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The United States Air Force Expeditionary Center

Airpower from the Ground Up

Maj Gen Kip L. Self, USAF
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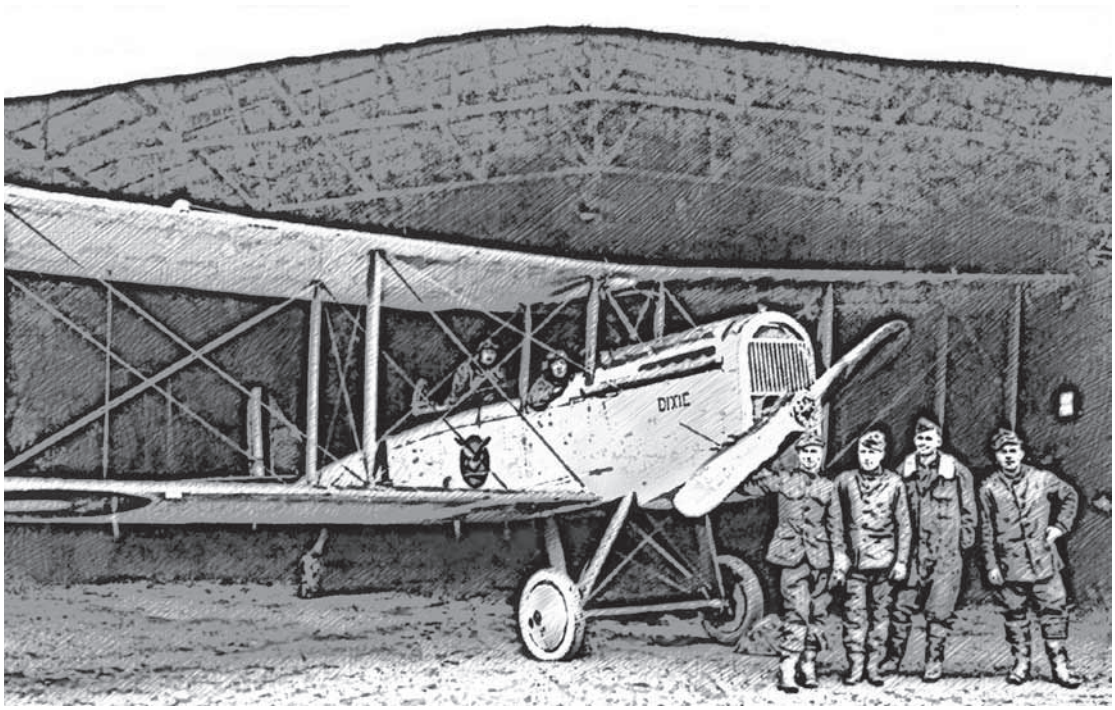
The American Expeditionary Force was created in 1917 as the first unit capable of significant over-the-horizon global power projection of US forces. Ninety years later, the US Air Force Expeditionary Center (USAF EC) received its commission as a training center of excellence for expeditionary operations. Between 1917 and today, everything—yet nothing—has changed in the world of expeditionary operations. That is, although the time



USAF photo

Expeditionary Airmen of the 96th Aero Squadron, American Expeditionary Force, 1918

required to project global power over the horizon has shrunk from months to hours, the enabling engine of that force projection remains the same: military and civilian professionals suitably trained and equipped to support the endeavor. The Air Force's ability to project power in air, space, and cyberspace has advanced significantly, but at the core remains the requirement to build the foundation of that airpower projection from the ground up. On the bookshelf of the Air Force's advanced training capabilities, the

USAF EC serves as the bookend complement to the US Air Force Warfare Center (USAF WC), the former focusing on airpower from the ground and the latter emphasizing airpower from above. Key to both bookends of this bookshelf is the ability to evolve with the speed of change and thus remain relevant to Airmen charged with over-the-horizon global power projection. The USAF EC's relevance lies in providing advanced training for expeditionary Airmen to support the joint fight and to develop the tactics, techniques, and procedures (TTP) that today's expeditionary combat support (ECS) mission needs to project airpower from the flight line to the front line, from the ground up.

Well-documented studies have correlated training with organizational performance. Commercial industry considers training a key part of "employee engagement," and studies show that highly engaged firms with robust employee training programs increase their operating income by upwards of 20 percent over less engaged firms with poor emphasis on employee training.[1] The impact of training on operating income obviously has a direct correlation to earnings per share and, ultimately, shareholder satisfaction. It comes as no surprise to military professionals that training is a valuable tool for improving performance and building equity in an organization and its mission. For most of us, this point is not so much an epiphany as it is a blinding flash of the obvious. However, in the face of cost cutting and reduced operating budgets, it is worth reemphasizing that training (or employee engagement) is a front-end load that we must support in order to generate desired operational outcomes and effects. Just as we update computer hardware and software to improve performance, so must we continually update the "grayware" of our Airmen, keeping them trained, current, and engaged.

Commercial cargo carriers such as FedEx fully understand the importance of keeping their grayware up to date, investing more than $2,500 annually per employee to ensure that maintainers, cargo specialists, and couriers remain on the cutting edge of industry innovation.[2] This significant investment leverages a relatively stable workforce that operates within a rather well-defined delivery grid. Obviously more dynamic, the military workforce moves through the force structure with greater velocity than personnel in commercial industry. For example, FedEx operates from 375 airports worldwide, whereas Air Mobility Command (AMC) operates from 1,162.[3] Notably, over 90 percent of the airports utilized by AMC lie outside the structured en route system. The ability to operate off the established en route grid and cover the last tactical mile of the supply chain in uncertain environments distinguishes AMC from FedEx or other commercial carriers. The combined effect of operating in austere and uncertain environments with a more transient work force is the imperative that motivates relevant and timely training. In a commercial enterprise, failing this imperative results in diminished income. For the military, failure means reduced over-the-horizon maneuver speed, a lack of in-transit visibility, and insufficient combat-support logistics. Success, on the other hand, comes with the capability to provide timely global-reach laydown, which ultimately creates the foundation we need to win battles and save lives. The USAF EC enables success through timely and relevant training. This article offers insight into the design of the USAF EC, discusses how this design contributes to enabling the effects of its two schools, and shows how those effects are integrated across the spectrum of the ECS mission in building airpower from the ground up.

The Design of the US Air Force Expeditionary Center: From the Flight Line to the Front Line

Located at Joint Base McGuire-Dix-Lakehurst, New Jersey, the USAF EC partners with the Air Staff, Air Education and

Training Command (AETC), and the USAF WC to provide a disciplined training process that teaches the right skills at the right time across the expeditionary enterprise. The center offers 82 in-residence courses and 16 Web-based training courses, graduating more than 17,000 students annually.

Two Schools from the Ground Up

The USAF EC brings together a wealth of expertise from dozens of specialties to provide accountable, up-to-date instruction across the spectrum of mobility and expeditionary skills. Because of the wide variety of demands on ECS training and the huge swath of responsibility for which AMC and the Air Force are tasked, instruction runs the gamut from mission qualification to graduate-level academic programs. Composed of a mobility operations school (MOS) and an expeditionary operations school (EOS), the USAF EC meets both the steady-state training requirements for advanced mobility training and the need for rapidly emerging, war-fighter-centric, just-in-time (JIT) expeditionary skills training (fig. 1).

Mobile and Expeditionary

Neither equipped nor organized to provide foundation training (which remains within the scope of AETC), the USAF EC offers advanced training only, largely conducted at one of two Air Force centers of excellence—the USAF WC at Nellis AFB, Nevada, or the USAF EC at Fort Dix. These centers report directly to their operational major command headquarters—Air Combat Command and AMC, respectively—for resourcing of their advanced training, an arrangement that reflects the core competencies of each command.

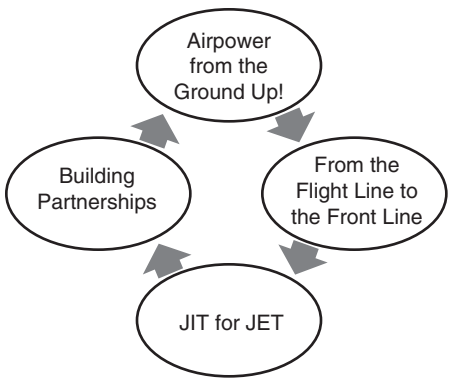


Figure 1. The production circle of expeditionary training: the USAF EC provides JIT for joint expeditionary taskings (JET)

The Multiplying Effect of Advanced Training

By having experts use lessons from today's fight to teach future experts, we produce a multiplying effect on advanced training, bolstering the argument for independent centers of excellence outside the realm of foundational training. The integration of current TTPs, taught by professionals with recent experience, into the training environment results in a timely and highly effective construct for training and education.

In addition to incorporating current and relevant TTPs into JIT training, the USAF EC training model efficiently cross-utilizes core-competency skill sets and common infrastructure. For example, when the center teaches the mission-orientation course for an air base opening, in addition to aerial porters, mobility doctrine specialists, and mobility command and control (C2) professionals, it employs security forces, intelligence analysts, civil engineers, and communications specialists while leveraging access to advanced training ranges. The same Airmen who teach advanced contingency skills also facilitate Eagle Flag, a realistic ECS training event similar in design to the USAF WC's Red Flag exercise.

Enabling Effects of the Mobility Operations School: Flight Line to Forward Operating Base

The MOS is the sole source of C2 training for all air mobility operations in both the

intertheater and intratheater missions. Graduates are trained in the full range of operations from deployment planning, through deployment execution and monitoring, to highly effective automated systems and total asset visibility.

