executive Summary* (Washington, DC: Government Printing Office, 2004), 14.

26. Dennis M. Drew and Donald M. Snow, *Making Twenty-First-Century Strategy: An Introduction to Modern National Security Processes and Problems* (Maxwell AFB, AL: Air University Press, 2006), 198, http://aupress.maxwell.af.mil/Books/Drew_Snow/DrewSnow.pdf.

27. Ibid., 196–97.

28. "About 85 percent of all governmental expenditures were in three categories: entitlement programs (e.g., Medicare), national defense, and servicing (paying the interest on) the national debt. All other government functions comprised only 15 percent of the total. Entitlements are difficult to cut since they benefit a large number of constituents (voters) and are generally mandated by law. One cannot fail to pay the interest on the national debt because of the need to borrow in the future, and much of the 'fat' has been removed from the other 15 percent of the budget. That leaves the defense budget, which is particularly vulnerable because approximately two-thirds of it is appropriated annually and is somewhat easier to cut than expenditures that are made automatically (entitlements and debt service)." Ibid., 69.

29. Everett C. Dolman, *Pure Strategy: Power and Principle in the Space and Information Age* (London: Frank Cass, 2005), 6.

30. Winston Churchill, "We Shall Fight on the Beaches" (speech to the House of Commons, 4 June 1940), Churchill Centre, http://www.winstonchurchill.org/i4a/pages/index.cfm?pageid=393.

31. Quoted in "An Enduring Illusion," *Economist* 380, no. 8492 (24 August 2006), http://www.economist.com/world/displaystory.cfm?story_id=7826962.

32. Ibid. See also James S. Corum and Wray R. Johnson, *Airpower in Small Wars: Fighting Insurgents and Terrorists* (Lawrence: University Press of Kansas, 2003), 53.

33. Ibid.

34. David E. Omissi, *Air Power and Colonial Control: The Royal Air Force, 1919–1939* (Manchester, UK: Manchester University Press, 1990), 20.

35. "Meddling in Mesopotamia Was Always Risky," *Telegraph*, 18 March 2003, http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2003/03/18/widip218.xml.

36. Air Force Doctrine Document 1, *Air Force Basic Doctrine*, 17 November 2003, 24, http://www.au.af.mil/au/awc/awcgate/afdc/afdd1-chap3.pdf.

37. Ibid.

38. Victor Davis Hanson, *Carnage and Culture: Landmark Battles in the Rise of Western Power* (New York: Doubleday, 2001), 165.

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Go Pills in Combat

Prejudice, Propriety, and Practicality

Dr. John A. Caldwell

Editorial Abstract: The military's use of medications for operational reasons has traditionally garnered substantial, often negative, attention from the popular news media—and sometimes from the scientific community as well. However, the author details how clear guidelines on the use of stimulants (and, by inference, other counterfatigue medications) in operational contexts optimize the safety, performance, and general well-being of US military combat-aviation personnel while preserving their rights to make informed decisions about their own lives.

THE MILITARY'S USE of medications for operational reasons has traditionally garnered substantial attention from the popular news media and sometimes from the scientific community as well. Unfortunately, this attention often is decidedly negative. For instance, although we now accept the appropriateness of vaccinating US forces against germ warfare, in 1998 Secretary of Defense William Cohen's mandate that all personnel receive anthrax vaccinations prompted numerous congressional hearings and legal disputes. Meanwhile the media reported that significant numbers of personnel

were "leaving the armed forces because they did not want to be vaccinated."[1] The use of the nerve-agent pretreatment pyridostigmine created a similar controversy following the Persian Gulf conflict of 1991 because of the medication's wide use for what is generally referred to as an "off-label" indication.[2] Although a later ruling permitted its appropriate administration following either presidential orders or individual informed consent, questions continued with regard to the safety and wisdom of policies concerning this prophylactic intervention.[3] More recently, the military's use of dextroamphetamine to sustain the performance of sleep-deprived pilots created concern after two pilots blamed a friendly-fire incident in 2002 on their use of this medication.[4] Despite the fact that an Air Force investigation ultimately failed to implicate dextroamphetamine as a contributor to this unfortunate event, the general public knew nothing of this fact; thus, many people continue to question the military's use of dextroamphetamine and other performance-sustaining pharmacological compounds.

Incidents such as these contribute to ongoing debates about the ethics of using medications to protect or sustain (or augment) our military personnel. These debates are particularly pointed with regard to the military's use of counterfatigue medications—especially stimulants such as amphetamines. In fact, the issue of the appropriateness of using counterfatigue drugs to augment combat safety and performance has again become a topic of considerable discussion.[5] Some North Atlantic Treaty Organization members consider the US military's use of prescription stimulants such as amphetamines unethical, and this stance on the ethical ramifications of "performance-enhancing drugs" may be largely responsible for the fact that the United States currently is the only major world power authorizing the operational use of amphetamines and some other counterfatigue medications.[6]

As a research scientist who has conducted numerous studies on the operational utility of prescription stimulants in US aircrews, I find it difficult to understand why some people raise the question of *ethics* regarding the uses of these compounds.[7] The military's use of "cognitive performance enhancers" is ethical as long as (1) the decision to use a performance-enhancing/sustaining medication rests freely with the individual; (2) the use of the drug is safe within the context in which it is used; (3) the manner of the substance's use remains consistent with its dosage and pharmacological function; and (4) in general, the military employs medication options only after exhausting nonpharmacological alternatives.[8]

On these grounds, one might ask why anyone would consider physicians wrong to prescribe amphetamines (or other stimulants) to perfectly healthy, nonmilitary people so that they can get by with less sleep for the sake of working (or playing) longer hours. A close examination shows that such a prescription would meet the first criterion and possibly the third, listed above, but prescribing stimulants to healthy civilian workers violates the second and fourth criteria. Failure to meet the second criterion stems from the fact that, unlike military-aviation personnel closely monitored by medical personnel, civilians walk out of the physician's office (or the pharmacy) with a multiday supply of the drug, able to use it in the absence of close medical supervision. This is potentially unsafe, especially considering amphetamine's potential for abuse and, in this case, the fact that patients are free to modify the prescribed dosage in any number of ways (some of them possibly dangerous). Failure to meet the fourth criterion stems from the physician's not having exhausted the nonpharmacological alternatives. Unlike military pilots who use the stimulant medication to perform a potentially life-saving mission that they probably could not do effectively without the aid of the drug, civilian patients (who in this example do not suffer from some type of alertness *disorder*) really have the choice of remaining awake for a shorter period and choosing to sleep sufficiently rather than electing to take a drug in order to prolong wakefulness. Little downside accompanies this choice (to sleep) because although civilian patients won't be able to work or play longer than normal without the stimulant, they are unlikely to suffer harm as a result. Thus, offering stimulants to healthy civil-

ians for everyday use clearly presents a less favorable risk/benefit ratio and a less favorable ethical stance than prescribing them for military pilots, who have little choice except to engage in sustained combat operations.

Do "morality" issues attach to the military's use of "cognitive-enhancing agents"? That is a difficult question to answer since different people define morality in various ways. For some, ethical actions are also moral; for others, morality refers to the concept of absolute "rightness" or "wrongness"; and still others define morality contextually. (That is, if the ultimate outcome is "good," with no intent to harm another innocent human being, violate an innocent person's rights, or cheat people of their rightful possessions, then the actions are moral.)[9] The US military's use of performance-enhancing medications seems "moral" because it utilizes them to meet specific objectives upon which we as a nation presumably agree—and to do so in a way that improves the survivability of our personnel under less-than-optimal circumstances. We do not *force* our personnel to ingest stimulant medications against their will; neither do we force our enemies to ingest them. Rather, we offer the medications, which have been proven "safe," in order to protect the well-being of our military personnel.[10] For all practical purposes, we as a nation have essentially agreed that this type of medical intervention is acceptable to achieve desired tactical outcomes (extant policies authorize such use). Yes, these medications may contribute to our ability to harm our enemies, but we already use a variety of other strategies (technological, behavioral, etc.) for this purpose. The fact that cognitive enhancers provide a tactical advantage over our enemies is not considered cheating any more than the fact that our use of superior night-vision technology offers a tactical advantage. Also, I should note that in strict terms of fairness, we publish information on our use of or intent to use pharmaceutical performance enhancers in the open scientific literature, which our enemies are free to read and take advantage of. Thus, in my opinion, our use of these medications is both moral and ethical.

However, since the use of pharmacological compounds is a medical and/or behavioral-sciences issue and since published standards outline the principles of ethical actions in both of these fields, let us rely on these standards to address the appropriateness of using the medications that are the subject of this article. I first present a brief overview of the basic ethical principles that guide the behavior of physicians and psychologists. Then I discuss as a primary example the military's use of dextroamphetamine as a safe and effective fatigue countermeasure for combat-aviation operations, explaining why our current stance on the use of this medication—and, by inference, other counterfatigue (or performance-enhancing) drugs—does not pose an ethical dilemma for the US military.

Basic Ethical Principles

General ethical principles are designed to inspire individuals to act in accord with the highest standards and ideals of their respective professions. Caring for others, inspiring trust, behaving honestly, treating people fairly, and respecting the essential worth of human life are core characteristics of ethical thoughts and actions. Ethical professionals strive to benefit those with whom they work and to minimize the possibility of doing harm. They are trustworthy and mindful of their responsibilities to others. They are truthful, accurate, and honest. These individuals take care to justly distribute their contributions among those for whom they are responsible. And they respect the rights of every individual to privacy, general well-being, and self-determination. In summary, ethical professionals make every effort to treat others with the same fairness, dignity, and respect they would hope to receive themselves.[11] Given the basic tenets of ethical behavior outlined above, let us examine the military's use of dextroamphetamine as an example and determine whether guidance governing the use of this compound is ethically appropriate.

History of the Dextroamphetamine Policy

Fatigue from sleep loss and body-clock disruptions is a widespread problem in military operations, particularly in recent high-tempo actions associated with the global war on terror.[12] Such around-the-clock operations, rapid time-zone transitions, and uncomfortable sleep environments are common on the battlefield; unfortunately, these conditions prevent personnel from obtaining the eight solid hours of sleep required for optimum day-to-day functioning. Sleep in the operational environment often is fragmented for weeks at a time and sometimes totally nonexistent for days at a stretch.[13] Needless to say, such sleep deprivation rapidly degrades reaction time, alertness, attention, and mood, leading to seriously impaired safety and performance.[14] Generally speaking, every 24 hours of sleep deprivation produces a 25 percent reduction in operational performance, with higher-level cognition the most severely compromised of all capabilities.[15] Thus, unsurprisingly, *we have determined that fatigue exacts significant social, financial, and human costs and that it has been implicated as a causative or contributing factor in numerous military-aviation mishaps.*[16]

In an effort to counter fatigue-induced performance decrements, the military has invested substantially in what is often termed alertness-management research. This research resulted in an array of strategies, including duty-time limitations, behavioral countermeasures, napping interventions, and drug-based remedies designed either to enhance available sleep opportunities or to sustain performance despite sleep deprivation. The strategy of periodically using dextroamphetamine was one product of this research thrust, and I will use the procedures governing dextroamphetamine therapy as the primary example in this article.

Amphetamines became available for prescription in 1937, and by the time of World War II, the German, Japanese, and British militaries used them to enhance performance on the battlefield. Although some reports indicate that US forces used the drug during the Korean conflict, the US Air Force did not officially sanction the use of dextroamphetamine for performance sustainment until 1960.[17] Subsequently, widespread use of amphetamines by military aircrews probably first occurred during the Vietnam conflict. The policies concerning stimulants evolved into Air Force Regulation 161-33 / Tactical Air Command Supplement 1, *The Aerospace Medicine Program*, 1 January 1984, which sanctioned the use of amphetamines by single-seat pilots in particular due to their susceptibility to boredom and fatigue during deployments and extended combat air patrols. In 1996 Air Force leadership rescinded the long-standing approval to use amphetamines in aviation operations.

The Air Force suspended amphetamine authorization even though the use of dextroamphetamine evidently played no part in mishaps during Operation Desert Storm. (Fatigue contributed to a number of them, however.) Furthermore, one survey collected during Desert Storm noted the value of amphetamines for maintaining alertness in flight operations, and one squadron commander described the availability of the medication as a "safety of flight" issue.[18] These results, coupled with data from four placebo-controlled aviation studies conducted between 1995 and 2000 led, in part, to the reintroduction of approval to utilize dextroamphetamine in select combat Air Force operations in 2001.[19]

The Real Issues at the Heart of the Current Stimulant Policy

All three US military services currently approve dextroamphetamine for the sustainment of combat-pilot performance under particularly fatiguing circumstances. When considering the ethical implications of using this prescription medication for maintaining the alertness of sleep-deprived but otherwise normal personnel, one must first consider a couple of points.

First, detractors of the current stimulant policy often describe the choice of whether or not to use stimulants as one between having well-rested pilots fly their missions drug free versus having sleep-deprived pilots fly their missions on drugs. However, as I have

already noted, military operations often inevitably entail unavoidably high levels of fatigue. Thus, in actuality, the *real* choice lies between having sleep-deprived pilots fly the mission with the aid of proven, alertness-enhancing drugs versus having them fly the mission while struggling to stay awake on their own. Further, research has shown quite clearly that attempting to self-sustain wakefulness in the presence of substantial sleep pressure (fatigue) is a losing proposition.