Deployment Planning

The MOS meets the need for enduring mobility training with such offerings as the Aerial Port Operations Course, Mobile Command and Control Leadership Course, and Maintenance Supervision and Production Course, as well as upper-level programs such as the Advanced Logistics Readiness Officer Course and Advanced Study of Air Mobility, a one-year Intermediate Developmental Education program granting a master's degree in logistics to future mobility leaders. Through its array of contingency response (CR) training courses, the MOS also serves as the command, control, and communications (C3) schoolhouse for CR forces. The MOS's advanced training enables CR Airmen to effectively deploy and employ the most modern mobile C3 equipment and systems, providing the closing link in the C3 chain at in-theater aerial ports of debarkation. If the MOS did not train this robust set of CR C3 capabilities, both the C3 and in-transit-visibility systems would be blind at the forward-deployed end of the spectrum. With this vital training, however, the link is closed, extending the fidelity of the distribution process far into the theater.

Deployment Execution and Monitoring

Through lecture, demonstration, performance, and exercises, the MOS shapes the logistician, installation deployment officer, and unit deployment manager to assume their roles in the deployment/redeployment process using the latest C2 systems. Courses for the installation deployment officer and unit deployment manager, as well as the Advanced Logistics Readiness Officer Course, provide significant, in-depth training in deployment planning and execution, preparing these individuals to execute the full spectrum of duties across the deployment-through-redeployment continuum. This training develops critical thinking skills for performing predeployment, execution, reception, and redeployment duties.

Automated Systems and Total Asset Visibility across the Spectrum

The MOS also trains Airmen to master the automated systems that ensure in-transit visibility / total asset visibility (fig. 2). At the tactical level, the USAF EC trains installation deployment officers and unit deployment managers to load and transfer all materiel and personnel data accurately into in-transit-visibility systems. Additionally, the center provides training at the operational level on extracting data from these systems, thus ensuring C2 of logistics over all materiel and the flow of personnel into a theater of operations.

Enabling Effects of the Expeditionary Operations School: The Last Tactical Mile from the Forward Operating Base to the Front Line

The EOS concentrates on field craft and the practical application of ECS, which allows our Airmen to survive and operate in diverse, uncertain environments. Many EOS field courses focus on military operations in urban terrain, convoy operations, and training in countering improvised explosive devices, utilizing fully instrumented ranges. Additionally, several EOS courses prepare Airmen in our security forces to meet the rapidly growing demands for their capabilities. These include such courses as Tactical Security Element, Phoenix Warrior, Military Working Dog, and Phoenix Raven (a highly specialized course for small security forces teams that protect aircraft and aircrews at remote, poorly protected air-

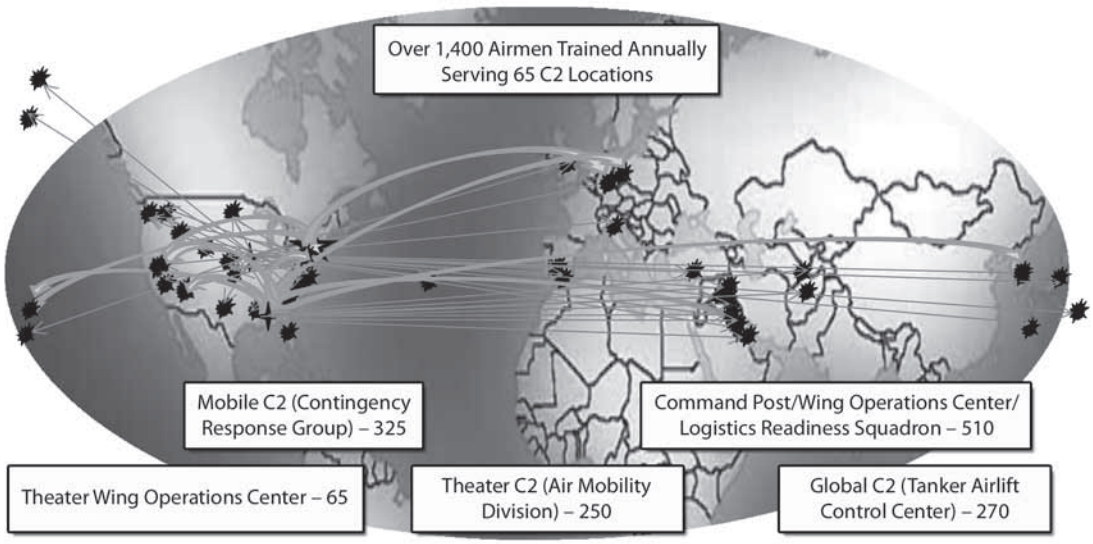


Figure 2. Over 1,400 Mobility Airmen are trained annually at the USAF EC to provide worldwide logistics C2 and total asset visibility for AMC.

fields around the world). The EOS also acts as the exercise-control function for Eagle Flag, an Air Force chief of staff exercise that allows the CR community to practice its base-opening capabilities in a real-time, hands-on scenario. The school supplies not only observer-controllers to monitor and direct the exercise, but also the opposing forces and actors who pose as local nationals. The end effect is a realistic and relevant training environment that replicates the conditions of today's fight.

The Joint Fight and the Joint Enabler

The expeditionary enterprise begins at accession for every Airman. The expansion of basic military training and advanced training in JIT contingency skills ensures that we reach every Airman with the appropriate level of education, creating personnel who are expeditionary in nature and effective by design. JIT predeployment training must be relevant to the contingency and build upon basic skills learned by all Airmen. This advanced training provides the greatest payoff in mission success and individual survivability. The continuum of training guarantees that the expeditionary enterprise has the appropriate level of expertise yet conserves resources to assure maximum effectiveness.

As part of the Air Force's capability in agile combat support, ECS has developed rapidly in the past 15 years. Both the CR and en route communities have evolved with supporting wing-organization constructs (CR wings and air mobility operations wings) that enhance the mobile and fixed en route system, which in turn supports the war fighter's logistics reachback.

Every Airman a Joint Enabler

As the Air Force continues to respond to emerging missions in the combat support arena, it is imperative that Airmen acquire and maintain skills necessary to survive and operate in uncertain and rapidly changing environments. A small, agile center of excellence that teaches the most up-to-date TTPs and adapts quickly to maximize the readiness of our ECS forces is crucial to at-

taining success in today's fight and meeting tomorrow's challenges. Graduates of EOS field courses, such as Combat Airman Skills Training, are trained at a level that allows them to operate in sync with US Army and US Marine Corps units. The skills imparted by the USAF EC's cadre of instructors prepare Airmen to become value-added joint enablers.

The effect produced from establishing an Air Force center of excellence for expeditionary training is nothing less than Airmen standing shoulder to shoulder with joint partners on the front line. Whether deployed to fulfill joint expeditionary taskings, such as advising or building the capacity of partner nations, or to provide combat support to traditional Air Force missions at bases around the world, Airmen deserve the best training and preparation available. Without the USAF EC and its advocacy for the expeditionary Airman, we risk sending personnel forward without the proper training to survive and operate—and we ultimately lose the legitimacy of a true joint partner.

Beyond the Wire

The Air Force already possesses unique expertise in many expeditionary skills that will prove critical to growing US military missions such as irregular warfare (IW) and building partnerships (BP). Planned modifications to CR groups that call for adding a BP mission send a strong signal that the Air Force is ready to leverage a valuable mobility capability to meet current and future missions. The USAF EC's EOS has the capability to integrate IW/BP scenarios into training and exercises—including Eagle Flag, which has traditionally served as a training ground for CR groups to practice their base-opening mission. The Air Force's IW tiger team has already acknowledged that IW and BP missions frequently require types of agile combat support capabilities resident in the CR groups. That same team wants to develop processes for tracking and managing Airmen with IW- and BP-related skills.[4] Many of these Airmen will have received their training at the USAF EC.

Effects of the Joint Tactics Squadron: The Integrator

The Air Force's role in the joint fight has evolved considerably in recent years, and, as a service, we continue to develop new competencies in the ground-combat-support arena, joint expeditionary taskings, and IW/BP. Airmen continue to advocate and maximize the advantages of airpower inherent in these capabilities, as long as those Airmen are the product of a disciplined, accountable training process in a curriculum that continually adjusts its TTPs to remain relevant to today's and tomorrow's fight. As we continue to build airpower from the ground up, we must remain aware of emerging threats, catalog our capabilities, and improve our training in real time.

As part of the journey to build a better expeditionary Airman, the USAF EC is moving toward a disciplined and comprehensive TTP capability for ECS Airmen. With the establishment of a joint tactics squadron (JTS) within the USAF EC's EOS (expected in early 2010), we will have moved the Air Force significantly closer to closing the gap between our highly trained aircrews and our ECS Airmen.

Tactics, Techniques, and Procedures and Lessons Learned: Avoiding Lessons Observed

The 561 JTS at the USAF WC has enjoyed much success in validating tactical lessons learned in the flying community and turning them into codified TTPs. Leveraging the Air Force's weapons officer establishment to provide subject-matter expertise, the 561st has cemented its place as the premier tactics squadron in the service and the single focal point for capturing tactical-air lessons learned. Unlike the highly evolved air tactics practiced by the USAF WC, many ECS training-improvement processes were simply a two-way exchange between quality assurance and training.[5]

Under its charter, the USAF EC is tasked to gather, refine, disseminate, and serve as the repository for expeditionary-skills lessons learned and TTP development.[6] A new USAF EC squadron will fulfill this task for the Air Force's ECS forces. Although the USAF WC has a robust TTP process for aviators, our ECS forces currently do not have a single, central point for capturing tactical lessons learned.

The Blood of Those before Us

Establishing a JTS will link ECS training and standardization as well as provide valid current tactics to our trainers, allowing them to deliver timely, up-to-date instruction and resulting in better, more prepared Airmen for the combatant command. As a focal point for entry of lessons learned into the TTP development process, that squadron will prove crucial to the successful implementation of those lessons. Our goal is documenting enduring TTPs for future warriors and, ultimately, saving lives by never making a deadly mistake twice—literally, we learn from the blood of those who served before us. Knowing the validated and effective Air Force TTPs, as well as those of our enemies, is essential for surviving and operating in the combat environment. This process enables our forces to plan for and against a rapidly evolving threat, adapting current tactics to a changing environment. At the USAF EC, training venues use enemy TTPs to test and prepare counter-TTPs for the crucible of combat. Tactics evolve and mission requirements change rapidly, so training must also evolve to ensure that our Airmen truly "train like they fight," excelling on today's battlefield and in tomorrow's challenging scenarios of hard and soft power.

The Glue That Binds

Until now, the various agile-combat-support functional communities had stovepiped their respective efforts in standardization; furthermore, the integration of new procedures has often been self-contained, lacking cross talk among specialties. Without the single-gatekeeper function that the new JTS will provide, many agile-combat-support communities have experienced limited success in validating their own TTPs and have had virtually no perception of new enemy TTPs observed by friendly forces in the area of responsibility. The ECS JTS will collaborate with the entire training community to ensure the integration of tactical lessons into predeployment training for ECS forces and the use of those lessons during Air Force exercises to further validate their effectiveness in a combat environment. Through benchmarking processes currently employed at the USAF WC, the USAF EC's new JTS will create a circular exchange of information among trainers, validators, and practitioners.

Conclusion

The design of the USAF EC concentrates on building airpower from the ground up by providing agile-combat-support Airmen with the necessary advanced training to enable global power projection and success in the joint fight. Agile mobility is a unique core competency of all Airmen, who are steeped in the knowledge of operating in the third dimension of air and space. The MOS emphasizes mastering the spectrum of global reach from the flight line to the forward operating base, whereas the EOS concerns itself with refining and developing the field craft (TTPs) to take us the last tactical mile to the front line in the mobility continuum. The JTS will synchronize and update the combined effects of the two schools, with a unique and focused objective of melting the titanium cylinders of functional excellence and creating a community of practice that facilitates the exchange of TTPs across the skill sets of agile-combat-support Airmen.

The USAF EC has the ultimate effect of presenting Airmen fully prepared to enable the joint mission at the right time

with the right training. This was the charge from Gen John J. Pershing to Col Billy Mitchell over 90 years ago, when the American Expeditionary Force was created, and it is the charge of the chief of staff of the Air Force to the USAF EC today. Although everything has changed and nothing has changed, the requirement to build airpower from the ground up remains the thread that ties it all together from the flight line to the front line. ✪

Notes

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Gen John Pershing, General Headquarters, Chaumont, France, 1918

Maj Gen Kip L. Self

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The Combined Air Power Transition Force

Building Airpower for Afghanistan

Brig Gen Michael R. Boera, USAF

What does "airpower" mean in the struggle for Afghanistan's future? An objective perspective of what airpower is and what it can deliver is difficult to find in the US armed forces—rare is the informed military leader who approaches the topic without a strong ideological bent. Gen Stanley McChrystal, the top US commander in Afghanistan, recently said that "air power contains the seeds of our own destruction."[1] His accusation was not without merit in his intended context, coming as it did after a missile attack on a residential compound. Because air strikes can kill innocent civilians as well as enemy combatants, the kinetic effects of airpower sometimes aid the efforts of the insurgency that they seek to defeat. The aspects of airpower other than kinetic strike, though, are often the most quickly forgotten in debate.

This other face of airpower carries balloting materials to outlying areas of Afghanistan, granting elections a chance to have broad credibility throughout the country. It affords battlefield mobility to indigenous troops, allowing confrontation with and defeat of insurgents. This kind of airpower provides mobility to Afghan citizens, filling logistical gaps that the budding commercial market struggles to meet. It welcomes young people into the service of their nation, giving them a reason to strive for excellence in working for government organizations that have awakened to new,

promising days after three bleak decades of uninterrupted armed struggle.

In any discussion of "airpower" in Afghanistan, there is reason for caution in painting all of its forms with a single broad brush. Evidence for airpower's effectiveness exists in one of the most exciting and rewarding endeavors in which the US Air Force and its joint-service partners participate today. Most people know that an international coalition is partnering with the nation of Afghanistan. The shared goal calls for strengthening Afghanistan's national institutions while reducing the influence and capabilities of insurgents who want to see that country returned to a state of chaos. Fewer people know about the full range of actions that our Airmen are contributing toward lasting security in Afghanistan. Airpower capabilities rising from their efforts are sowing the seeds of a brighter future there.

The Combined Air Power Transition Force (CAPTF), part of the international community's effort to rebuild Afghanistan's national institutions, features three supporting pillars that focus on governance, security, and socioeconomic development.[2] International agreements have established the United States as the lead nation for instituting reform in Afghanistan's security forces, and the CAPTF is part of the military organization led by the United States and the North Atlantic Treaty Organization (NATO) that works with Afghanistan's military and police leaders to develop sustainable security capabilities.[3] The command's mission is straightforward: work alongside Afghan soldiers and airmen to help build a "strong, capable, and sustainable" Afghan National Army Air Corps (ANAAC) that will meet Afghanistan's security requirements.[4] The ANAAC is an essential part of the Afghan National Army (ANA), which will play a pivotal role in Afghanistan's fight to provide security for its citizens as long as armed insurgency remains a threat.

Three goals motivate and structure this article. First, I want to share the importance of airpower in Afghanistan's future. Second, I wish to outline the activities with which the CAPTF assists the ANAAC throughout Afghanistan. Third, I would like to share some of the important, impending developments in the realm of Afghan airpower. The evidence suggests that airpower is critical to Afghanistan's struggle for a peaceful existence and that our recent progress puts Afghanistan on the verge of an airpower breakthrough, though one quite different from the image that airpower conjures in the minds of many military leaders.

Airpower in Afghanistan

The ongoing struggle in Afghanistan is a counterinsurgency (COIN) fight. In a summary of lessons learned from studying wars against terrorists and insurgents, airpower scholars James Corum and Wray Johnson remind us of some important lessons that must shape our approach in Afghanistan. The first is that a comprehensive strategy—allocating diplomatic, political, military, and economic resources to attain a political goal—must drive the overall effort.[5] The CAPTF is positioned for success in that respect because it touches on every element of a linked grand strategy. Our close mentoring relationships with Afghanistan's government and military leaders give us insight into the political and social challenges here. We channel resources provided by the international community to increase military capability, and we have a hand in ensuring good stewardship of those resources. This resulting increase in military capability bolsters the legitimacy of the Afghan government and at the same time enables it to provide better security for the population. Thus, the building of Afghan airpower capacity that the CAPTF facilitates reaches

across all strategic areas and furthers the political goal at the heart of COIN success.

A second lesson applied by the CAPTF in Afghanistan is that support aviation—airlift and battlefield mobility, for example—is often the most important role that airpower can play in this type of conflict.[6] As discussion of our ongoing activities will show, the CAPTF focuses its present efforts almost entirely on providing exactly those capabilities, via both fixed- and rotary-wing platforms. Just a few moments of looking at the geography of Afghanistan, with population centers isolated from each other by tall mountains and harsh deserts, reveal the wisdom of concentrating on airlift.

Afghanistan's landlocked position in Southwest Asia and its isolated geographic regions make it a "natural" air power.[7] Mountain ranges and desert expanses divide the country, isolating its urban centers, and robust road networks do not exist. The lack of ground infrastructure has been a challenge since efforts to rebuild Afghanistan began. NATO nations have realized that tactical airlift and helicopters are necessary to support the provincial reconstruction teams that do most of the infrastructure rebuilding in Afghanistan.[8] In the CAPTF, we have observed that the capabilities afforded by tactical airlift are vital to the elected leaders of Afghanistan, giving these officials their only opportunity to forge meaningful cooperation and trust in the federal government across the disparate regions of the country. Afghanistan is a natural air power because it cannot function as a modern state without the mobility that airpower alone can provide.

Next, the CAPTF takes to heart the lesson that "aerial campaigns that target insurgents and terrorists located in or very near population centers are generally counterproductive."[9] They are doubly so when the enemy's most effective information-operations tactic involves drawing attention to the national government's reliance on "occupiers and infidels."[10] Even with the United States' ability to conduct so-called surgical strikes, the best-intentioned ground commanders have exhibited an ability to anger civilian populations and give public-relations victories to insurgents. The unfortunate circumstances that unfolded in Kunduz when Taliban insurgents hijacked two petroleum tanker trucks offer a recent reminder of this conundrum.[11] The natural remedy is to provide Afghanistan with an organic airpower capability. The ANAAC's ability to deliver its own Afghan soldiers to the fight will reduce the demand for air strikes conducted by outside air forces. This, in turn, compromises the insurgents' claim that the government is a puppet of the West, even as the ANA undermines the ability of the Taliban, al-Qaeda, and other groups to conduct attacks.