Second, detractors often like to draw comparisons between civil-aviation operations, which do not allow stimulants, to military-aviation operations, which do permit them. They ask why the military allows these drugs when the civilian world does not. In answering this question, one should clearly understand that the two situations are not comparable.

One major difference is that combat-aviation missions are presumably significantly more stressful than commercial air-transportation operations. For instance, although airline-transport pilots no doubt experience stress from their responsibility for the safety of up to 400 passengers, they are rarely targets of enemy aggression. Combat pilots, however, routinely perform their duties under imminent and palpable threats to their own safety and, in fact, their very lives. Additionally, military aircrews routinely find themselves subjected to the most arduous and continuous flight schedules—sometimes requiring numerous, successive missions despite the absence of adequate crew rest—in order to sustain the operational tempo, whereas stringent crew-rest and duty requirements specified in Federal Aviation Administration regulations protect commercial crews from such circumstances.

Another major difference is that the consequences of cancelling a commercial flight differ markedly from those associated with calling off a military flight. If a fatigued airline pilot declines a flight due to concerns over his or her impaired performance capabilities, the airline may not like the decision, but, clearly, it jeopardizes no one's safety. Instead, the airline will replace the fatigued pilot with a rested standby pilot, who will complete the scheduled flight. Every major commercial air carrier has clear contingencies for such events. However, in a military context, already severely limited by the number of available pilots, an aviator's decision to decline a mission will probably result in delaying or simply not flying it. Like the airline passengers mentioned previously, those scheduled to fly aboard the affected aircraft likely will be safer, but what about the soldiers awaiting medical evacuation from the field? What about the units awaiting resupply of ammunition, food, and water? And what about the people threatened by enemy fire? What about their safety after cancellation or delay of a scheduled military mission?

When considering the military's position on stimulant use, one must remember (1) that combat is not a sporting event but an unpredictable, life-threatening, stressful, and fatiguing endeavor calling for the employment of every reasonable aid to success, and (2) that in order to protect and defend the lives of our friends and allies, US military pilots must think far beyond the most immediate ramifications of their decisions regarding mission acceptance and completion. It is within this context that we must consider the ethics of stimulant use (as well as the use of other performance-enhancing medications).

Current Guidelines for Amphetamine Use in Air Operations

Much careful forethought went into the US military's current dextroamphetamine policy, with the aim of protecting individual war fighters—primarily aviators—and of fulfilling our military objectives.[20] Moreover, as I will show (primarily by citing Air Force policies/procedures as an example), guidance ensures that we can achieve these aims without compromising professional ethical principles. The following tenets assure the appropriate use of dextroamphetamine:[21]

1. Clear guidelines dictate the circumstances under which one can utilize dextroamphetamine in operational contexts; they also extend its use to exceptional cir-

cumstances. These guidelines specify mission durations and drug dosages.

2. Prior to using dextroamphetamine, each pilot must read and sign a detailed informed-consent agreement to ensure sufficient knowledge about both the positive and potentially negative effects of the medication. Failure to obtain documented informed consent precludes the operational use of the drug for that individual.

3. The population authorized to utilize stimulant medication (military aviators) is by nature young, healthy, and likely free of any medical complications that would contraindicate the use of dextroamphetamine. Military pilots must routinely undergo recurrent physical examinations in order to document the necessary good health required to remain on flight status.

4. In addition, since individual responses to any type of medication are difficult to predict even in the healthiest population, the military requires a documented predeployment ground test, conducted under the supervision of a military physician, to guard against problematic idiosyncratic reactions.

5. In the operational environment, qualified medical personnel control the supplies of dextroamphetamine, dispensing it in appropriate amounts when needed and documenting its use in carefully maintained records. These personnel collect unused medications upon mission completion and secure them as appropriate.

6. The ultimate decision regarding whether or not to use dextroamphetamine during an operational mission always rests with the individual aircrew member. No one is ever required to ingest a stimulant.

7. Medical personnel authorize the use of dextroamphetamine as a fatigue countermeasure only after exhausting every other nonpharmacological option. The military never turns to drugs as the first solution to a fatigue problem in the field and does not consider them a substitute for planning adequate crew work/rest.

8. Ultimately, with all options on the table, leadership, in collaboration with appropriate medical personnel, carefully considers the option of using stimulant medications in terms of the criticality of the mission, the potential for known hazards, and the ultimate safety of affected personnel.

Does this list of safeguards optimize the ethical use of dextroamphetamine (and, potentially, other medications) in operational aviation contexts? By following these guidelines, we mitigate the known dangers of fatigue with a scientifically proven method validated by laboratory studies and field testing. Every individual receives a predeployment test dose to guard against idiosyncratic side effects. Therefore, we achieve the ethical principle of "doing no harm." The decision to utilize the medication in support of an operational objective is made jointly by the leadership, the physician, and the individual war fighter to ensure that operational concerns do not override the safety and health of crew members. Thus, the medical community demonstrates trustworthiness and responsibility towards our military personnel. Prior to administering the medication (or making it available) to individuals, medical personnel obtain documented informed-consent agreement, the information contained therein based on currently available scientific knowledge about the positive and negative effects of dextroamphetamine. Thus, this process conveys truthful, accurate, and honest information to personnel. Upon authorization of dextroamphetamine, aviators throughout the affected unit have access to the drug, making the benefits of this fatigue countermeasure equally and justly available to everyone in the group. Finally, no individual aviator is ever *required* to use dextroamphetamine, and, most often, when the time to decide comes, the individual crew member does so privately, in light of his or her perceived needs during the actual flight mission (when neither the flight surgeon nor the unit commander is present). Thus, the policy essentially

respects the principle concerning privacy, general well-being, and self-determination.[22]

Conclusions

The US military has the responsibility of balancing operational objectives and individual rights while protecting the health of the force. By its very nature, achieving this balance can prove challenging, particularly during stressful and fatiguing combat operations. However, the military has dedicated a substantial amount of work to the development and implementation of comprehensive fatigue-management programs that employ administrative, behavioral, *and* pharmacological strategies. When all else fails, the medication option offers an important counterfatigue intervention, but in today's "just say no to drugs" climate, pharmacological treatments often seem to create an opportunity for spirited debate. However, with regard to the use of medication for performance sustainment, the military has developed a conservative approach designed to meet organizational objectives without compromising individual autonomy or well-being. As I have shown in this article, clear guidelines on the use of stimulants (and, by inference, other counterfatigue medications) in operational contexts optimize the safety, performance, and general well-being of the US military's combat-aviation personnel while preserving their right to make informed decisions about their own lives. Recent survey data suggest that the current policy is working and that there is little perceived pressure to use stimulants if individuals have personal misgivings about doing so.[23] This finding, in combination with the fact that untreated fatigue has cost numerous lives throughout the years but that stimulants have *never* been implicated in a single Air Force mishap, makes a strong argument for the ethics of continuing to employ counterfatigue medications. ❑

Notes

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2. The Food and Drug Administration approved pyridostigmine bromide for the treatment of myasthenia gravis but considered it an investigational pretreatment medication for organophosphate poisoning. Although some media reports suggested that this medication was significantly associated with so-called Persian Gulf Syndrome, the actual incidence of untoward neurological side effects was 1 percent.

3. D. O. E. Gebhardt, "Off-Label Administration of Drugs to Healthy Military Personnel: Dubious Ethics of Preventive Measures," *Journal of Medical Ethics* 31, no. 5 (May 2005): 268.

4. Tina-Maire O'Neill, "US Pilots Blame Drug For Canadian Bombing," *Sunday Business Post Online*, 19 January 2003, http://archives.tcm.ie/businesspost/2003/01/19/story437452528.asp.

5. Michael B. Russo, "Recommendations for the Ethical Use of Pharmacologic Fatigue Countermeasures in the U.S. Military," *Aviation, Space, and Environmental Medicine* 78, no. 5, sec. 2 (May 2007): B119.

6. Erich Roedig, "German Perspective: Commentary on 'Recommendations for the Ethical Use of Pharmacologic Fatigue Countermeasures in the U.S. Military,'" *Aviation, Space, and Environmental Medicine* 78 no. 5, sec. 2 (May 2007): B136.

7. John A. Caldwell, J. Lynn Caldwell, and Kecia K. Darlington, "The Utility of Dextroamphetamine for Attenuating the Impact of Sleep Deprivation in Pilots," *Aviation, Space, and Environmental Medicine* 74, no. 11 (November 2003): 1125–34; and John A. Caldwell et al., "Modafinil's Effects on Simulator Performance and Mood in Pilots during 37 Hours without Sleep," *Aviation, Space, and Environmental Medicine* 75, no. 9 (September 2004): 777–84.

8. Russo, "Recommendations for the Ethical Use," B123. The term *safe* within this context refers to the fact that the medications have been tested in controlled laboratory environments as well as in clinical trials and have been determined *not* to cause physiological harm to the individual. Also, the claim of "safety" is based on the fact that controlled simulator and in-flight studies conducted on military pilots have produced evidence that cognition and performance are *not* adversely affected by the drug. In fact, results have shown that it improves performance. Lastly, we have evidence of "safety" across individuals

since every pilot who uses a prescription stimulant in combat must have already satisfactorily completed a test dose of the drug under a physician's supervision.

9. In the context of "war," or a US-sanctioned "police action," or other military conflict, enemies of the United States who bear arms against us with the intent of causing harm are not considered innocent.

10. See note 8.

11. American Psychological Association, "Ethical Principles of Psychologists and Code of Conduct," *American Psychologist* 57, no. 12 (December 2002): 1060–73.

12. John A. Tirpak, "The Force Seeks a New Baseline," *Air Force Magazine* 86, no. 1 (January 2003): 36, http://www.afa.org/magazine/jan2003/0103force.pdf.

13. S. Elliot, "Chief of Staff Shares Views on Global Strike Task Force," *Air Force News Archive*, 31 October 2001, http://www.combatsim.com/memb123/cnews/arch/cnewsarc146.htm#chstff.

14. David F. Dinges et al., "Cumulative Sleepiness, Mood Disturbance, and Psychomotor Vigilance Performance Decrements during a Week of Sleep Restricted to 4–5 Hours per Night," *Sleep* 20, no. 4 (1997): 274, http://www.journalsleep.org/Articles/200403.pdf.

15. Greg Belenky et al., "The Effects of Sleep Deprivation on Performance during Continuous Combat Operations," in *Food Components to Enhance Performance*, ed. Bernadette M. Marriott (Washington, DC: National Academy Press, 1994), 128.

16. Jeffrey S. Durmer and David F. Dinges, "Neurocognitive Consequences of Sleep Deprivation," *Seminars in Neurology* 25, no. 1 (March 2005): 117; and Tom Luna, "Fatigue in Context: USAF Mishap Experience," *Aviation, Space, and Environmental Medicine* 74, no. 4 (April 2003): 388.

17. Lt Col Rhonda Cornum, Dr. John Caldwell, and Lt Col Kory Cornum, "Stimulant Use in Extended Flight Operations," *Airpower Journal* 11, no. 1 (Spring 1997): 54–55, http://www.airpower.maxwell.af.mil/airchronicles/apj/apj97/spr97/cornum.pdf.

18. Kory Cornum, Rhonda Cornum, and William Storm, "Use of Psychostimulants in Extended Flight Operations: A Desert Shield Experience," in *Advisory Group for Aerospace Research and Development (AGARD) Conference Proceedings 579* (Neuilly sur Seine, France: North Atlantic Treaty Organization, October 1995), 37-1 to 37-4.

19. Brig Gen Gary H. Murray, commander, Air Force Medical Operations Agency, to Department of the Air Force, letter, 26 June 2001 (policy letter on the implementation of Headquarters USAF/XO message on countermeasures to aircrew fatigue in the combat air force).

20. Department of the Air Force (Maj Stephen Moulten, point of contact), to Air Combat Command, letter, 20 February 2001 (policy letter on aircrew fatigue-management program).

21. This same guidance applies to the use of modafinil (Provigil), recently approved by the Air Force surgeon general for certain Air Force combat-aviation operations. (No doubt the other services will soon approve it as well.)

22. A couple of caveats deserve note here: (1) Of course, when the pilot is asked at the conclusion of the flight to account for the medications issued, the flight surgeon will then know the in-flight decision that he made; however, this will occur after the fact (which would lessen its influence at the decision-making point). (2) No doubt, in some situations one crew member could feel "pressured" to use a performance-sustaining medication because other crew members have decided to do so, but survey data suggest that this is more the exception than the rule (see note 23).

23. Sarady Tan and John Caldwell, "A Survey of the U.S. Air Force Aviation Personnel on Flying, Fatigue and Fatigue Countermeasures," *Aviation, Space, and Environmental Medicine* 77, no. 3 (March 2006): 293.

The Air Force is redefining air, space, and cyber power through cross-domain dominance—our effort to integrate all of our capabilities to exploit the natural synergies across these warfighting domains.