Even with excellent battlefield mobility, airpower's kinetic-strike capability retains a role in battling insurgency. In the Afghan COIN arena, however, the politics of the struggle dictate that indigenous capabilities become much more valuable to overall victory than those of any outside nation. On this front, the ANAAC is working to train forward observers who, from positions on the ground, can clear and coordinate airborne fires. Their first milestone calls for acting as observers for Mi-35 attack helicopters, interfacing with live-fire missions on ranges around Afghanistan (fig. 1). The CAPTF is assisting with the challenges of instituting close-coordination procedures that will work on the Afghan battlefield and

CAPTF / Department of Defense (DOD) photo

Figure 1. An Mi-35 on a live-fire training mission

that will eventually include fixed-wing attack platforms. For the same reason that indigenous ground troops are better than foreign troops, an ANAAC enabled to conduct its own COIN battles from the air will mean lasting stability of a kind that does not come with outside military involvement.

A fourth lesson from Corum and Johnson maintains that a "low-tech" approach to airpower can have dramatic, positive effects in COIN.[12] Although the Western world in general, and America in particular, traditionally favor high-tech military solutions, this approach will not work in Afghanistan. As the school-building mountaineer Greg Mortenson learned in his personal efforts to advance peace, the patience of Afghan culture is staggering by our standards. Sometimes we need to "listen to the mountains" and accept the fact that modest capability built with patience represents the most effective way to leave Afghanistan with enduring airpower capability.[13] Current operations and training use airframes familiar and well suited to Afghanistan, including Mi-17 and Mi-35 helicopters along with the fixed-wing An-32 airlifter (fig. 2). The C-27 Spartan, which is joining the air fleet, offers increased airlift, battlefield mobility, and instrument flight but resembles the An-32 in its simplicity and ruggedness; moreover, our Afghan partners are comfortable operating it. In building up capability to employ these airframes, the CAPTF and the ANAAC are pursuing ends that will prove sustainable after outside advisors depart.[14]

CAPTF/DOD photo

Figure 2. An An-32 aircraft at Kabul International Airport

Fifth, we understand that "joint operations are essential for the effective use of air power."[15] The CAPTF's position within NATO's training and mentoring forces affords us the chance to shape the ANAAC in a way that complements the development of the larger ANA it supports, because we interact with the individuals who mentor the leaders and future leaders of the ground army. We have the opportunity to help Afghanistan forge an air corps capable of independent action—and to do so in a way that ensures growth commensurate with the army it supports. Our actions will produce a flexible, strategically and tactically capable air force that gives critical support to ground troops.

Efforts to cultivate Afghanistan's airpower stretch beyond jointness, embracing the efforts of several coalition partners. At the Kabul International Airport alone, members of no fewer than 36 nations eat together every day at the dining facility. A Spanish commander currently oversees the installation, with this responsibility rotating among the NATO nations. Belgians provide and demonstrate ground security to the ANA. Czech operational mentors assist Afghan helicopter crews as they learn to become more effective in combat. The CAPTF, in addition to its mentoring efforts, strives to break down barriers so that coalition involvement with Afghan security forces can expand even further.

Finally, it is evident in the CAPTF that airpower "provides the flexibility and initiative" that insurgents normally enjoy in the COIN battle.[16] The need for the involvement of ground troops in COIN will never go away, but certain functions of airpower—airlift, battlefield mobility, and light attack—are a terrific force multiplier in that fight. With responsive airpower available, force requirements of 20 to 25 soldiers for every 1,000 indigenous residents—commonly considered the gold standard for COIN—may shrink substantially, allowing a relatively small force to conduct effective

operations against insurgents.[17] Having set forth the case for why the CAPTF's role in developing airpower in Afghanistan is so important, I will now address our current collaborative activities with the ANAAC.

Current Airpower Development

By training, assisting, and mentoring the ANAAC, the CAPTF seeks to create sustainable capacity in four areas, but our goals transcend these easily quantified lines of operation. At first glance, our efforts (1) build the supply of aircraft available to the force, (2) create a trained, motivated, and talented group of airmen for the force, (3) build and improve airfields and related infrastructure throughout Afghanistan, and (4) concurrently support ongoing operations critical to Afghanistan's survival as a nation. Most importantly, we seek to embed improved institutional processes, command and control (C2) functions, and a culture of training throughout the ANAAC, interweaving them into Afghan military culture across the four mission areas upon which we focus. I will briefly highlight our ongoing activities in each of these areas.

Unsurprisingly, airlift capabilities have dominated the ANAAC's aircraft build thus far. Afghanistan's terrain and the need to support ground forces engaged in a COIN fight justify this concentration. The workhorses of the ANAAC fleet are the Mi-17 (fig. 3) and An-32. A utility helicopter, the Mi-17 is ideally suited to high-altitude operations in Afghanistan's mountainous terrain, and the An-32, a fixed-wing airlifter, is capable of short-field takeoffs and landings on unimproved surfaces. Daily operations for these aircraft include personnel movement, medical transport, and cargo delivery. Some capabilities that we tend to take for granted in the West have recently sprung to life in the ANAAC and will become a bedrock foundation for the further development of a professional Afghan military. Let me relate an example.

Combined Security Transition Corps-Afghanistan (CSTC-A) photo

Figure 3. An Mi-17 delivers ANA troops.

In late September 2009, two ANA soldiers wounded in the Kandahar province arrived in Kabul on an An-32. ANAAC flight medics transferred the soldiers to National Military Hospital medics on the ramp at Kabul and helped load the patients onto an Mi-17 configured with litters for aeromedical transport. The soldiers arrived at the National Military Hospital, their care uninterrupted and provided completely by Afghan aircrews and medical personnel.[18] The ability to provide care of this quality to the ANA's soldiers builds confidence and trust among its members. Our continued mentoring and investment in such capabilities will enable Afghan security forces to recruit and retain the best and brightest of Afghanistan's rising generation, preventing recruitment by insurgent organizations.

To continue building on the success enabled by airpower, we must recognize the importance of one particular event occurring right now in the CAPTF and the ANAAC with respect to the aircraft build—the delivery of refurbished C-27 aircraft (fig. 4). Delivered directly from Italy since November 2009, the aircraft adds a pallet-and-roller cargo system, airdrop system, and dedicated medical-evacuation capability to the existing fleet of short- and unimproved-field aircraft in the inventory. The C-27 will eventually become the core of Afghanistan's fixed-wing airlift fleet. The coalition military-training mission to Afghanistan has facilitated the refurbishment of eight aircraft to be delivered through fiscal year 2010, with 18 aircraft planned for delivery by 2012.[19]

The development of the rotary-wing fleet is no less dynamic. The fleet of Mi-17s

CSTC-A photo

Figure 4. A C-27 Spartan refurbished for the ANAAC

grows every month, and the Mi-35 attack helicopter has conducted successful live-fire training missions at ranges throughout Afghanistan in recent months. The Mi-17 fleet, critical to battlefield mobility and medical transport missions, is a reliable mode of transport for government officials. It is slated to more than double in size by 2013. The Mi-17's reliability, high-altitude capability, compatibility with neighboring nations, and availability of maintenance assets make it the right helicopter for Afghanistan.[20] Building a robust rotary-wing fleet for Afghanistan is a good bet for sustainable capabilities in the ANAAC because helicopters will remain essential for movement in the nation's rugged terrain.

It is not enough merely to provide aircraft for the ANAAC. To have an effective force, we must foster the development of skilled and motivated airmen. This is the most difficult and rewarding effort in which the CAPTF engages, and it will have the most enduring impact. Our efforts span all levels of the ANAAC organization, with Afghans and Americans collaborating on everything from C2 decision-making processes to the best way to load cargo on an An-32. American mentors offer advice adapted to the Afghan way of doing business, with a keen eye for carrying out the mission and ensuring safety.

Subject-matter experts on every function performed at a US Air Force flying wing are in Afghanistan offering training, advice, and mentoring. From civil engineers to airfield managers, Americans work with Afghans to share experiences and develop best practices for Afghan airpower. The first Afghan loadmaster class in over 30 years finished a three-month course of training in July 2009, certifying eight basic loadmasters and preparing them for transition to the C-27.[21] Additionally, intensive training in the English

language allows aircrews and other Afghans who must function in the international flight system to perform there with safety and competence. Our mentors and instructors come from all military branches and include civilian contractors. The largest group lives and works in Kabul, but the CAPTF oversees a group at Kandahar Air Field and detachments in all regions of Afghanistan.

Training and mentoring does not occur just in Afghanistan. In July 2009, 30 An-32 pilots traveled to the Defense Language Institute in San Antonio, Texas, for intensive training in the English language. They will follow this with an instrument flight-training course and C-27 transition training.[22] Despite the sometimes substantial language and cultural barriers, Americans and Afghans who work with each other report a sense of satisfaction, mutual respect, and accomplishment as they partner to complete missions and build a better ANAAC. This progress is evident among any group of mentors and Afghans who work together every day. Everyone is on the same team.

Trained aircrews, support personnel, and aircraft are effective only with a robust airfield structure within which to operate. The CAPTF is consolidating its headquarters at the Kabul Afghanistan International Airport, improving synergy with the ANAAC and the newly established International Security Assistance Force Joint Command, also at the airport. In addition to development at Kabul, air facilities in Kandahar, Jalalabad, Shindand, Herat, Gardez, and Mazar-e-Sharif benefit from planning and construction facilitated by the CAPTF. On 5 October 2009, the Kandahar Air Wing celebrated its official establishment. Affiliated with the ANA's 205th Corps, Kandahar joins the Kabul Air Wing as the second wing established in the nation since 2001.

Operations constitute the CAPTF's fourth and final area of mission concentration. Because flight operations have never stopped in Afghanistan, the expression "building the airplane while flying it" is an apt description of the CAPTF and the ANAAC's team effort. Our desire to increase training and institute new means of C2 is in constant tension with a limited fleet of aircraft, a never-ending list of urgent missions, and a combat-operations tempo that can never stand down for a "reset."

Besides day-to-day combat and other military operations, the flying on the CAPTF's radar scope that receives the most attention today includes support of national elections, the annual Muslim hajj to Mecca, and increased levels of flight training—particularly for the Mi-17. The ANAAC supported the main 2009 Afghan election superbly, and its assets were retained without hesitation to support a planned runoff election. Although a candidate's late withdrawal caused cancellation of the runoff, Afghan Mi-17s diligently carried balloting materials around the country, ready for a second round. The ANAAC provides airlift for Muslim pilgrims in remote areas to regional air transport hubs in Afghanistan. Because of the cultural importance of the hajj, this support makes the ANAAC a valued institution in the eyes of all Afghans. In 2009 the hajj occurred in late November, when the start of winter weather put extra strain on an already difficult logistical undertaking.

Although flight training is a normal sustainment function of any air force, the unique demands on the ANAAC make allocating resources dedicated to training a difficult proposition. Because many of the regular pilots in the ANAAC have years of flight experience, training sometimes receives less priority than the urgent operational missions demanded by Afghanistan's current COIN struggle. By increasing the numbers of aircraft available, increasing the pool of available pilots, and establishing training centers in Afghanistan, the CAPTF is helping the ANAAC build a culture of training that prioritizes regular proficiency requirements as an integral part of safe and effective military flight operations.

It is evident that much is taking place right now in Afghanistan to advance the development of airpower capability. Each program reveals several places where more resources and capabilities would do im-

measurable good. The next section provides a glimpse of plans for the CAPTF and the ANAAC.

Flight Plan for the Future

As we move forward, I want to emphasize the absolute necessity for the CAPTF's plans to embrace the plans of Afghanistan's military and political leaders. It is critical that we do not *impose* on Afghanistan an air corps patterned after our own US Air Force. We have made progress in convincing Afghan leaders that an empowered, centrally commanded organization is an effective way to control airpower, but an existing culture of close control by senior leaders over all decisions means that change in this aspect of military culture will come slowly at best. Further, the frenetic pace at which US Airmen restructure their own organizations is itself anathema to Afghan culture and would thus prove unsustainable. With those caveats in mind, several promising developments for the ANAAC loom just over the horizon.

In the area of aircraft procurement, the ANAAC will continue to develop its Mi-17 and C-27 fleets. Moreover, we are looking at possible additional rotary- and fixed-wing trainer aircraft and a light attack platform. Concurrently, the number of trained operators and support personnel in the ANAAC will grow to complement the additional airframes. Current plans envision enlarging the overall fleet size from 43 to 154 aircraft while increasing the number of personnel from the current 2,700 airmen to over 8,000 by 2016.[23]

Plans to expand the aviation infrastructure throughout Afghanistan are likewise ambitious. The recent establishment of the Kandahar Air Wing is a good omen for future development of flying units around the country. By 2016 Afghanistan should take pride in permanent ANAAC detachments at Mazar-e-Sharif, Jalalabad, Gardez, and Herat. Along with an air wing and training center at Shindand and the existing air wings at Kabul and Kandahar, these will function as the backbone of an ANAAC that will have substantial capability on call in every region of the country (fig. 5).

As we consider these exciting plans for the ANAAC's growth, it is difficult to overstate the importance of patience. As two well-known experts in Afghanistan COIN put it, "The hosts doing something tolerably is often better than foreigners doing it well."[24] In our zeal to help Afghanistan develop its airpower, we must never outstrip the ability of our hosts to adapt and learn new ways of doing things for themselves. Failure to appreciate this constraint turns our "help" into an obstacle and means that blood and treasure will have been spent in vain. On the other hand, patience that leads to new capabilities internalized by the next generation of Afghan airpower operators and leaders will become the kind of investment that leads to victory in this complex theater of war.

It is critical that we do not *impose* on Afghanistan an air corps patterned after our own US Air Force.

Along with cultivating patience and perseverance, the COIN warrior in Afghanistan must grasp the essential art of understanding the realm of the possible. Readers familiar with Corum and Johnson's argument about airpower in COIN efforts will recog-

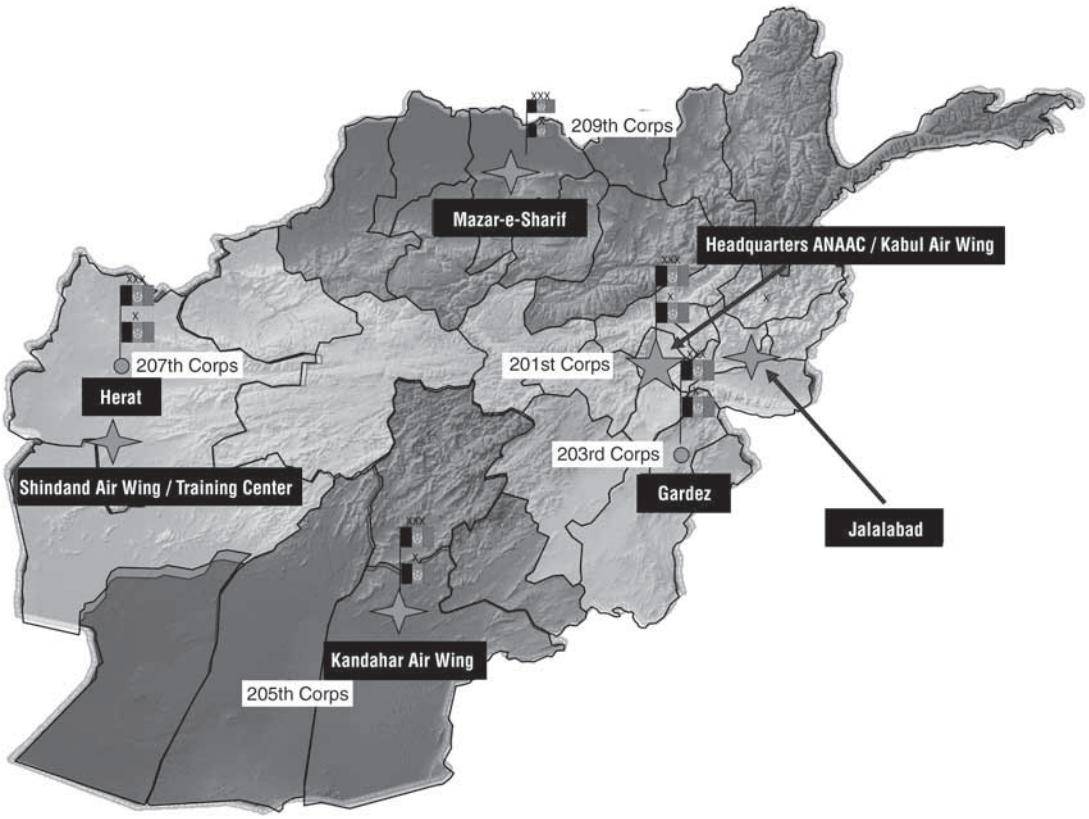


Figure 5. ANAAC facilities in 2016. (From CSTC-A/CAPTF.)

nize the premise that "small wars are intelligence intensive" and may wonder about the airpower focus on intelligence, surveillance, and reconnaissance (ISR) as it relates to Afghanistan.[25] The COIN fight here is certainly intelligence intensive, and the Afghan military excels at collecting and exploiting human intelligence. Fused with the high-tech platforms available to coalition partners, the collective ISR effort in Afghanistan has yielded hundreds of successful operations.

Despite this synergy, rushing to give Afghanistan a computer-based, high-tech intelligence infrastructure of the kind used by industrial nations would be misplaced right now; training efforts would be wasted. Instead, Afghanistan needs time to build a pool of technology-savvy recruits able to fill potential billets. More importantly, the Afghan military as a whole needs an opportunity to develop and internalize institutional processes that would make a technologically enabled intelligence system worth its cost. Pushing ISR in the mold of the US military on Afghanistan now would do more to dismantle an excellent existing human-intelligence capability than it would build a viable new system.

Conclusion

Corum and Johnson have noted that "small wars are long wars."[26] A constant reality that must inform any strategy for Af-

ghanistan is the possibility that the COIN struggle here may well outlast the staying power of Western governments. According to Nathaniel Fick and John Nagl, "Some of the best weapons do not shoot."[27] Developing security capabilities *within* Afghanistan rather than attempting to wear down a determined insurgency from without is itself a kind of domestic development, enabling more visible measures such as making available electricity, water, jobs, and education. The two observations together suggest that the best investments we can make in Afghanistan are those that allow people to provide security and good governance for themselves after outside involvement has run its course.

As a recent historical account challenges us, America needs to "solidify victory within a chaotic political environment" by helping Afghanistan "get back on its feet."[28] Involvement of the CAPTF in building airpower for Afghanistan by mentoring Afghan airmen is a textbook effort in building capacity for a partner nation. The new capabilities being instilled in the ANAAC will form an enduring legacy. The new "eagles" soaring over Afghanistan will secure internal national security even as they prevent foreign terrorists' exploitation of that country's remote regions.[29] Together, these professionals and their committed mentors will forge demonstrable, sustainable advances in capabilities and capacities for Afghanistan's security forces. Some oft-forgotten aspects of airpower have great potential to carry the nation into an era of peace and stability. This is a victory for the whole world, and we are excited to be at the heart of it in the CAPTF. ✪

Notes

1. Dexter Filkins, "Stanley McChrystal's Long War," *New York Times Magazine*, 14 October 2009, http://www.nytimes.com/2009/10/18/magazine/18Afghanistan-t.html (accessed 17 November 2009).