—Air Force Posture Statement 2008

Book Reviews

The Jedburghs: The Secret History of the Allied Special Forces, France 1944 by Lt Col Will Irwin, USA, Retired. Public Affairs (http://www.publicaffairsbooks.com), 250 West 57th Street, Suite 1321, New York, New York 10107, 2005, 352 pages, $26.95 (hardcover); 2006, 352 pages, $14.95 (softcover).

Special operations forces have come in for attention since they spearheaded the successful invasion of Afghanistan in 2001. Although secrecy stunts any analysis of current operations, historical investigation remains unfettered, as reflected in Will Irwin's contribution of an account of the Jedburgh operations in France in 1944. The Jedburghs—teams of uniformed specialists dropped into enemy territory to coordinate with resistance groups in advance of major operations—offer ready parallels to Afghanistan, making them an attractive case study. Readers have their choice of new books by Colin Beavan and Roger Ford as well as Irwin's, the latter offering a straightforward history of the Jedburgh teams from their founding, through recruitment and training, to their deployment in France, starting in June 1944.

The book addresses the establishment of Special Forces Headquarters in the United Kingdom as well as the Special Projects Operations Center (SPOC) for the Mediterranean theater but devotes most of its attention to the combat service of these Franco-Anglo-American teams. Irwin focuses on teams dropped in advance of the landings for Operations Overlord and Dragoon, omitting Dutch operations, and concludes with the termination of Jedburgh activity in Northwest Europe on 13 October as well as the closing of the SPOC on 12 September. Although the author makes extensive use of documents from the Office of Strategic Services and personal testimony, many readers will be disappointed because he raises important questions but then leaves them unanswered. Irwin mentions activities of the British Special Air Service in Normandy and special-operations executive agents but fails to explain their relation to and coordination with the Jedburghs. The insertion of Jedburghs occurred exclusively by air, but the text notes only that 4,000 sorties dropped 6,000 tons of supplies between July and September. One must look elsewhere for the contribution of units like the famous "Carpetbaggers" of the 801st Bomb Group. In general, the book relates the story of the Jedburghs without reference to any of the major or minor controversies in the professional or scholarly fields.

The overwhelming focus of *The Jedburghs* on the US part in the enterprise and its reliance on American sources further limit the book's utility. Irwin's evaluation of the program provides a good example. Based mainly on the praise heaped on special forces by Allied leaders, the author supposes that the Jedburghs did indeed disrupt enemy movements to the beachheads. However, US sources cannot judge the impact on German operations. Only German sources can do this, and they were not consulted. Furthermore, the author's breezy style, full of asides on the length of the Loire and the soils best suited to the Muscadet grape, will annoy some readers. For deeper insights, historians and military professionals will have to look to the US Army's official history or collections of published documents. Although the prize for writing the definitive study of the Jedburghs remains unclaimed, this will not prevent interested general readers from enjoying this book, which offers a lively introduction to one of the most important ventures of special forces during the Second World War.

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Guderian: Panzer Pioneer or Myth Maker? by Russell A. Hart. Potomac Books (http://www.potomacbooksinc.com), 22841 Quicksilver Drive, Dulles, Virginia 20166, 2006, 160 pages, $17.56 (hardcover), $11.16 (softcover).

In all probability, there will never be another war like Heinz Guderian's. The clash of truly massive armies equipped with thousands of tanks does not seem likely in the immediate future. Thus, if air warriors are seeking practical lessons at the micro-level, such as the nitty-gritty of how to run a future tactical campaign or support it from the air, they should look elsewhere for guidance. However, if they want some general notions about the pitfalls of developing oneself for military leadership, then Russell Hart's little book on Guderian might be a worthy read. Hart claims that though Guderian had his strong points as a leader, his fatal flaws included too much commitment to self-promotion and a failure to grasp the principles of grand strategy and strategy.

A professor working in Hawaii, Hart got his undergraduate education in the United Kingdom and did his master's and PhD degrees at Ohio State. Highly specialized in World War II, especially in the German dimension of it, he has also written a book about the campaign in Normandy and has coauthored several others having to do with armored warfare on the Eastern Front during World War II.

According to Hart, the memory of Guderian is much inflated because he is one of those who survived World War II, living until 1954. An exceedingly industrious man, articulate in both English and French, he had translated some of the British writings on war into German. Reputed to be one of the originators of the German armies' armored doctrine before the war, Guderian was instrumental in the campaign in France in 1940 as well as in the opening campaigns of the strike on the Soviet Union in 1941.

Guderian had written a book about armored warfare in the 1930s and then wrote one after the war that some, including Hart, considered self-serving. Hart also thinks that Guderian was unduly contemptuous of the German navy and air force and was at fault in not being able to get along with his bosses. Some others at higher levels of the Army thought he was too cozy with the Nazis—especially with Hitler. He did accept a huge gift of money from Hitler in 1942 and then took possession of a large estate in Poland, evicting the family that had owned it. According to Hart, both Guderian's memoirs and his earlier biographies improve the truth in his favor too much; actually, he was not as deserving as he appeared.

Guderian knew of the plot to kill Hitler in July 1944; although he did not directly participate, he was cagey enough to remain far enough on the outskirts to hide his culpability and escape execution. Hitler may have had his suspicions, but he did use Guderian after that. According to Hart and others, though, Guderian at least was able to openly disagree with Hitler and live to tell about it.

One can hardly deem this short book a comprehensive biography, but it does yield some thought on the dangers of careerism and the pitfalls of "improving the truth" to get ahead or escape blame. It is well written, and the prose is engaging. Readers may want to add it to their reading list to balance out some other books that are too worshipful of the fighting abilities of the German armies during the 1940s.

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A Continent for the Taking: The Tragedy and Hope of Africa by Howard W. French. Alfred A. Knopf (http://www.randomhouse.com/knopf/home.pperl), 1745 Broadway, New York, New York 10019, 2004, 304 pages, $25.00 (hardcover); 2005, 280 pages, $15.00 (trade paperback).

A Continent for the Taking gives insight into the instability and corruption that have held Africa back from proper governance and sustainable development since the era of independence. The author, Howard W. French, argues not only that instability is the result of poor African leaders but also that despite the United States' intermittent involvement on the continent, it has never had a sound Africa policy. French contends that although Washington isn't culpable for most of Africa's problems, "it would be dishonest to pretend there is no link between what has perhaps been the least accountable and least democratically run compartment of America's foreign policy—African affairs—and the undemocratic fortunes of the continent" (p. 107). Catchphrases such as "Trade, Not Aid" and "African Solutions for African Problems" were used during the 1990s to mollify critics—both domestic and foreign—of America's strategy (or lack thereof). The author sets out to show how these glossy slogans were a thin veil for the missteps of administrations that did not truly understand or care about Africa.

Having spent several years of his young-adult life in Africa and then more years (1994–98) as the *New York Times* bureau chief, French is able to give a nu-

anced analysis of the role that indigenous politics, military forces, and foreign involvement play in the stability of west and central Africa. Early in the book, the author points out that trying to lump all of Africa together is to oversimplify; he therefore discusses only a portion of the continent. The title of the book is misleading for two reasons. First, the author's in-depth analysis covers only Nigeria, Liberia, Mali, and the Congo. Second, although he may be able to reflect on his time spent in Africa in a positive light, his book's "hope [for] Africa" is only implicit (if it exists at all). French compensates for any lack of breadth in the book through insight into and access to pivotal events in the area covered.

He argues that the United States' steadfast support for corrupt and brutal dictators during the Cold War, motivated by our own strategic interests, had nothing to do with African democracy. In fact it worked to the countries' detriment: harsh rulers maintained the appearance of stability for a short while but simultaneously sowed the seeds for future destabilization. American ties to leaders such as Yoweri Museveni (Uganda), Mobutu Sese Seko (Congo, at that time Zaire), Idi Amin Dada (Uganda), Hastings Kamuzu Banda (Malawi), Samuel Kanyon Doe (Liberia), and Jonas Savimbi (Angola) left a disastrous legacy of mutinous civil wars and corruption.

French had incredible access to leaders at all levels of African government, and his interviews with them gave him a well-informed, strategic view of the situation. This strategic perspective is seamlessly interwoven with the author's anecdotes of interactions with the citizens he encounters during his interviews and perilous travels throughout the continent. French tracks groups of Hutu refugees as they flee Rwandan Tutsi revenge killings. When he first interviews a Zairian Hutu doctor at a refugee camp in Tingi-Tingi, he never imagines that in tracking the remaining refugees' escape through dense rain forests of Zaire, he would encounter the same man five months and 1,000 miles later in Luokolela. The devastation and killings that French witnessed provide a poignant background for his narrative. This same perspective, however, colors the author's criticism of the Clinton administration's failure to intervene in the slayings. For all of his intimately detailed discussions of the subversive politics in the Congo, Liberia, Nigeria, and Mali, French rarely ventures deeply into Washington politics and downplays the American public's reticence to intervene in Africa after the debacle in Somalia.

As the United States seeks to coordinate its varying economic, political, and humanitarian policy objectives in Africa through the stand-up of Africa Command, this book serves as a warning of the perils attendant upon working in an unstable and corrupt continent with shifting alliances and shaky infrastructure (whose very existence is questionable). Although more anecdotal than classically researched, *A Continent for the Taking* gives great perspective regarding the inextricable linkages that exist among the government, military, foreign and domestic economic interests, and international aid agencies in any given country in Africa. French's writing style ensures an entertaining and easy read of this excellent book, which African experts will wish to add to their collection and which someone starting to delve into the continent's conflicts could utilize as a fantastic primer.

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Striking First: Preemptive and Preventive Attack in U.S. National Security Policy by Karl P. Mueller et al. RAND (http://www.rand.org/publications/index.html), 1700 Main Street, P.O. Box 2138, Santa Monica, California 90407-2138, 2006, 344 pages, $30.00 (softcover). Available free from http://www.rand.org/pubs/monographs/2006/RAND_MG403.pdf.

In light of violent nonstate actors, proliferation, changing defense policy, and—for the US military—an attendant shift to a more "expeditionary" outlook, preemption seems an increasingly relevant doctrine. Events leading to the invasion of Iraq as well as the emergent Iranian and North Korean nuclear crises seem to underscore this fact. The authors of *Striking First*, a broad yet well-founded analysis, show that although an early offense can be a surprisingly flexible policy option, it is never a simple one.

A solidly written work, *Striking First* aligns the purposefully vague outlines of national security policy with the language and analysis of international-relations scholars and historians, laying the ground rules for further analysis. From the beginning, the authors immerse the reader in discussions on making decisions with incomplete information, consensus building between nation-states, and cost-benefit analyses as they pertain to preemptive attack. At times, these analyses take on typical characteristics of RAND research: reliance on graphs, figures, and frameworks with a somewhat detached attitude. However, the authors quickly and consistently introduce current examples in order to place concepts in context.

They also clearly define the advantages and disadvantages of attacking before the enemy does, illustrating the multitude of different factors that affect how and when proactive conflicts could occur. This skillfully segues into a rather involved discussion of how international law interfaces with the actions of nation-states on the battlefield, the difference between legality and legitimacy, and the gap between de jure and de facto limitations on the use of force. During this discourse on limits to preemptive conflict, the authors place the analysis in a framework of consequences and outcomes for present and future planning/action.

The analysis in *Striking First* is solid and stands on its own, but the work does not come ex nihilo; isolated from real-world conditions, it has little meaning. The dissection of preemption in international conflict is shot through with a hard-edged realism appropriate to a political-science text. The appendices—occupying more pages than the main body of the work—examine historical cases of preemptive and preventive attack by the United States and other countries in a wide variety of situations throughout the entire spectrum of conflict. The authors use conflicts, ranging from those between large nation-states (war) to military operations other than war against smaller nonstate actors, as sources for dialogue. Specific policy prescriptions and courses of action lend credence and impact to the discussion by suggesting how to reach occasionally unclear policy goals with several concrete steps.

A concise, vital, and clear look at the complex intersection of policy and war fighting, *Striking First* shows the factors influencing preemptive and preventive attack, potential outcomes, and the way ahead. It is of particular interest and importance to anyone with a role in the national security of the United States and could not be more germane to military operations and strategic planning for the present and near future.

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Victory in War: Foundations of Modern Military Policy by William C. Martel. Cambridge University Press (http://us.cambridge.org), 32 Avenue of the Americas, New York, New York 10013-2473, 2006, 432 pages, $35.00 (hardcover).

Fighting and winning the long war against global terrorism are critical priorities of the United States Air Force. We share a stake in this fight with every security-focused agency in the nation and those of our allies. Since this war began, arguably on 11 September 2001, strategies and plans have been written and rewritten at all levels. Through these iterations, however, no one has defined victory. Few need reminding of the significant expenditure of national prestige, treasure, and blood. Given the nature and cost of the long war, why do we have no clear concept of what it means to win?

Victory in War: Foundations of Modern Military Policy by William C. Martel, associate professor of international security studies at the Fletcher School of Tufts University, presents an engaging and thoughtful analysis of the concepts and questions encompassing a topic artfully captured in the book's title. Before turning the first page, one sees on the cover a highly recognizable picture that imaginatively frames Martel's premise. The image of a large banner prominently displayed on the USS *Abraham Lincoln* in May 2003 behind President Bush reads "Mission Accomplished." Since that day, over 4,000 Americans have been killed, and almost 30,000 have been wounded in Iraq alone.