2. *Afghanistan National Development Strategy* [*ANDS*]*, 1387–1391 (2008–2013): A Strategy for Security, Governance, Economic Growth and Poverty Reduction* (Kabul: Government of the Islamic Republic of Afghanistan, 21 April 2008), i, http://www.ands.gov.af/ands/final_ands/src/final/Afghanistan%20National%20Development% (accessed 17 November 2009). The *ANDS* serves as Afghanistan's Poverty Reduction Strategy in accordance with its World Bank Country Assistance Strategy. See also "Bank Publication 2.11 – Country Assistance Strategies" (Washington, DC: World Bank, June 2005), http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064541~isCURL:Y~pagePK:64141683~piPK:64141620~theSitePK:502184,00.html (accessed 17 November 2009).

3. The most important of these is the "Agreement on Provisional Arrangements in Afghanistan pending the Re-Establishment of Permanent Government Institutions" [Bonn Agreement (Afghanistan)] (Bonn, Germany: United Nations, 5 December 2001). The term *security forces* refers to both the military (MoD) and the police (MoI) in Afghanistan. Formally, the United States is the lead nation for military reform per an Afghan Security Assistance Meeting in Geneva on 17 May 2002, but it also undertakes a substantial police-reform effort alongside the European Union's Police Mission for Afghanistan (EUPOL).

4. Brig Gen Michael R. Boera, USAF, CAPTF, Kabul, Afghanistan, predecisional draft briefing, subject: Afghan National Army Air Corps, 2009.

5. James S. Corum and Wray R. Johnson, *Airpower in Small Wars: Fighting Insurgents and Terrorists* (Lawrence, KS: University Press of Kansas, 2003), 425–26.

6. Ibid., 427.

7. Colin Gray called the United States a natural air power. Many of the geostrategic factors that underpin Gray's claim about the US predilection for airpower also apply to Afghanistan. Among these are Afghanistan's continental geography, its geopolitical isolation, and its lack of sea power. The technological base and nuclear-deterrent capability attributed in Gray's US list obviously do not apply to

Afghanistan today. See Colin S. Gray, *Explorations in Strategy* (Westport, CT: Greenwood Press, 1996), 85.

8. Andy Nativi, "Afghan Airpower," *Aviation Week and Space Technology* 160, no. 4 (26 January 2004): 48–49.

9. Corum and Johnson, *Airpower in Small Wars*, 428.

10. "From Insurgency to Insurrection," *Economist* 392, no. 8645 (22 August 2009): 22.

11. Nicholas Kulish and Judy Dempsey, "Germany Defends Decision on Afghan Airstrike," *New York Times*, 8 September 2009, A4.

12. Corum and Johnson, *Airpower in Small Wars*, 430.

13. Greg Mortenson and David Oliver Relin, *Three Cups of Tea: One Man's Mission to Fight Terrorism and Build Nations—One School at a Time* (New York: Viking, 2006), 149.

14. Histories of the Afghan Air Corps report that "the helicopter [was] the single most important weapon in the Soviet-Afghanistan war"; they also reveal that An-32s and An-26s have been closely intertwined in the struggle to carve order out of chaos within the government and military leadership since the fall of the Taliban. See "A Short History of the Afghan Air Force, 1919–2009," unpublished draft (Maxwell AFB, AL: Air Force Historical Research Agency, 2009).

15. Corum and Johnson, *Airpower in Small Wars*, 433.

16. Ibid., 434.

17. Other force-structuring ratios put the ideal number at 10 soldiers for each insurgent. Since the insurgent population in Afghanistan is unknown, the population-based ratio makes better sense. See Nathaniel C. Fick and John A. Nagl, "The U.S. Army / Marine Corps Counterinsurgency Field Manual: Afghanistan Edition," *Foreign Policy*, no. 170 (January/February 2009): 46.

18. TSgt Misti Adams, USAF independent duty medical technician, 438th Air Advisory Group, Kabul International Airport, interview by the author, 12 October 2009.

19. Boera, briefing.

20. Ibid.

21. Lt Col Mark Hersant, USAF, "Afghan C-27A Program Takes Flight," *Air Force Link*, 3 September 2009, http://www.af.mil/news/story.asp?id=123166178 (accessed 17 November 2009).

22. Ibid.

23. Boera, briefing.

24. Fick and Nagl, "U.S. Army / Marine Corps Counterinsurgency Field Manual," 46.

25. Corum and Johnson, *Airpower in Small Wars*, 434.

26. Ibid., 435.

27. Fick and Nagl, "U.S. Army / Marine Corps Counterinsurgency Field Manual," 45.

28. Stephen Tanner, *Afghanistan: A Military History from Alexander the Great to the Fall of the Taliban* (New York: Da Capo Press, 2002), 325.

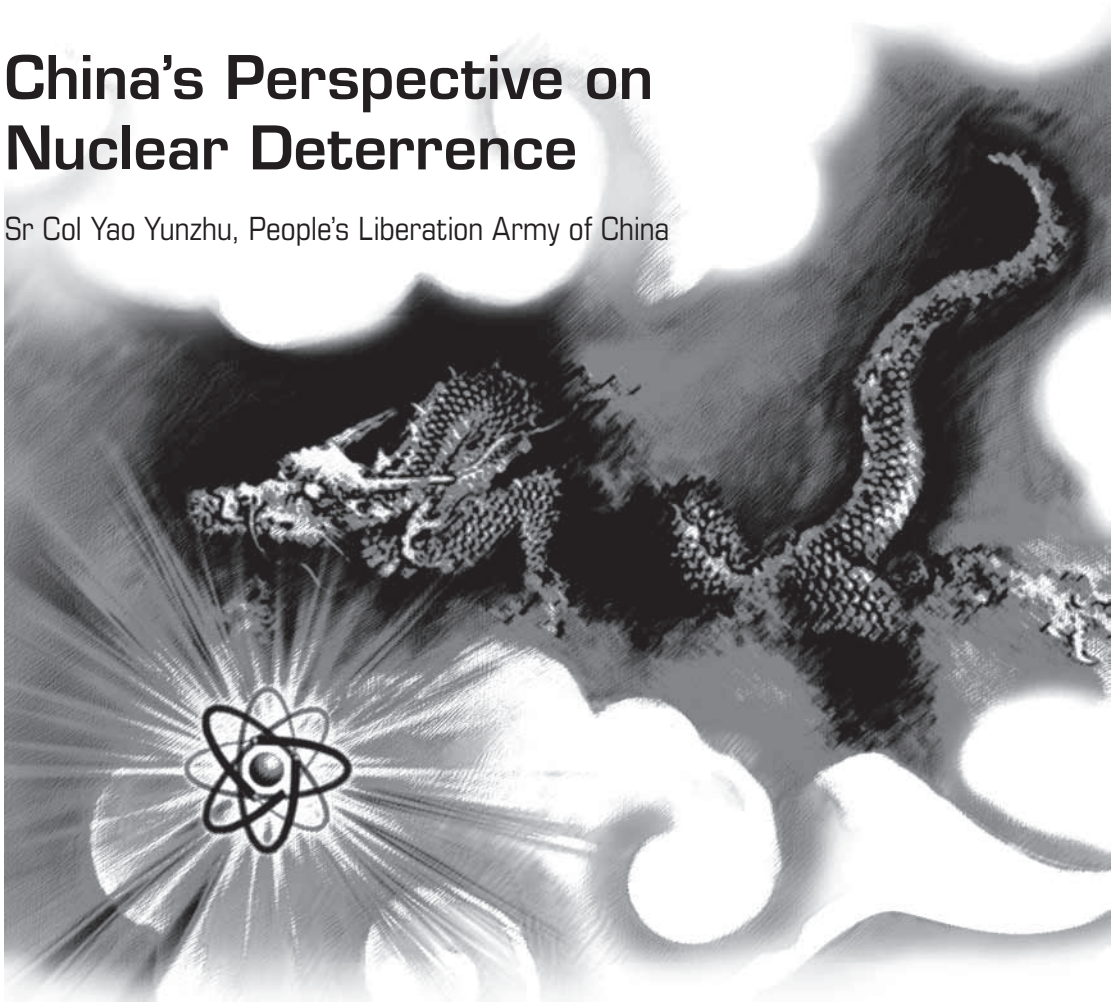
29. Translation of the official Dari motto of the ANAAC recruiting initiative: "Be an Eagle for Afghanistan." Boera, briefing.

Brig Gen Michael R. Boera

General Boera (BS, University of Colorado–Boulder; MA, Central Michigan University; MSS, Air War College) is commanding general, Combined Air Power Transition Force, Combined Security Transition Command-Afghanistan, Kabul, Afghanistan, and commander, 438th Air Expeditionary Wing. Prior to his current assignment, he was deputy director for operations at US Pacific Command. He has served on a major command and combined air operations center staff, and has commanded a fighter squadron, cadet group, fighter operations group, wing, and the 613th Air and Space Operations Center. During Operation Allied Force, General Boera led his F-16CJ squadron in the first attack in Serbia. Additionally, he led his squadron on deployments in support of Operations Southern Watch, Northern Watch, and Deliberate Forge. A command pilot with more than 5,500 flying hours, he has flown 160 combat missions in the F-16. He also deployed in support of Operations Desert Shield, Desert Storm, Provide Comfort, and Unified Assistance, the tsunami humanitarian-relief effort in South Asia. General Boera is a graduate of Squadron Officer School, Army Command and General Staff College, and the Air War College.