The premise of *Victory in War* is straightforward. No modern theory of victory exists, yet it should. The author poses pertinent questions and displays keen analytical rigor as he rapidly moves through a review of ancient and modern military strategists and theorists to arrive at chapter 4—the heart of the book. Here Martel develops "four concepts—level of victory, change in status quo, mobilization for war, and post conflict obligations—which jointly provide the foundation for a pretheory of victory" (p. 94). Readers should not be confused since the author successfully explains the definition and rationale for using the social-science term *pretheory*.

Examining 12 American wars through the lens of his theory, Martel first considers the American theory of victory by using case studies of major wars from 1776 through 1975. His analysis leaves one with a greater understanding of victory in the American psyche. Next, he studies six cases encompassing American armed conflicts from the end of the Cold War to the present, determining the extent to which the pretheory presented in chapter 4 develops a proper framework for understanding the concept of victory. Closely tied to the analysis of these six cases is an outstanding discussion of the role of military power and victory. This treatment includes an evaluation of the advantages and disadvantages of air, land, and maritime forces in producing victory.

Clearly the author fulfills three key tasks: he provides a proper "framework for understanding vic-

tory, advances our knowledge of the meaning of victory, and provides a foundation for criticism" (p. 308). Other aspects of the text are exceptionally noteworthy. The two chapters on strategists and theorists offer an excellent, albeit abbreviated, primer on these grand military thinkers. The case studies, particularly those of the last 20 years stand alone as exceptional accounts of American military involvement in those conflicts. Additionally, the book is a classic example of how to conduct a study with analytical rigor and integrity. Without exception, it presents the advantages and disadvantages of all key and controversial arguments and positions. Professor Martel, a former RAND analyst, has produced a superb work that will influence how current and future generations of military and political leaders understand the nature of war and what it means to achieve victory.

Because of the lessons, historical perspective, and inherent knowledge to be gained from *Victory in War*, I highly recommend that every military officer in the Department of Defense read it. Martel's study is the timeliest and one of the most important books written on strategy for the profession of arms in the recent past.

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The 360 Degree Leader: Developing Your Influence from Anywhere in the Organization by John C. Maxwell. Thomas Nelson (http://www.thomasnelson.com), P.O. Box 141000, Nashville, Tennessee 37214, 2006, 336 pages, $24.99 (hardcover).

Much leadership training, including the Air Force's, historically has focused on leading one's subordinates—not one's peers and certainly not one's superiors. Yet almost all leaders lead in "the middle" as often as they do at "the top." For this very reason, it is just as important to learn how to lead effectively across (with your colleagues) and up (with your leader) as it is to lead down (with your followers). Despite this importance, however, today's myriad material on leadership development offers little, if any, guidance to assist one in excelling in the two former leadership situations. John Maxwell's *360 Degree Leader* fills this void by offering insight into these very situations, which leaders at all levels must master to achieve success.

In describing the critical role of leaders in the middle, Maxwell states that they "have a better perspective. They see how any given issue impacts them, but they are also able to look up and down. 360-Degree leaders make the most of this perspective to lead not only up and down, but across" (p. 186). By the same token, he points out that leaders can misuse such a position just as much as they can optimize it. In fact, he declares, "To do nothing in the middle is to create more weight for the top leader to move" (p. 7). Ultimately, the success that leaders achieve in the middle depends upon the degree to which they affect the influence associated with that position: "Good leaders will gain in influence beyond their stated position. Bad leaders will shrink their influence down so that it is actually less than what originally came with the position" (p. 11). Throughout the book, he focuses on how a leader can increase that influence by leading up, across, and down.

Most leaders would likely agree that leading up poses the greatest challenge since they like to lead but don't like to be led. However, only limited leadership literature and training is available to navigate this difficult environment. On the other hand, Maxwell offers very beneficial guidance in helping leaders excel in leading up. As he does so, he is quick to assert that one should not confuse leading up with "kissing up" for the purpose of getting ahead. Rather, he contends that leaders should focus on who they want to be—not on where they want to be. The former benefits one's organization while the latter benefits oneself. Maxwell states that when one combines this selfless mentality with a willingness to go the extra mile and build trust—or "relational chemistry"—with a leader, that person can provide optimum support and value to his or her leader and organization.

Regarding another very complex area of leadership—leading across with one's peers—Maxwell opines that succeeding as a peer-to-peer leader requires "giving your colleagues reasons to respect and follow you" (p. 159). Such respect comes when leaders show their peers that they care more for them than the job those peers can do for the leaders or the organization. Maxwell explains this process by noting that "great leaders don't use people so that they can win. They lead people so that they all can win together" (p. 167). Such a leadership approach promotes trust. As peers begin to trust a peer leader, they give that person permission to lead them.

The stereotypical aspect of leadership is leading down with one's followers. Although some leaders may be inclined to dismiss this section for this very reason, Maxwell offers valuable insights into this leadership environment as well by focusing on the

people one leads: "Leaders who tend only to business often end up losing the people and the business. But leaders who tend to the people usually build up the people—and the business" (p. 218). He emphasizes that the best way of doing this involves seeing and leading people as they can be—not as they are. To enable one's followers to fulfill their potential, Maxwell emphasizes the obligation of leaders to mentor and develop their people, quoting Jack Welch, former chief executive officer of General Electric: "Before you are a leader, success is all about growing yourself. When you become a leader, success is all about growing others" (p. 156).

In addition to addressing points applicable to leading up, across, and down, *360 Degree Leader* offers further valuable leadership insights, three of which are especially applicable to the current resource-constrained environment. Regarding the first insight—servant leadership—Maxwell's belief that leaders should serve the needs of their followers instead of expecting their followers to serve their needs parallels the Air Force's second core value of "service before self." The second insight—a leader's willingness to shift from what has always been done to what should be done—lies at the heart of the Six Sigma and Lean process-improvement concepts inherent in the Air Force's new initiative known as Air Force Smart Operations 21. Jim Collins describes the third insight—the need for a leader to place as much importance on "stop-doing" lists as "to-do" lists—as a crucial element among the "great" companies he identifies in his book *Good to Great: Why Some Companies Make the Leap—and Others Don't* (HarperBusiness, 2001). One cannot overstate the criticality of each of these insights today, when each Air Force member is asked to do more.

Based on the above leadership principles, Maxwell's *360 Degree Leader* offers valuable insights that will assist Air Force leaders at all levels to lead up, across, and down. The Air War College's Department of Leadership and Ethics has incorporated a small extract from this book into its curriculum, but including *360 Degree Leader* at each level of the Air Force's professional military education would benefit the service's leaders of all ranks, both enlisted and officer. Such inclusion would befit the emphasis that Maxwell and the Air Force place on developing leaders.

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Roaring Thunder: A Novel of the Jet Age by Walter J. Boyne. Forge Books, Tom Doherty Associates (http://www.tor-forge.com), 175 Fifth Avenue, New York, New York 10010, 2006, 304 pages, $24.95 (hardcover).

Many people believe that the age of jet aviation began in the final days of World War II when the German Luftwaffe produced a few new jet-fighter aircraft to patrol the skies over central Europe in a final, desperate effort to hold off the massive bomber raids of the Allies. What might have changed the course of the war proved too little and too late, however. Actually, the race to be first in designing, testing, and flying jets began several years before the war and involved British designers as well. *Roaring Thunder*, written by noted aviation authority Walter J. Boyne, captures the dramatic story of the beginning of the jet age of aviation—and then some. Boyne makes an imaginative choice by using the novel form to lay out an accurate tale of actual events and achievements presented against a background of diverse personalities, both real and fictional.

Very qualified to discuss this subject, the author has written about aviation since the early 1960s when he served as a pilot in the US Air Force. After retiring as a colonel with more than 5,000 flying hours, he later became director of the Smithsonian Institution's National Air and Space Museum. Working since the mid-1980s as an aviation consultant and novelist, the prolific Boyne has published five novels, 33 works of nonfiction, and over 500 articles. He has entrenched himself in the exclusive company of authors who have made both the fiction and nonfiction bestseller lists of the *New York Times*.

Roaring Thunder is the initial entry in a fictional trilogy that encompasses the complete history of the air and space industry. This first segment covers a three-decade period from the contested beginnings of jet aviation in the pre–World War II years, through the US military's involvement flying combat and support jet aircraft in the Vietnam War, to the beginnings of the commercial jet-transport industry. The saga highlights the true pioneers responsible for the birth of the jet age, including such notables as Sir Frank Whittle, British inventor of the jet engine; Hans von Ohain, designer of jet engines for the Luftwaffe during the war and then a successful engineer who worked for the US government afterwards; Kelly Johnson, a famed American aeronautical engineer and designer; and fellow American Tex Johnston, an early test pilot of great fame.

Boyne blends the real-life adventures of these giants with the story of the fictional family of Vance

Shannon and his two sons, who serve as good counterparts to the actual movers and shakers of the jet age. Their tale spans the formative years of the air and space industry, covering the successes, failures, trade-offs, and complexities inherent in this competitive arena.

Aviation enthusiasts will find that *Roaring Thunder* makes for worthwhile reading. The story does become a bit stretched at times as it integrates the Shannon family into the plot—impressive when involved in aviation matters but much less so with their personal lives. More important, the rest of the epic tale—the factual aspects—comes through loud and clear as it enlightens and entertains.

Dr. Frank P. Donnini, Lieutenant Colonel, USAF, Retired
Newport News, Virginia

Making Twenty-First-Century Strategy: An Introduction to Modern National Security Processes and Problems by Dennis M. Drew and Donald M. Snow. Air University Press (http://www.maxwell.af.mil/au/aul/aupress), 131 West Shumacher Avenue, Maxwell AFB, Alabama 36112-5962, 2006, 290 pages, $24.00 (softcover). Available free from http://www.maxwell.af.mil/au/aul/aupress/Books/Drew_Snow/DrewSnow.pdf.

"The strategy process is, in its basic form, a straightforward and sequential decision-making exercise. The simplicity of the process masks the difficulty of the decisions and the dilemmas that bedevil strategists" (p. 191). In their latest publication, retired Air Force colonel Dennis M. Drew and Prof. Donald M. Snow, recently retired from the University of Alabama, have scored another remarkable success in their long and distinguished collaboration. They have met and surpassed the challenge to divine the difficult decisions and dilemmas facing the people who develop and implement military strategy in the United States.

The authors begin their book with a crisp summary of military strategy and war between the eighteenth and late twentieth centuries to show that although the practices of warfare have varied across time, the nature of war does not change. Thus the fundamental functions performed by strategists—developing, deploying, and orchestrating the use of military forces—have remained intact. This observation serves as a unifying thread throughout the book.

Drew and Snow turn quickly to an overview of the strategy process to examine five decision steps that influence and shape the formulation and execution of strategy: (1) determining national objectives, (2) formulating grand strategy, (3) developing military strategy (a level of inquiry some authors refer to as "national strategy"), (4) developing operational strategy, and (5) formulating battlefield strategy (tactics). They conclude the chapter by offering a model of the strategy process, acknowledging that many factors influencing military strategy often reside outside the control of even the most skilled strategists of war. (They discuss these factors in detail in chap. 10.)

Among the many superb sections in the book, Drew and Snow examine at length the inextricable connection between the political and military dimensions of war by devoting no fewer than seven of 14 chapters to this subject. Most books on military strategy readily recognize this interconnectedness, but the authors examine every aspect of this relationship in a sharp, crisp fashion, leaving no stone unturned. They explore the American actors and institutions that define and shape strategy and the instruments of national power used to secure national objectives in a setting influenced by the unique characteristics of the American grand-strategy process.

Their discussion of the military dimension of strategy is notable for its inclusiveness. Drew and Snow provide a rich examination of the elements of military strategy (force employment, force development, force deployment, and force coordination), combined and joint campaign warfare, and the influence of service views on operational strategy. (They discuss service worldviews and doctrine at greater length in chap. 11.) They also include in this discussion an interesting section about basic approaches for designing operational strategy that should prove useful as a starting point for students of campaign planning. Their chapter on strategies for asymmetrical warfare is particularly insightful in light of the many challenges facing the United States due to insurgencies: new internal wars, a subset of insurgencies developed by Snow in an earlier book (*UnCivil Wars: International Security and the New Internal Conflicts* [Lynne Rienner Publishers, 1996]); fourth-generation warfare; and terrorism. Although the end of the Cold War dramatically reduced the threat of a nuclear holocaust, the authors have nevertheless included a chapter on the continuing relevance of nuclear strategy in the twenty-first century. That section addresses nearly every major concept of nuclear strategy, but it may be too basic for readers who have an intermediate or higher knowledge of military affairs.

The book concludes with three chapters which examine dilemmas that pose intriguing and at times vexing questions for contemporary strategists. For whom and what do we prepare? How do we deal with problems caused by the current operations tempo and an all-volunteer force? How do civilian decision makers and military leaders deal with an omnipresent news media that can either rally support for military operations or turn public opinion against them? Why has the United States had a historic lack of success with asymmetrical warfare? How can we better wage this form of warfare? What desired outcomes do we seek from involvement in asymmetrical warfare? What interests merit US military engagement abroad?

Drew and Snow have succeeded in examining a complex and difficult subject in a comprehensive book that should be read by officer candidates and officers attending both basic and intermediate developmental education. *Making Twenty-First-Century Strategy* is well written, logical, and timely. The numerous historical examples cited by the authors to illustrate concepts and ideas are readily accessible and relevant. In this reviewer's judgment, only one area does not receive adequate examination: cyber warfare. Although Drew and Snow make note of it in several passages, they do not explore the subject in depth. Given the emerging importance of cyberspace in twenty-first-century warfare, it warrants study along with the ground, maritime, air, and space arenas of war.

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A War of Their Own: Bombers over the Southwest Pacific by Capt Matthew K. Rodman, USAF. Air University Press (http://www.maxwell.af.mil/au/aul/aupress), 131 West Shumacher Avenue, Maxwell AFB, Alabama 36112-5962, 2005, 184 pages, $14.00 (softcover). Available free from http://www.maxwell.af.mil/au/aul/aupress/Books/Rodman/rodman.pdf.

Matthew Rodman, now a major, has written a concise historical study of an inspiring leader's ability to motivate a team to tackle seemingly insurmountable challenges and prevail. This well-documented book focuses on Fifth Air Force under the leadership of Gen George Kenney from December 1941 through September 1945.

According to a Japanese proverb, "Vision without action is a dream; action without vision is a nightmare." Although Major Rodman focuses primarily on attack aviation, the important, thought-provoking takeaway for twenty-first-century Airmen is creativity. Because General Kenney had a vision for victory, he could inspire his command to create unconventional approaches for action that would ultimately lead to victory. When Kenney assumed command of the sparse aviation resources in the Southwest Pacific, he became Gen Douglas MacArthur's *joint force air component commander* before the term came into vogue.

The Southwest Pacific differed substantially from the European theater. The great distances and lack of industrial strategic targets dictated a different approach to countering Japanese forces. Because the Allies' "Europe first" policy meant that General Kenney's forces generally got the "leftovers" of available war materials, they had to adapt equipment and tactics in order to be effective.

Undeterred by these constraints, Kenney inspired creativity and baffled the experts. One of his most trusted officers, Paul "Pappy" Gunn, had already served a full career, had retired from the US Navy, and was running a civilian airline in the Philippines when World War II broke out. The Army "drafted" him, and, because of his current location, Fifth Air Force "inherited" him. Just the type of creative person whom General Kenney could genuinely inspire, Gunn had a special knack for mechanics and flying; his "chemistry" with Kenney allowed them to try new and bizarre concepts for the battle at hand: "Gunn . . . essentially redesigned the medium bombers and light attack aircraft in the [Southwest Pacific Area], giving them the forward firepower that transformed these planes into strafing machines" (p. 41). The modifications were made in-theater at field-maintenance facilities. Gunn's work led to such creations as a B-25 with 10 forward-firing .50-caliber machine guns. Major Rodman cites a humorous incident from the book *General Kenney Reports* in which Kenney had the opportunity to silence the experts in Gen Henry "Hap" Arnold's presence:

> One day, during a lull in the conferences, . . . Arnold told me to come to his office. On arrival there I found a battery of engineering experts from Wright Field who explained to me that the idea was impracticable. They tried to prove to me that the balance would be all messed up, the airplane would be too heavy, would not fly properly, and so on.
>
> I listened for a while and then mentioned that twelve B-25s fixed up in this manner had played a rather important part in the Battle of the Bismarck Sea and that

> I was remodeling sixty more B-25s right now at Townsville. Arnold glared at his engineering experts and practically ran them out of the office (p. 83).

The author skillfully reminds the reader that unconventionally modified aircraft, low-altitude and skip bombing, and parafrag bombs and improvised "daisy cutters" are all part of the incredible history of Fifth Air Force. But twenty-first-century Airmen should recognize the creativity that General Kenney inspired in his team. Under his leadership, the adaptation of machines and tactics led to victory. Now engaged in the global war on terror, our Airmen must lead with creativity to fulfill the mission. We must have the vision and willingness to take action to find, fix, and destroy our enemies. Just as Fifth Air Force had to modify equipment and tactics to meet the enemy between 1941 and 1945, so must today's Air Force adapt to meet an ever-changing, elusive enemy in the war on terror.

With *A War of Their Own*, Maj Matthew Rodman has penned a great "quick read" for anyone interested in attack aviation in the Southwest Pacific theater of World War II. For a more in-depth study of General Kenney's brilliant staff inventor, I suggest reading *Pappy Gunn* by Nathaniel Gunn (Authorhouse, 2004).

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A Pilgrim in Unholy Places: Stories of a Mustang Colonel by Thomas D. Phillips. Heritage Books (http://www.heritagebooks.com), 65 East Main Street, Westminster, Maryland 21157-5026, 2004, 256 pages, $19.95 (softcover).

In *A Pilgrim in Unholy Places*, Thomas Phillips drives home the point that life is full of unexpected events, especially in the military. He even manages to make readers feel comfortable with the unexpected. This interesting read welcomes civilians and veterans alike into its pages, presenting military life from the perspective of both commissioned and noncommissioned officers.

Here, the term *mustang* denotes not a car, horse, or World War II plane but an officer who began his career as an enlisted recruit and moved up through the ranks. In this autobiography, Phillips discusses the various aspects of leadership in the clear, distinct fashion that only years of experience could provide. His stories offer a very personal look at the human side of the Air Force.

Divided into two parts, the book intersperses humorous tales of the stereotypical, grizzled, old-time sergeant among its chapters. In the first half, Phillips chronologically recounts episodes of his memorable career, including time spent at basic training and Squadron Officer School as well as his tenure as commander of the Air Force's 1141st Special Activities Squadron in Stuttgart, Germany. The second part deals more with the ideas and important lessons he acquired in the service. Although the turn of events that led to Phillips's transition from enlisted man to officer and the particular jobs he held is interesting, the lessons he learned and their accompanying anecdotes are the most moving.

The author doesn't hesitate to address such hot-button issues as (1) the Vietnam War, which he examines objectively, carefully peeling back layers that I had not considered before; (2) the Air Force's "don't ask, don't tell" policy and a commander's role when an Airman discloses a homosexual orientation; (3) sexual harassment and its horrendous impact on individuals and units; (4) the best way for a commander to get to know his or her subordinates and immediately create a healthy working environment; (5) the beneficial impact of women in the military and his concerns about the treatment of female prisoners of war; (6) the issues and intricacies involved in relieving a commander; and (7) the importance of family support and the unique challenges faced by children of military members.

Of obvious importance to Phillips is the military's sense of "oneness" and how "in the Air Force, its essence is captured in the phrase, 'The Air Force takes care of its own' " (p. 111). He recognizes that the good units in which he served over the years "had an 'all for one and one for all' outlook: a Band of Brothers (and now, Sisters) who cared for and supported one another, exalted in the highs, anguished in the lows, and worked together towards a shared objective" (p. 226). A unit's sense of pride and camaraderie always directly affects its productivity—an idea that civilian leaders and military commanders alike would do well to remember.

The book's most memorable passage deals with how we could apply the lessons of Vietnam, especially Phillips's experience with "casualty notification." Concerning the heart-wrenching experience of having to inform parents that their son had died in Vietnam, he comments that "[he] came to wish that every decision maker in a position to commit a nation's sons and daughters to war ought to *first* be required to make a casualty notification visit" (p. 149).

A Pilgrim in Unholy Places is very informative, entertaining, and useful, especially to anyone considering a leadership role in either the military or civilian worlds. Using both enlisted and officer perspectives as well as effective anecdotes, Phillips shares crucial ideas on the challenges of leadership. I strongly recommend this book.

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Blood Stripes: The Grunt's View of the War in Iraq by David J. Danelo. Stackpole Books (http://www.stackpolebooks.com), 5067 Ritter Road, Mechanicsburg, Pennsylvania 17055, 2006, 384 pages, $29.95 (hardcover).

In a dark, staccato writing style that chronicles the exploits of real-life marines, *Blood Stripes* offers a proud yet sobering tale of the war in Iraq—particularly the battle of Fallujah. About a year after combat operations seemed successful and after the American people and their military cheered the pronouncement of "mission accomplished," a hardy group of marines found themselves in the streets of the Iraqi city of Fallujah, locked in mortal combat. Largely seen through the eyes of Marine noncommissioned officers (NCO)—and to a lesser extent, their families, officers, and Iraqis—the story transports readers into the bloody events that marked Iraq in 2004 and still capture today's headlines. These NCOs' orders embody all one needs to know, either in battle or foreign policy: do no harm, be no better friend, and be no worse enemy. Against this backdrop, we see the dynamic faces of peacekeeping operations and American diplomacy.

In the Middle East, "be no worse enemy" seems unavoidable, and through the vehicles of plot and prose, author David Danelo highlights the contrasting roles of diplomacy and destruction alongside the battlefield contradictions of order and disorder. Adding to the fog, the story line flashes among characters, scenes, and situations, enhancing the drama. Even though the stories become clearer and at times overlap, readers are left disjointed, working to keep every fact in order and every person straight. The cutaways and flashbacks permit us to develop affection for these dynamic figures, adding to the suspense and allowing us to share, as much as we can, in the uneasy tension of patrol and the mania of battle.

Although the culture and tactics are predominantly Marine, *Blood Stripes* is a great read for any warrior leader—whether airman, soldier, sailor, or marine—at the tip of the spear or in support of the mission. Influenced by Steven Pressfield's *Gates of Fire: An Epic Novel of the Battle of Thermopylae* (Doubleday, 1998), Danelo's story seduces the reader by manly deeds and what he refers to as the Spartan way. As recounted in *Blood Stripes*, *Gates of Fire* has become a must-read for all Marine NCOs, indoctrinating them into the belief that battlefield experience combined with the Spartan way represents the only conduit to the highest good. The living sacrifice of these marines is not only instructive but also inspirational.

Fittingly, the book focuses on missions rather than politics and people rather than prognostication. Yet through the eyes of those closest to the struggle, we see the true difficulty of bringing peace to this region and receive a glimpse of the price we must be willing to pay to achieve it. Maybe the answer lies in Danelo's observation that "we will stay patient one hour longer, one day longer, one week longer than the enemy expects us to" (p. 65).

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The First Heroes: The Extraordinary Story of the Doolittle Raid—America's First World War II Victory by Craig Nelson. Penguin Group (http://us.penguingroup.com), 375 Hudson Street, New York, New York 10014, 2003, 448 pages, $16.00 (softcover).

The First Heroes relates the epic journey of the Doolittle Raiders, offering a thorough and encompassing account of a daring mission to attack the Japanese homeland. Including testimonies from American crew members, Japanese soldiers, and civilians affected by this raid, this book presents the entire picture, unlike many other accounts. Chronologically outlining American and Japanese history since the end of World War I, author Craig Nelson plots the course of both countries until their forces finally meet at Pearl Harbor on 7 December 1941. Discussing the planning, coordinating, and controlling of Lt Col James H. Doolittle's top-secret mission with painstaking detail, he provides biographical information about each pilot, navigator, bombardier, copilot, and gunner in this task force—including an extensive biography of Doolittle himself. In the process, Nelson succeeds in giving readers a sense of personal attachment to

these men; he also addresses the current attitudes and emotions of the American public, military, and government, as well as the circumstances and environment in which these men lived and fought.

The first half of the book covers historical events, training, and the mission itself, precisely and vividly describing the odds overcome by the raiders in their effort to boost American morale and deliver a blow against the Japanese Empire. Indeed, the crew of the USS *Hornet*, the aircraft carrier that would deliver the B-25s off the Japanese coast, gave the pilots no more than an even chance at getting airborne, let alone successfully bombing Japan. The second part follows the crews' escape into China and, for some, their final days as prisoners of war in Japanese camps. Even more dramatic and spectacular than the raid itself, the China episode reveals the struggle to survive Japanese air attacks, disease, infection, and gruesome injuries suffered from crash-landing or parachuting from their B-25 Mitchells. Concluding when every member of the Doolittle mission returns home, dead or alive, *The First Heroes* covers this amazing operation from start to finish.

Today, we remember these men as great American heroes, but time has dulled some of their luster. The author's retelling of this great American victory, executed with enthusiasm, exhilaration, and excitement, does much to correct that situation. Timeless stories and lessons of heroism and valor are important for every leader to understand and appreciate. For that reason, I highly recommend *The First Heroes.*

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America Won the Vietnam War! How the Left Snatched Defeat from the Jaws of Victory by Robert R. Owens, PhD. Xulon Press (http://www.xulonpress.com), 2180 West State Road 434, Suite 2140, Longwood, Florida 32779, 2004, 408 pages, $21.99 (softcover).

Dr. Robert Owens has turned his frustration with liberals' interpretation of America's defeat in Vietnam into a book on how *America Won the Vietnam War!* A pastor and historian, the author has published a number of other books, primarily on religious subjects. Unfortunately, this effort falls well short of making a convincing argument.