China's Perspective on Nuclear Deterrence

Sr Col Yao Yunzhu, People's Liberation Army of China



My topic is about China's perspective on deterrence, but before I deal with the topic, I must point out that for a long time in the Cold War, China strongly opposed the concept of nuclear deterrence, which, as so frequently used by the US government, had carried with it such derogatory connotations as "nuclear blackmail," "nuclear coercion," "nuclear containment," and "nuclear threat." And China, as the country most frequently threatened by nuclear attack, was understandably reluctant to use such a term.[1] Not until the late 1980s or early 1990s, when China's drive toward defense modernization inspired academic debate, did deterrence gain acceptance as a key concept in strategic studies and lose its pejorative sense. However, even though the term remained taboo for some time, the logic of deterrence has always played a major role in Chinese nuclear thinking. To facilitate understanding, I explain China's nuclear policy, making use of US deterrence terminology, and compare China's deterrence thinking with that of the United States.

China's No-First-Use Policy Indicates That It Applies Pure Deterrence and Deterrence by Punishment

The most important element of China's nuclear policy is renunciation of the first-use option. By adopting a no-first-use policy, China has to base its deterrence on retaliation, not on denial. Therefore it must develop retaliatory second-strike capabilities instead of nuclear war-fighting capabilities and doctrines. Studying the nuclear thinking of earlier Chinese leaders like Mao Zedong and Deng Xiaoping, we find that neither man considered nuclear weapons usable on the battlefield in the same way as conventional means. Moreover, neither believed that nuclear wars could ever be fought and won in a measured and controlled way. Such thinking differs from that of American nuclear strategists who have explored many possible forms of nuclear conflict and have formulated complex, complete theories of nuclear war fighting, including limited war, theater nuclear operations, and escalation control.

The Self-Defensive Nature of China's Nuclear Policy Means That It Carries Out Central Deterrence but Not Extended Deterrence

China preserves nuclear capabilities only to deter nuclear-weapon states from launching nuclear attacks against its homeland. China neither provides a "nuclear umbrella" to, nor accepts one from, any other country. Its opposition to the policy of extended nuclear deterrence—the practice of nuclear-weapon states' providing nuclear umbrellas to their non-nuclear-weapon allies—attests to the self-defensive nature of that policy. China has clearly indicated that it will neither deploy nuclear weapons on foreign territory nor allow foreign nuclear weapons into China. By comparison, the United States has incorporated extended deterrence as a key component into its nuclear strategy and alliance policy, both during the Cold War and even today. I disagree with the notion that extended deterrence helps nonproliferation by relieving allies of the need to develop their indigenous nuclear arsenals, thus reducing the number of nuclear states. In my view, extended deterrence is first and foremost a defense commitment used to strengthen an alliance, with nonproliferation a by-product of this commitment rather than a predesigned major mission. Very few of America's allies face threats today that can be dealt with only by US extended nuclear deterrence; rather, US conventional military means can easily satisfy their defense requirements. Additionally, extended deterrence promotes proliferation by motivating declared or potential enemies of the United States and its allies to possess nuclear weapons as asymmetric means to offset US conventional superiority. If we are serious about creating conditions for a nuclear-free world, as President Obama has suggested, the policy of extended nuclear deterrence should be among the first to change.

China's Nuclear Policy Seeks Deterrence at the Grand Strategic and Strategic Levels, Not at the Operational and Tactical Levels

Chinese leaders mainly consider nuclear weapons a political instrument for employment at the level of grand strategy, not as a winning tool for military operations. The concept of "what wins, deters" does not guide China's nuclear thinking. China has not stratified nuclear operations into strategic, operational, or tactical levels. China perceives a nuclear strike against its territory—whether with high- or low-yield warheads, causing either great or small losses—as the attack that invokes its counterattack. The American practice, by comparison, incorporates nuclear war fighting into strategic, campaign, and tactical operations. For

example, theater operational plans (OPLAN) like US Pacific Command's OPLAN 5077 (the OPLAN for military conflict in the Taiwan Strait) have annexes on nuclear operations.

China's Nuclear Arsenal at the Minimum Level Can Be Interpreted to Some Extent as the Minimum-Deterrence Posture

At this point, let me alter the meaning of the concept of nuclear deterrence somewhat by giving it some Chinese characteristics. Chinese minimum deterrence means that the role played by nuclear weapons in national security should be minimized. China would use nuclear weapons only against nuclear attack and only for second-strike purposes. Accordingly, the arsenal must be kept at the minimum level needed. In China's official documents, "lean" and "effective" are the two adjectives used to describe the nuclear arsenal. To keep the arsenal lean, China has to exercise restraint in developing nuclear weapons; to keep the arsenal effective, China has to modernize it to ensure credibility after a first nuclear strike. Furthermore, Chinese strategists regard the concept of minimum deterrence as a relative one, defined not only by quantitative criteria but also by the survivability of nuclear weapon systems and the credibility of counterattack. Some researchers in the United States have concluded that, based on its modernization effort, China is shifting from a minimum- to a limited-deterrence posture, whereby China could use nuclear weapons to deter both conventional and nuclear wars—and even to exercise escalation control in the event of a conventional confrontation. However, we must remember that the basic logic of China's nuclear thinking conceives of nuclear weapons as a deterring, not a winning, instrument against other such weapons.

China Depends More on Uncertainty for Its Deterrence Than Any Other Nuclear-Weapon State

By introducing the matter of uncertainty, I try to preempt any questions on China's opaqueness regarding the structure and size of its nuclear force. For a state adopting a no-first-use policy and intending not to waste too much money on unusable weapons, dependence on opaqueness to bring about greater deterrent value is a wise choice. One can achieve deterrence through the certainty of prospective costs outweighing prospective gains, as well as through the uncertainty in cost/gain calculations. Deterrence works not only to reverse the enemy's original intention, but also to prevent him from forming such an intention for lack of information. Comparing China with the United States, one sees that the former places more emphasis on taking advantage of uncertainty in implementing deterrence, while the latter realizes more deterrence value by a show of force.

Lastly, China's Nuclear Policy Has Remained Constant

Here, I want to make the point that China's perspective on nuclear deterrence has not changed very much since the start of the twenty-first century. The 1960s and 1970s had been the most crises-ridden years for China. Since then, China's security environment has improved steadily. However, several new factors complicate China's nuclear calculations. First, it has more nuclear neighbors than before. Second, the Taiwan Strait has become a potential flash point that might drag two nuclear states into military conflict. And third, the deployment of US ballistic missile defense (BMD) systems threatens the credibility of China's deterrence and the strategic stability between the United States and China. In spite of these new developments, we can see no substantial change in China's declared nu-

clear policy and no deviation from the basic deterrence logic in which it believes. Several reasons may account for this lack of change. First, the multilateral-deterrent relationship that China forms with all nuclear-weapon states can readily accommodate new nuclear neighbors. Second, deterrence applied at the strategic level, if credible, can deter nuclear use against China in peace and even in conventional conflict. Third, the BMD system may result in a reassessment of force structure and size, but not in the abandonment of a policy that has best served China's national interest for nearly half a century.

★ ★ ★ ★ ★

In conclusion, China will continue to apply deterrence at the grand strategic level, to base its pure and central deterrence on a retaliatory second-strike capability, to depend more on uncertainty for better deterrence effect, and to modernize its nuclear arsenal by keeping it more survivable, penetrating, and secure. ✪

Note

1. China has been repeatedly threatened with nuclear attacks and might be nearer to such an attack than any other country in the world. During the Korean War, General MacArthur urged the Truman administration to drop atom bombs on China. During the French-Vietnamese War, President Truman and British prime minister Churchill consulted on several occasions, agreeing that the Allies would support US use of atom bombs on China in case the Chinese intervened on the side of Vietnamese troops. The Eisenhower administration threatened to use nuclear weapons against key areas in China (including Beijing) if it launched another offensive in 1953 during the Korean War. The Taiwan Strait crisis of 1958 once again saw China threatened by US nuclear weapons. Top Soviet military leaders considered launching a preemptive strike against China with a "limited number of nuclear weapons" during the Sino-Soviet border clash in 1969. See "A Chronology of Nuclear Threats," *Science for Democratic Action* 6, no. 4 / 7, no. 1 (October 1998), http://www.ieer.org/ensec/no-6/threats.html (accessed 24 September 2009).

Sr Col Yao Yunzhu, People's Liberation Army of China

Senior Colonel Yao (MA, Foreign Languages Institute, People's Liberation Army; PhD, Academy of Military Science), a member of the 10th National People's Congress of China (2003–7) and of the 17th Chinese Communist Party Congress, is a senior researcher of the Asia-Pacific Office, Department of World Military Studies, Academy of Military Science. She joined the People's Liberation Army in 1970, serving as an enlisted member, a staff officer, an instructor, a researcher, and both a deputy director and director of a research office. She spent one year in the School of Oriental and African Studies, University of London, United Kingdom, as a visiting scholar and two months in the United States as an Eisenhower Exchange Foundation Fellow. Senior Colonel Yao has published books and has translated books, articles, and papers on international military and security issues, US military affairs, Asia-Pacific security issues, cross-strait relations between China and Taiwan, and Korean Peninsula security issues. Her works include *Post-War American Deterrence: Theories and Policies*, *On Asia-Pacific Security Strategy* (author of chapters), and *20th Century Strategic Legacy and the World through Chinese Scholars* (author of chapters). She was elected one of the "Top Ten Outstanding Chinese Women" in 2007.