The study begins by presenting historical background about how the United States became involved in Vietnam by stepping in after the defeat of the French in order to maintain credibility with allies around the world. America was motivated by the domino theory, which held that the fall of Vietnam would lead to one communist victory after another throughout the world. Dr. Owens adequately highlights how communist success in China and the Korean conflict stoked the United States' belief that it had to defend itself against an aggressive East. As Pres. Lyndon Johnson argued, retreating from Vietnam would just mean that the United States would have to fight somewhere else.

In order to convince the reader of the truth of his thesis, Dr. Owens defines victory as prevailing on the field of battle and achieving goals set for the military by the political leadership. The United States sought to contain communism by bringing about a stable, independent South Vietnam capable of holding off the aggressive North. The author completely ignores this fact, preferring to point out that the United States completed Vietnamization and that North Vietnam signed the Paris Peace Accords. Nevertheless, these actions did not contain communism, and South Vietnam fell. Owens concedes that "since the conquest of South Vietnam marked the goal of North Vietnam, from its viewpoint it did 'Win' the war. . . . The goal of the United States . . . was instead to stop the invasion of South Vietnam" (p. 220).

The author seems to forget that the war was fought between two countries. For America, this included not only the military but also the executive branch, legislature, media, and the public. Dr. Owens does an excellent job of highlighting how an antiwar Congress swept into power in 1974 because of Vietnam and Watergate, cutting support to South Vietnam by passing the Case-Church Amendment, which forbade US military intervention in the South. This allowed North Vietnam to move forward with its invasion and defeat the South. The author attempts to discount this fact by asserting that North Vietnam never defeated the American military—but the North sought only to prolong the fight until Americans lost their will to continue. Ultimately, Vietnamization and the peace accords served as tools to allow the United States to extricate itself from Vietnam. Dr. Owens's argument fails to show how this fulfilled the American objective of containing communism by establishing a stable, independent South Vietnam. Given the failure of this objective, one cannot reasonably state that America won the Vietnam War.

The reader encounters other problems as well. An online publisher, Xulon Press leaves the editing to the author, which in this case has resulted in a

poorly organized book that contains grammatical errors, missing words, and unnecessary repetition. Owens also spends too much time criticizing the left and not enough time evaluating the policies of the administrations involved to determine whether or not they could have succeeded. He also fails to compare and contrast the political decisions made in Vietnam with those made today in the fight against global terror. In terms of the book's reference value, Dr. Owens does cite many policy documents from the Vietnam era, but these are readily available elsewhere—especially from the Internet.

I do not recommend *America Won the Vietnam War!* The author presents no new evidence and eventually contradicts his own theory. Although he may have demonstrated "how the left snatched defeat from the jaws of victory," he certainly doesn't show how America won the war. There is nothing earth-shattering here.

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Saturn V: The Complete Manufacturing and Test Records plus Supplemental Material by Alan Lawrie and Robert Godwin. Apogee Books, Collectors Guide Publishing (http://www.apogeebooks.com), 1440 Graham's Lane, Unit no. 2, Burlington, Ontario, L7S 1W3, Canada, 2005, 308 pages, $27.95 (softcover).

Air and space engineer Alan Lawrie has compiled a very interesting work. In *Saturn V*, he and publisher Robert Godwin offer information on the development and manufacturing of the propulsion system that enabled Americans to reach the moon in the 1960s and 1970s. The Saturn V, the most powerful rocket ever built, had capabilities both awesome and awful to witness. Representing the culmination of earlier rocket development and test programs, it stood 363 feet tall. The first stage generated 7.5 million pounds of thrust from five massive engines developed for the system. This engine, known as the F-1, represented some of the most significant engineering accomplishments of the Apollo program, requiring the development of new alloys and different construction techniques to withstand the extreme heat and shock of firing. The second stage presented enormous challenges to the National Aeronautics and Space Administration (NASA) engineers, very nearly causing the United States to miss its lunar-landing goal. Consisting of five engines burning liquid oxygen and liquid hydrogen, this stage could deliver 1 million pounds of thrust. It was always behind schedule, requiring constant attention and additional funding to ensure completion. By comparison, both the first and third stages of the Saturn V development program moved forward relatively smoothly.

Representing a triumph of systems management, the Saturn V program required that NASA juggle prime contracts with Boeing for the S-IC, first stage; North American Aviation, S-II, second stage; Douglas Aircraft, S-IVB, third stage; Rocketdyne Division of North American Aviation, J-2 and F-1 engines; and IBM, Saturn instruments. These prime contractors, with more than 250 subcontractors, provided millions of parts for use in the Saturn launch vehicle, all meeting exacting specifications for performance and reliability. The total cost expended on development was massive, amounting to $9.3 billion.

Saturn V is an important story, deserving serious attention from historians. An official history, Roger E. Bilstein's *Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicles* (Washington, DC: NASA, 1980; reprinted in 1996 by NASA and in 2003 by University Press of Florida), which offers an exceptionally capable narrative history, is the appropriate place to start any serious study of the Saturn V moon rocket. Lawrie's volume is a compilation of technical data, much of it reprinted from elsewhere and some of it offering an important set of details about the program. The first item reprinted, the "Saturn V News Reference" of August 1967, intended for the media and others seeking detailed information about the program, remains a valuable source 40 years after publication. It has also been available for downloading from the NASA Marshall Space Flight Center on the World Wide Web for many years at http://history.msfc.nasa.gov/saturn_apollo/saturnv_press_kit.html. Lawrie also reprints the "Saturn V Payload Planners Guide," a document from November 1965 intended as a source of detailed knowledge needed by any organization that might launch a payload on a Saturn V. (At the time, NASA anticipated that the Saturn would become the launcher of choice for all manner of spacecraft.) Because of this document's rarity, it is a welcome addition to the volume.

The most useful part of the book is Lawrie's compilation of manufacturing and test records concerning each of the stages built for the Saturn V, as well as for each of the engines constructed for the moon program. Lawrie's ferreting out obscure data from a variety of sources to construct this discussion represents a decidedly useful contribution to knowledge about the program. Finally, as is the

case with many Apogee publications, Robert Godwin has found and offered on DVD a selection of engine tests, assembly sequences, and manufacturing film to round out the work.

Saturn V: The Complete Manufacturing and Test Records plus Supplemental Material is a useful compilation of information about the rocket that carried astronauts to the moon. It is not, per se, concerned with the moon landings or any other aspect of the program. Even the discussion of the propulsion system ends with delivery of each stage to the Kennedy Space Center, where it was assembled for launch. This book's greatest value lies in providing technical details about the Saturn V's systems, engines, tests, and manufacturing. It is very much a work aimed at a technical audience that seeks considerable detail about the rocket. As such, it will serve as a useful addition to the literature of the Apollo program.

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America the Vulnerable: How Our Government Is Failing to Protect Us from Terrorism by Stephen Flynn. Harper Perennial (http://www.harperperennial.com), 10 East 53d Street, New York, New York 10022, 2005, 272 pages, $13.95 (softcover).

"America remains dangerously unprepared to prevent and respond to a catastrophic terrorist attack on US soil" (p. ix). So argues Stephen Flynn in a well-researched book that, while often scathing in its criticism, remains free of partisan axe-grinding. Flynn offers a wealth of creative, practical recommendations to better protect our people, ports, food and water, factories, and transportation networks.

He brings strong operational, academic, and policy-making credentials to the subject. In addition to a 20-year career in the US Coast Guard, he taught at that service's academy, served on the staffs of the White House Military Office and National Security Council, and was a special adviser to the 2001 Hart-Rudman Commission on National Security. He has provided congressional testimony 17 times since 11 September 2001 and is currently a Senior National Security Fellow at the Council of Foreign Relations. Flynn holds a PhD in international politics from the Fletcher School of Law and Diplomacy at Tufts University. His policy proposals reflect this broad experience in government as well as extensive interaction with the private sector.

Raging pragmatism may best describe his approach—the "rage" being directed mainly at bureaucratic inertia. Aware of budget realities and the ineffectiveness of solutions issued from above, he uses a keen eye for incentives that cross the public-private divide to keep his ideas within the achievable realm.

For example, he suggests that investments made to better deal with a biological attack on our food supply would also pay dividends in our ability to manage natural pandemics like severe acute respiratory syndrome (SARS), West Nile virus, foot-and-mouth disease, or mad-cow disease. Similarly, leveraging existing technologies to improve the inspection and tracking of cargo containers could benefit both security and the corporate bottom line. Published before Hurricane Katrina, the book also explains how improvements to terrorism response, such as closer interagency cooperation, could save lives in a natural disaster. On these and a host of other concrete proposals, Flynn masters the details.

His thinking on the larger issues seems equally sound. He advocates a call to service to mobilize Americans' innate resourcefulness and civic-mindedness. A better informed, engaged public, he argues, will willingly make reasonable sacrifices and hold its elected leaders more accountable for inaction. With much originality, Flynn also proposes a Federal Security Reserve System, organized on a regional basis and comprised of private and public-sector participants. This idea, developed in depth in the book, at least deserves consideration as a way to better attune federal agencies with local needs.

Regarding public concerns about infringements on civil liberties (due to surveillance or profiling, for example), Flynn makes the valid point that deliberate measures, debated and established in advance, will be both more effective and better protect those liberties than policies hastily put into effect in the emotionally charged aftermath of an attack.

This book tackles many big questions, but readers seeking a comprehensive treatment of US antiterrorism policy on a global scale should look elsewhere. This is not about hearts and minds or foreign policy—the text stays focused on active prevention and response at home. Flynn does briefly acknowledge a role for preemptive, offensive actions but remains generally pessimistic of their cost and efficacy on any grand scale. He emphasizes that one day's expenditure in Iraq approximates what the federal government spends in one year on homeland security.

Although *America the Vulnerable* is not specifically relevant to the Airman, any citizen wishing to be better informed on these issues need not look elsewhere. For the homeland-security professional, the book should be mandatory reading.

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Anticipating Surprise: Analysis for Strategic Warning by Cynthia M. Grabo. University Press of America (http://www.univpress.com), Rowman and Littlefield Publishing Group, 4501 Forbes Boulevard, Suite 200, Lanham, Maryland 20706, 2004, 184 pages, $30.00 (softcover).

Originally written as a textbook for Cold War intelligence analysts, the declassified book *Anticipating Surprise: Analysis for Strategic Warning* speaks clearly to our current security environment. As author Cynthia Grabo points out, "The analytic problems of warning, and the nature of errors, are really little changed" (p. ix). Individuals who must collect, interpret, and use intelligence to prepare for conventional conflicts as well as stop acts of terrorism can look to this book for help in developing a framework. Grabo wrote *Anticipating Surprise* because of her perception of "several failures by the Intelligence community to produce clear warnings for policymakers of impending hostile actions" (p. vii). As an analyst during the Cold War, she was present for many of the surprises that occurred.

The book begins by defining warning intelligence, discussing its role, and exploring the important question of whether the analyst should address an adversary's intentions or capabilities. The author then moves to the methods used by warning analysts. In several respects, this exposition is one of the most important in the book. Reading about how warning analysts perform their jobs, we cannot help wondering if they are developing new tools and indicators for the collection, organization, and assessment of intelligence on terrorist organizations. Electronic eavesdropping performed by the National Security Agency and the monitoring program run by the Department of the Treasury have attracted much attention. One must ask whether these programs are adequate to the task of providing indicators of terrorist aims and actions. To paraphrase the story of the drunk looking for his keys under the lamppost, are we performing these surveillance activities because they are the best things to track or because they are the only things we can track?

The next three chapters deal with the intricacies of political and military factors that provide indications of potential hostilities; they also examine these factors to provide "the totality of evidence." Specific topics include weighting various factors, assessing the meaning of evidence, and reconstructing an adversary's decision-making process. The discussion of military and political indicators is particularly revealing. The reader gains an excellent sense of the actions we can and should monitor when looking at intelligence. More to the point, the book raises the question of what indicators now in development will offer insight into the future aims and actions of nonstate actors such as al-Qaeda and its franchise organizations. We developed technologies such as satellite imagery and electronic interception of communications to monitor armed forces of the Warsaw Pact. What technologies do we need now to monitor people who use commercial banking systems to provide funding, telephone and Internet systems to communicate, and household goods available at Wal-Mart to hijack airplanes and manufacture explosives?

Obvious differences may exist between indicators that a state may exhibit before it takes some action and those noted in a nonstate actor or organization such as al-Qaeda or Hezbollah. However, the strength of *Anticipating Surprise* lies in the clear exposition of the author's framework for assessing intelligence, permitting the reader to imagine and develop new means of assessing current situations, regardless of the topic under analysis. The final chapters address such areas as surprise and timing, the problem of deception, judgments and policy, and improvements to warning assessments.

Implicit in the book are such questions as how intelligence will be interpreted and who determines whether conflicting analyses should be forwarded to a decision maker. For example, the Cold War conflict between order-of-battle analysts and warning analysts has clear implications for today. Different methods of analysis and interpretation, together with the consequent differences in prioritizing potential actions, still constitute a serious weakness in providing advance warning of conflict or attack. The treatment of indications and warnings received by the FBI and CIA prior to 11 September 2001 closely parallels the treatment of warnings received by analysts prior to the invasion of Czechoslovakia and the final North Vietnamese offensive against South Vietnam in 1975.

Furthermore, in Grabo's book we see only the conflict between the warning and order-of-battle

analysts. What if the number of participants in the process increases through the addition of local and state law-enforcement agencies that must balance the need for acting on possible terrorist threats against potential economic and political consequences, as well as the loss of credibility if the warning proves incorrect? We saw a clear instance of this dilemma when the Department of Homeland Security raised alert levels due to ambiguous indicators of a terrorist attack against the Brooklyn tunnels.

Another implicit argument concerns the analysts themselves. By concentrating on military and political analysis, the author identifies the types of expertise that analysts should possess. When analysts examine a terrorist organization such as al-Qaeda, what kind of knowledge, background, and skill do they need?

Finally, no one who has followed debate on the recent and ongoing reorganization of the intelligence community can fail to see the implications of this book's guidelines and examples. Rather than reorganization, our intelligence community requires new means of gathering information on potential threats and dangerous operations. Reorganization will not provide better warning if analysts cannot agree on the meaning of the indicators or if policy makers do not heed the intelligence.

The author has not updated this study to deal specifically with the detection of terrorist actions, nor does she deal with how political leaders should handle the political aims of extremists. However, Grabo does provide a framework for developing intelligence systems that can function better than the current process and organization. Furthermore, the guidelines found in this outstanding work apply to fields other than national security. Political scientists, economists, businessmen, trend watchers, and competitive intelligence analysts all can benefit from reading *Anticipating Surprise*.

Paul Younes
Newport, Rhode Island

Death at a Distance: The Loss of the Legendary USS *Harder* by Michael Sturma. Naval Institute Press (http://www.usni.org/press/press.html), 291 Wood Road, Annapolis, Maryland 21402-5034, 2006, 252 pages, $29.95 (hardcover).

On 24 August 1944, almost a year before the end of hostilities in the Pacific during World War II, the US Navy lost one of its most famous submarines off northern Luzon. The USS *Harder* (SS-257), a *Gato*-class submarine skippered by Cdr Samuel Dealey, was credited with sinking 16 enemy ships, among them five destroyers, a feat that earned him the nickname "the destroyer killer." As the war neared its end, the entire submarine community felt the loss of the *Harder*.

In *Death at a Distance*, Dr. Michael Sturma, chair of the history program at Murdoch University in western Australia, covers the submarine's life, its officers and crew, and their exploits during the war. Beginning with the arrival of American submarines in Fremantle, Australia, during the critical days of the war, the author looks into the social and cultural impact of the submariners' arrival and interaction with the Australian people. He also examines the *Harder*'s construction and commissioning in December 1942, noting such aspects as boat design and weapons load—specifically, the torpedoes.

Sturma then turns his attention to the life and character of Commander Dealey, discussing his life from birth to acceptance at the Naval Academy, duty on surface ships, submarine service, and relationships with fellow officers, crew members, and superiors. Portrayed as a resourceful, steadfast, and aggressive skipper, Dealey became known for his short-range attacks against Japanese destroyers.

Next, the author's blow-by-blow account of the *Harder*'s six war patrols puts readers inside the submarine as it tracks Japanese convoy escorts, dodges depth charges, and evades enemy aircraft. One particularly notable episode involves the submarine's role in the rescue of a downed pilot in enemy-held territory, where two members of the crew exchange fire with Japanese forces. Another describes the insertion of Australian commandos on the island of Borneo to establish a coast-watch station and gather intelligence and their retrieval some five months later. Readers also learn that the *Harder*'s and other submarines' tracking of Vice Adm Jisaburo Ozawa's carrier divisions at the Japanese anchorage of Tawi-Tawi, Southern Philippines, played a pivotal role in the Battle of the Philippine Sea. The final four chapters further detail the *Harder*'s actions, including its teaming up with the USS *Haddo* (SS-255) and USS *Hake* (SS-256) to sink several Japanese ships and escorts. Later, a clash with a Japanese minesweeper and destroyer off Dasol Bay would seal the fate of the legendary submarine, which was eventually declared missing and presumed lost.

Well written and researched, *Death at a Distance* effectively chronicles the *Harder*'s action-packed history. Especially noteworthy are the vignettes about other submarines and their skippers as well as the achievements of Allied officers. My only criticism concerns the fact that the book lacks photos

of Japanese warships engaged by the submarine and maps showing the route of its six war patrols. Nevertheless, I thoroughly enjoyed and learned much from the book. This definitive history of the USS *Harder* would make a valuable addition to the library of anyone interested in naval history and the feats of US submarines during World War II.

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Policy Analysis in National Security Affairs: New Methods for a New Era by Richard L. Kugler. National Defense University Press (http://www.ndu.edu/inss/press/nduphp.html), 300 Fifth Avenue, Building 62, Fort Lesley J. McNair, Washington, DC 20319-5066, 2006, 658 pages, $55.00 (softcover).

Drawing on his more than 30 years of working in the national security field, Department of Defense, RAND, and academia, Richard L. Kugler has written a comprehensive book that fills the gap in professional literature regarding the conduct of post–Cold War policy analysis in national security affairs. "The business of forging national security policy has two main components: first, determining how the U.S. should use its powers abroad to pursue its goals, and second, determining how the U.S. should spend money in order to build its military, posture, defense strategy, and related assets" (p. 5). His overarching thesis calls for the use of new methods in adapting to the increasingly complex global landscape—methodologies that help the US government make the wisest and most effective national security decisions possible: "The days are gone in which foreign policy, defense strategy, military forces, technologies, and budgets could be treated as separate domains" (p. 5). As such, *Policy Analysis in National Security Affairs* is a forward-leaning, multidisciplinary book.

Within three categories of methods for national security analysis—strategic evaluation, systems analysis, and operations research—the book's chapters cover the application of analytical methods to both foreign policy and defense strategy, as well as to specifics of plans, programs, and budgets. A practitioner's book, written primarily for members of the younger post–Cold War generation, *Policy Analysis in National Security Affairs* seeks to help them choose the most appropriate analytical methods that lead to the best possible decisions and outcomes in supporting US interests.

Chapter by chapter, Kugler effectively simplifies diverse, contemporary decisions faced by the US government in formulating policy—some enduring, some unique. These include evaluating strategies for multiple goals, forging national security strategy, promoting economic progress and democracy, developing methods of systems analysis, sizing conventional forces, modernizing affordably, devising methods of operations research, designing nuclear forces and missile defense, and carrying out expeditionary wars, to name just a few. The author then presents appropriate methodologies for assessing these decisions in an understandable manner, even those that normally have exceedingly complex formulas and decision matrices.

Although Kugler has written *Policy Analysis in National Security Affairs* for a professional audience, he has taken pains to make the contents, presentation, and style accessible to graduate and undergraduate students as well as anybody who wants to learn about policy analysis. A particularly appealing feature of this massive work is that one can read the chapters independently of each other yet still draw meaningful lessons and real-world application tools from it. I recommend placing this insightful, go-to reference source on the shelves of military college faculty, their respective college libraries, middle-/senior-grade military officers, and comparable employees/staffs/agencies of the federal government working within (or linked to) the beltway in Washington, DC.

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Testing Aircraft, Exploring Space: An Illustrated History of NACA and NASA by Roger E. Bilstein. Johns Hopkins University Press (http://www.press.jhu.edu), 2715 North Charles Street, Baltimore, Maryland 21218, 2003, 256 pages, $42.95 (hardcover).

As many of my baby-boomer peers have done, I have tended to equate the National Aeronautics and Space Administration (NASA) with the development of spaceflight and exploration of the universe. My memory of the space race in the late 1950s, the 1960s race for the moon, and the space shuttle of the 1980s overshadows all the organization's other aeronautical activities during those years. This book did a good job of helping me un-

derstand the organization's journey from the early National Advisory Committee for Aeronautics (NACA) organization to the current NASA agency.

Testing Aircraft, Exploring Space is an excellent starting point for someone with a general knowledge of aviation history and a desire to understand the origins and history of NASA in its current form. This, the fourth edition of the book, is the first to be published by the Johns Hopkins University Press. The third edition appeared in 1989 under the title *Orders of Magnitude: A History of NACA and NASA*. Roger Bilstein authored both of those editions. The latest one includes more recent events through 2002 (before the *Columbia* shuttle accident) and carries a new title.

As the early aviation pioneers of the 1910s experimented with flying machines, legislation for NACA slipped through Congress in 1915 on a rider to the Naval Appropriation Bill, which provided $5,000 annually for an unpaid panel of 12 experts to pursue "the scientific study of the problems of flight, with a view to their practical solution," according to Public Law 271, passed in March 1915. This simple start grew into the United States' premier aeronautical research organization, leading the development of nearly all advances used by US aircraft during the two world wars and into the 1950s.

When President Eisenhower established NASA in July 1958, that new organization absorbed NACA. NASA's charter called for working for both civilian aeronautics and space research, but, as described in the book, that gradually changed. The space race with the Soviet Union started shifting that focus (and associated NASA funding) from basic aeronautics to spaceflight. Bilstein's chronology of activities in the 1960s makes it very obvious why aeronautical research was taking a backseat as NASA focused on reaching the moon. Funding for NASA's aeronautics programs today still struggles against the early public focus and the organization's internal priorities for its space operations.

Despite the new title, this is not a pictorial history of NACA/NASA. It includes very few pictures, all of which are of a rather poor black-and-white quality. I could excuse this for the early aviation pictures, but the lack of color in those depicting events of later years disappointed me, especially the ones related to space exploration. I also found an error in the caption of one photo in the chapter titled "Dress Rehearsals, 1965–1969," which wrongly identifies the HiMat research aircraft from the early 1980s as the XB-70.

Testing Aircraft, Exploring Space is a good, short book on the organization's history but is far from being an illustrated history of NACA and NASA. It follows the chronology of how this government agency assisted in the development of the US air and space industry. Perhaps a future edition will offer better photographs and illustrations—in color. More pictures and illustrations would help justify the $42.95 price suggested by the publisher. Until that time, if you don't mind missing the last 15 years of NASA history, I recommend the online version of the third edition. Downloadable from NASA's Web site, it contains the same history of the early NACA and NASA years.

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Força Aerea 50 Anos edited by Coronel António Tello Pacheco, POAF, retired; Maj Adelino Cardoso; and Nuno Esteves da Silva. Comissão Histórico-Cultural da Força Aerea Portuguesa, Portugal, 2002, 278 pages. (Not sold commercially.)

Portuguese military aviation has a distinguished history, and this lavishly illustrated official publication of the Força Aerea Portuguesa (Portuguese Air Force [POAF]) celebrates that service's heritage on the occasion of its 50th anniversary in 2002. The text is in Portuguese but includes an English translation, thus broadening potential readership and helping those who wish to study both languages. Presumably, the Portuguese text is primary, but some English translations appear to paraphrase the original text.

Like any official history or commemorative book, this one tends to emphasize the positive and is clearly designed to inspire national pride. Statements such as "the skies were now open the world over to Portuguese aviators, just like the oceans had been to Portuguese sailors 400 years earlier" (p. 17) illustrate how aviation feats of the 1920s and 1930s recalled proud historical achievements. On the other hand, the text says some surprising things. After noting aviation's effectiveness in the First World War, the book remarks, "It was thus only natural that in 1924 a reorganization of Military Aeronautics established it as a branch of the Army" (pp. 13 and 16). One might expect a book commemorating an air force's 50th anniversary to say that independence should have come even earlier. To its credit, the work frankly refers to painful events such as unsuccessful colonial wars in Angola and Mozambique.

Although the book covers a half century of history, only the first 65 pages deal explicitly with the

past. The remaining 200 address current or recent events and are divided into sections about mission areas ranging from air defense to airlift and support of flight operations. A couple of these sections are especially interesting. The technical and military-cooperation section describes how students from former Portuguese colonies now attend training in Portugal and how the POAF conducts training and other support activities in Angola and Mozambique as well as Sao Tome and Principe. These encouraging developments suggest that Portugal and its former colonies are putting past conflicts behind them and cooperating for a better future. The maritime-patrol section highlights Portugal's substantial responsibility for providing security, search and rescue, and other vital services in the vast, heavily traveled ocean area extending from continental Portugal to the Madeira Islands and Azores.

Overall, *Força Aerea 50 Anos* is an attractive introduction to the POAF. Readers will treasure the beautiful aircraft photos and find the bibliography useful for locating additional information, but they will gain few insights into POAF operations or doctrine. They will also enjoy the interesting vignettes about aviation pioneers, paratroopers, and other topics. The only thing one might wish for is simple maps of Angola, Mozambique, and POAF base locations in Portugal.

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Airpower Leadership on the Front Line: Lt Gen George H. Brett and Combat Command by Lt Col Douglas A. Cox. Air University Press (http://www.maxwell.af.mil/au/aul/aupress), 131 West Shumacher Avenue, Maxwell AFB, Alabama 36112-5962, 2006, 114 pages, $10.50 (softcover). Available free from http://www.maxwell.af.mil/au/aul/aupress/books/cox/cox.pdf.

With his short biography of Lt Gen George H. Brett, Lt Col Douglas Cox has added to our understanding of a little-known Army Air Forces leader during World War II. Originally written as the author's thesis at the School of Advanced Air and Space Studies at Maxwell AFB, the work offers a brief but thorough examination of Brett's career. Though not a complete biography of the general, it provides background for a perusal and appreciation of his leadership abilities in the Southwest Pacific during the war—the real focus of the work. In order to determine the success or failure of Brett's leadership, Cox applies a cluster of eight leadership characteristics that historian Forrest Pogue uses to assess Gen George C. Marshall in his monumental biography of the former US Army chief of staff. The author also attempts to understand Brett's knowledge of doctrine and whether or not he "was able to adapt his doctrinal preconceptions rapidly enough to maximize his combat effectiveness" (p. 3).

Cox effectively uses primary-source material throughout the book, especially in chapters on Brett's early life and military career, arguing that this period laid the "foundation for a study of his brief experience in the crucible of combat in World War II's Pacific theater" (p. 5). The author highlights some of these early formative experiences, including Brett's work with Billy Mitchell and his various assignments, culminating in his appointment as chief of the Air Corps in 1941, second only to Gen Henry "Hap" Arnold. During this prewar period, however, Brett received mixed performance reviews on an assignment to Panama and had difficulty carrying out his assigned orders.

The main part of this study focuses on the general's brief experiences in the Southwest Pacific. Cox has done a superb job of using archival sources to analyze Brett's role as a member of the American, British, Dutch, and Australian Command as well as his stormy and ultimately unsuccessful relationship with Gen Douglas MacArthur and his chief of staff, Gen Richard Sutherland. As Cox points out, Brett had few resources at his command, and he failed to educate MacArthur and Sutherland on the use of airpower as he understood it. A key point in explaining General Brett and his actions appeared in a memorandum that Arnold wrote in December 1941: "He was not given the job to determine ways and means for *not* doing it. The attached is a cable full of 'nots.' I want to find out how to do, not how not to do it" (emphasis in original) (p. 87).

The author concludes his work with a brief chapter dealing with Brett's career in charge of the Caribbean Defense Command until his retirement in 1946 and an examination of him based on Pogue's leadership traits and his combat execution. Of the eight leadership traits, Cox gives Brett a pass on four, which include the ability to learn, sense of duty, acceptance of responsibility, and compassion. The general fails to measure up in terms of self-certainty, simplicity of spirit, character, and loyalty (p. 84). The analysis of these leadership criteria as applied to Brett, along with Cox's examination of the general's ability to use and understand the "doctrinal applications of airpower" (p. 88), is clear and

concise, leading one to believe that Brett's failings were in his personality rather than his ability.

Although Brett may not have been retained in command in the Southwest Pacific, it is true, as Thomas Hughes states in the foreword, that "only the most cynical and uninformed observer would judge his career a failure" (p. v). Thus, *Airpower Leadership on the Front Line* is essential reading for anyone who wants to gain a better appreciation of airpower and the history of the Army Air Forces in World War II. It is also useful to students of modern applications of airpower because, much like Brett, today's commander often finds that "the resources provided will always be less than a conservative military man would array for the task at hand" (p. 92). The Air Force has always asked its leaders to do more with less. Studying how General Brett failed at this will benefit Airmen of today.

If this work has any failing at all, it is that it is too short. One hundred pages are not nearly enough to tell the whole story. One is left with unanswered questions and wishes that the author had undertaken an in-depth look at the relationship among Brett, Marshall, and Arnold. What role did Brett play in the rapid expansion of the Air Corps in 1940 and early 1941, beyond his trip across the Atlantic? What else did he accomplish in the Caribbean? Hopefully the author will have the opportunity to expand on his work in the future and answer such questions. In the meantime, this brief examination of Lt Gen George Brett and Combat Command is well worth reading, not only for its enjoyment but also for the insight it provides into the fragile art of leadership.

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The Development of Jet and Turbine Aero Engines, 4th ed., by Bill Gunston. Haynes North America (http:/www.haynes.com), 861 Lawrence Drive, Newbury Park, California 91320, 2006, 254 pages, $22.95 (softcover).

As the title suggests, *The Development of Jet and Turbine Aero Engines* offers a historical look at turbine and other jet-type engines such as rocket, pulse-jet, and ramjet. The primary focus, however, is on gas turbines, including turbojet, turbofan, turboshaft, and turboprop types. As in author Bill Gunston's similar book on reciprocating engines, *The Development of Piston Aero Engines*, this book is divided into two parts. The first ("How Gas Turbines Work") describes operating principles, function and configuration of major components, and materials used in construction. The second ("The Historical Story") starts with the pioneers (long before Frank Whittle and Hans von Ohain, by the way) and characterizes the development of all jet and turbine engines up to the present with update chapters for each edition.

Though technical, part 1 is not as dense as a textbook. The author's straightforward style should not be intimidating to anybody interested in the subject. In the introduction, Gunston suggests that "if the casual reader does find it heavy going, skip it and read Part II." Those who do so will miss all the fun. Every component—from the compressor to the combustor, turbine, jet pipe, nozzle, and auxiliaries—went through its own evolution of improvement to get to an integrated machine that actually worked. Moving from that point (with really abysmal pressure ratios) to the mechanical masterpieces of today makes for a fascinating trip that no reader wants to miss. I've been in the jet-engine test business for 27 years, so descriptions of early test methods and the iterative process of development are especially interesting to me, but every chapter is full of challenges that the engineers, designers, and craftsmen met and solved, one at a time. Like any other great enterprise, the development of turbine engines is really a story about people making things happen, and the author tells their story well.

Part 2 starts with a look at the earliest attempts at designing and building a power-producing gas-turbine engine. Of course, turbomachinery had been in use long before World War II in the form of steam turbines for ship propulsion and electrical-power generation as well as water turbines in hydroelectric plants. Gas turbines, using waste gas from steel production, drove blast-furnace compressors in the early 1900s. There was much interest in internal-combustion gas turbines and some early attempts at development, but of course the ability to design efficient compressors and turbines, together with the lack of materials able to retain strength at high temperatures, made turbine engines that were suitable for aircraft propulsion impractical. All that began to change in the 1930s when Germany initiated development of gas turbines with full government backing. In contrast, the Allies concentrated on optimizing piston engines and paid only marginal attention to turbines. Poor Whittle had to develop his engine with little funding and support while von Ohain and others had all the finances and engineering support they could ask for. The hardware and concepts that the Germans produced are truly amazing, even compared to today's products. If

they'd had more time and better materials, the war's end might have played out differently.

Since then, the story of jet engines has been one of constant evolution based on development of better materials, improved control systems, and design of more efficient compressors, combustors, and turbines. Gunston follows this theme through reviews of products from all the major manufacturers and countries of origin up to the present day. His more than 50 years in the business, authorship of more than 380 aviation-related books, and status as editor of *Flight* magazine give him much credibility, and the result is a very readable piece that anyone interested in aircraft and/or engineering history will enjoy.

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Airplanes: The Life Story of a Technology by Jeremy R. Kinney. Greenwood Press (http://www.greenwood.com/greenwood_press.aspx) (published in association with the Smithsonian National Air and Space Museum), 88 Post Road West, Westport, Connecticut 06881-5007, 2006, 184 pages, $45.00 (hardcover).

Targeting a wide audience, author Jeremy R. Kinney documents the evolution of aircraft and related technologies from their origins in the early eighteenth century to present-day advancements. He speaks with great authority as curator in the Aeronautics Division of the Smithsonian Institution's National Air and Space Museum. Kinney tells the story by intertwining threads of world economics, politics, and culture with those of aircraft system technologies (aerodynamics, propulsion, structures, and stability/control). The scope includes commercial, military, and general aviation with emphasis on development in the United States. Along the way, the book highlights assorted individuals and their significant contributions to the "technography" of the airplane. It also features a useful timeline, a brief glossary, an extensive bibliography, and a comprehensive index.

Airplanes will appeal to readers of varying levels of interest and subject-matter knowledge: the history buff, budding engineer, experienced pilot, aspiring entrepreneur, and more. It is an outgrowth of lectures and ideas presented by the author while serving as the Centennial of Flight lecturer at the University of Maryland at College Park in 2003. Kinney opens the book by explaining his intent simply to tell a story, the good and the bad, with minimal editorial comment. He also offers an elementary tutorial on airplanes and powered, controlled flight. The material does not require the reader to have an advanced degree; rather, it places various technical concepts in everyday, widely familiar contexts. In fact, those with years of advanced aeronautical education and experience should be forewarned not to overly scrutinize the book's technical explanations.

This brings me to my two lone criticisms. First, the story line omits several significant elements: the Bowling Commission of World War I, specific accomplishments between the world wars (e.g., speed records of Cy Bettis and Jimmy Doolittle as well as endurance records of the crew of the *Question Mark*, which included Ira Eaker and Carl Spaatz), American acquisition of German ground-test facilities and the establishment of Arnold AFB after World War II, and jet-engine patents of René Lorin and Maxime Guillame dating back to the early 1900s. Second, some of the technical descriptions, especially those relating to jet engines, did not completely satisfy me. For example, the author refers to "thrust" from the combustor powering the turbine, as opposed to "expansion" of combustion gases through the turbine powering the compressor (p. 80). He also describes the J58—the SR-71 Blackbird's engine—as a turbojet rather than a combined-cycle turbo-ramjet (p. 97). However, these minor criticisms may simply reflect my own overly critical point of view. In general, I learned something new with each turn of a page and never dwelt on any criticisms.

All that being said, I truly benefited from this book and do not expect it to collect any dust on my bookshelf. Indeed, I began recommending it to my family and friends even as I was finishing it. *Airplanes* is the sort of book that people will read more than once and use as a handy reference for classroom and professional presentations. I highly commend it to every Air Force Airman, as Kinney covers the technological heritage of airpower without plunging deeply into airpower doctrine. He does a superb job of documenting the link between the development of aircraft technology and its application in warfare.

Maj Kurt Rouser, USAF
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Mission Debrief

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Lt Gen Stephen G. Wood (BS, University of Washington; Master of International Relations, New Mexico State University; Master of National Security Policy, National Defense University) is deputy commander, United Nations Command; deputy commander, US Forces Korea; commander, Air Component Command, Republic of Korea and US Combined Forces Command; and commander, Seventh Air Force, Pacific Air Forces, Osan AB, South Korea. General Wood was commissioned in the Air Force in 1974 upon graduation from the Air Force Reserve Officer Training Corps program at the University of Washington–Seattle. He has served in various operational and staff assignments, including duty as an F-4 pilot, AT-38 instructor pilot, F-16 weapons instructor, and squadron operations officer. He has commanded two fighter squadrons, an operations group, a fighter wing, and the Air Warfare Center. Prior to his current assignment, he was deputy chief of staff for strategic plans and programs, Headquarters US Air Force, Washington, DC. He is a command pilot with more than 3,500 flying hours in the F-4, T-33, AT-38, and F-16, including 49 combat missions during Operation Desert Storm. General Wood is a graduate of Squadron Officer School, USAF Fighter Weapons School, Air Command and Staff College, and National War College.

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Air Commodore Tariq Mahmud Ashraf, Pakistan Air Force, Retired (BSc, Peshawar; BSc, Karachi; MSc, Islamabad), is the author of one book on air and space power as well as numerous articles and papers. He served as the assistant chief of Air Staff (Operations) during the 2001–2 military standoff between India and Pakistan. A distinguished graduate of the RAF Advanced Staff Course, he has also served on the faculty of Pakistan National Defence College.

Air Commodore Arjun Subramaniam, Indian Air Force (BA, Jawaharlal Nehru University; MSc, University of Madras), is a member of the air wing faculty at the Defence Services Staff College (DSSC), Wellington, India. An experienced fighter pilot with multirole expertise, he has completed two tours of duty in a Mirage-2000 squadron, commanded a MiG-21 squadron, served with an overseas military advisory team in Zambia, and recently completed his tenure as chief operations officer of a large fighter base. A winner of the Scudder Medal for graduating with distinction in the 49th Staff Course in 1994 at the DSSC, he is also a recipient of a commendation by the chief of Air Staff. A prolific writer and doctoral candidate at the University of Madras, Air Commodore Subramaniam published his first book, *Reflections of an Air Warrior*, in 2007.

Lt Col Michael L. Downs (BS, Texas A&M University; MA, George Washington University; MPA, Troy State University; MA, Naval Command and Staff College) is the speechwriter for the vice-chief of staff of the Air Force. He is a career intelligence officer with a broad background, having held assignments at the unit, air and space operations center, major command, Air Staff, and Office of the Secretary of Defense levels. He has participated in 16 joint and combined operations and exercises in the US Central Command, US European Command, US Pacific Command, and US Southern Command areas of responsibility and has served in an array of capacities, ranging from a joint special operations task force J2 in the Balkans to the chief developer of the joint integrated prioritized target list during Operation Iraqi Freedom. Colonel Downs also served as the director of operations, 13th Intelligence Squadron, Beale AFB, California, where he directed his squadron's daily Global Hawk, Predator, and U-2 exploitation missions in support of Iraqi Freedom, Operation Enduring Freedom, and Joint Task Force Horn of Africa.

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