Honoring Dr. David Mets for His Many Years of Service to *Air and Space Power Journal*

Capt Lori Katowich, USAF, Deputy Chief, Professional Journals

Dr. David Mets, a researcher at the Air Force Research Institute and a member of *Air and Space Power Journal*'s Editorial Advisory Board, is retiring. A diplomatic- and military-history icon, he has been an integral part of *ASPJ* for over 35 years.

Dr. Mets's contributions to the United States military began in 1946 when he enlisted in the US Navy and eventually earned an appointment to the Naval Academy. After graduating in 1953, he traded his fins for wings and accepted a commission in the US Air Force. During his flying days, he served as an instructor navigator, instructor pilot, and aircraft commander; flew over 900 C-130B sorties in Vietnam; and commanded an AC-130 squadron in Thailand. Dr. Mets has guided the scholastic achievements of numerous military professionals throughout his career, serving as an instructor of diplomatic and military history at both the US Air Force Academy in the 1960s and the US Military Academy in the 1970s.

Prior to his retirement from active duty in 1979, Dr. Mets served as editor of *Air University Review*, a predecessor of *ASPJ*. He is well known for his "Fodder for Your Professional Reading" series of articles, which combined book reviews in specific categories and related those to professional development. Dr. Mets continues to provide guidance and expertise to the *Journal* staff on a variety of topics.

After a brief stint as a professor of history and international relations at Troy State University–Florida Region, Dr. Mets returned to Air University in the 1990s as a professor at the School of Advanced Airpower Studies (now the School of Advanced Air and Space Studies) at Maxwell AFB where he taught for 14 years. He has been a military defense analyst and researcher with Air University's College of Aerospace Doctrine, Research and Education and the Air Force Research Institute since 2006.

A noted expert in and advocate for airpower, Dr. Mets has published five books: *NATO: Alliance for Peace* (1981), *Land-Based Air Power in Third World Crises* (1986), *Master of Airpower: General Carl A. Spaatz* (1988), *The Air Campaign: John Warden and the Classical Airpower Theorists*, revised edition (1999), and, most recently, *Airpower and Technology: Smart and Unmanned Weapons* (2009).

On behalf of the *ASPJ* staff, past and present, we thank Dr. Mets for his many years of service and dedication to both the *Air and Space Power Journal* and the United States Air Force. ✪

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

A PERFECT STORM OVER NUCLEAR WEAPONS

I read the article "A Perfect Storm over Nuclear Weapons" (Fall 2009), and Vice Adm Robert Monroe is quite correct. I also believe that America's concept of deterrence must change significantly to meet the variety of threats that will emerge in the twenty-first century. The old deterrent strategy of the Cold War is not adaptive enough and requires an overhaul. When we redefine and redevelop deterrence and what it means, the nation can then apply it to emerging nations such as Iran and North Korea. Furthermore, there must be an endeavor to combine nonproliferation efforts into this strategy to provide a more robust means of preventing the spread of nuclear weapons; moreover, if countries do obtain them, they will know what to expect from the United States if they wish to employ them. As such, America's ICBM force will need "calibrating" to ensure that our deterrent is not a paper tiger and can effectively deter potential aggressor nations that range from nonstate actors to reemerging superpowers. The United States first needs to develop the right strategy and then build the right force to make the strategy work. When we get the strategy of "layered deterrence" right, we can make our ICBM force fit the strategy. Ultimately, the right strategy that implements the right force will win the day. Why? Our nation desperately requires a "recalibration" of our nuclear deterrent strategy.

Lt Col Scott Edwards, USAF
Air Force Fellow, Oak Ridge National Laboratory

THE ARMY'S "ORGANIC" UNMANNED AIRCRAFT SYSTEMS

Although Maj Travis A. Burdine's article "The Army's 'Organic' Unmanned Aircraft Systems: An Unhealthy Choice for the Joint Operational Environment" (*ASPJ*-English, Summer 2009; *ASPJ*-Chinese, Fall 2009) is interesting, I feel that the author largely bases his argument on service sectarianism. I must, therefore, disagree with his reasoning.

To determine whether or not ownership of an asset correctly belongs to a specific branch of service, one must examine the first and foremost criterion—necessity. Current field operations indicate that the US Army is in dire need of organic remotely piloted aircraft (RPA) that perform a variety of tactical-level missions such as intelligence, surveillance, and reconnaissance; communication relaying; targeting; searching; or even ad hoc, direct air-land attacks. In light of this fact, one cannot conclude that "the Army's decision to develop and field organic theater-capable [RPAs] is not in the best interest of the US military" simply because the latter has only a "limited supply of these high-demand assets" (pp. 89–90). Indeed, I find such reasoning faulty.

This situation brings to mind the enactment of the US National Security Act of 1947. At the time, the newly established Air Force viewed the Army's organic aviation forces in a similar manner. However, we should not forget that the Army artillery's urgent need for organic aviation assets gave birth to Army aviation. If we follow the reasoning of the author, we might reach the conclusion that US Army aviation should merge with the Air Force, based on the logic of limited supply and high demand.

The Army and Air Force should not be rivals over the ownership of limited RPA assets. Rather, the solution for meeting the Army's high demand for RPA assets from the Air Force lies in redetermining the scope of the two services' operation and function, identifying and maximizing their strong capabilities, filling the necessity gap between them, and creating an integrated joint operational environment.

Although Major Burdine proposes a solution, it is unrealistic and lacks operational

substance. Aware of the fact that "the Army will not abandon the Sky Warrior Program" (p. 97), the author does make a good point by dividing RPA capabilities based on "task complexity" and "ease of automation" (see fig. 4 of the article, p. 98). I would go one step further and divide the functionality of the services. That is, the Army assumes the preponderance of responsibilities relating to management of RPAs / remotely piloted vehicle systems at the tactical level; the Air Force focuses on the strategic level; and both services share responsibility for the operational level.

Creation of a truly integrated operational environment requires that the services purge sectarianism from their mind-set and consider asset allocation and management primarily in terms of operational necessity.

Li Yanxu
Beijing, China

AIR FORCE TANKER AIRCRAFT: OVERHAUL THE FLEET!

Air-to-air refueling is at the heart of our Air Force doctrine. Without it, the Air Force would not be able to wage war. Nuclear deterrence, rapid global reach/power, and close air support are examples that barely scratch the surface of the missions and capabilities that benefit from air-to-air refueling. The aircraft that implement this priceless capability are growing old, and maintenance costs are continuing to rise. Either Boeing (Boeing 767) or Northrop Grumman (Airbus A330) will replace the KC-135 Stratotanker as soon as the Air Force successfully negotiates a contract. Some individuals support a "split tanker buy" as a solution to avoid lengthy protests from the losing bidder. This option has my support because, in addition to replacing the KC-135, it is also time to replace our fleet of inefficient wide-body KC-10 Extender tankers. The logical solution is to pursue the procurement of two modern air-to-air refueling aircraft already in use and employed by our international partners.

Although the KC-10 is an exemplary tanker platform, its design has many inefficient limitations—for example, the number-two engine on the tail represents a maintenance challenge when it is time to repair or replace an engine three stories high. The additional labor, time, and equipment required to work on this engine are excessive compared to the investments necessary for working on a wing-mounted engine. Much like the vast majority of aircraft used in the commercial realm, both the Boeing and Northrop Grumman tankers have easily maintainable wing-mounted engines.

Additionally, the KC-10 design utilizes a flight engineer who represents the systems expert in terms of operating the aircraft. Much in the same way modern avionics replaced the navigator, modern aircraft are replacing the flight engineer. Automation allows for the elimination of an additional crew position while increasing payload capability. FedEx, the second-largest owner of DC-10 aircraft, is currently upgrading its DC-10-30 fleet. This modification automates the flight engineer position, allowing the company to reduce manpower while increasing overall payload capability. Both the Boeing and Northrop Grumman tankers have eliminated this position with automation.

The Boeing 767 and the Airbus A330, the two more efficient aircraft competing to become the next Air Force tanker, are in wide use all across the world, not only in the civilian sector but also in the military sector. Boeing has contracts to provide Italy and Japan with four KC-767 tanker aircraft each. According to the Airbus military Web site, "A330 . . . has won all international tanker competitions with contracts signed by the governments of Australia, Saudi Arabia and the [United Arab Emirates]." The ability to involve coalition partners increases dramatically when countries use the same equipment. Purchasing both aircraft would foster international partnerships, ease current Air Force tanker shortfalls by employing allied tanker support in future conflicts, and allow individuals of the US Air Force to promote partnership in exchange programs.

It is time to overhaul and replace the Air Force tanker fleet. The KC-10 is an inefficient aircraft in terms of maintenance and additional aircrews. Cargo companies like FedEx still use the civilian version, but even they are modifying their aircraft to reduce manpower and increase cargo capabilities. Retiring the KC-10 along with the KC-135 and purchasing two new modern tanker aircraft will modernize our 1950s and early 1980s fleet, align our capabilities with those of our allies, and bring the backbone of our Air Force into the twenty-first century.

Maj Ryan Aerni, USAF
Travis AFB, California

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.*

Improving Cost-Effectiveness in the Department of Defense

Col Drew Miller, PhD, USAFR*

In signing the latest and largest Department of Defense (DOD) budget, which cut the Air Force's F-22 and the Army's Future Combat Systems, Pres. Barack Obama proclaimed, "We can't build the 21st-century military we need unless we fundamentally reform the way our defense establishment does business."[1] Reforming the DOD and achieving more businesslike cost-effectiveness—long-standing goals for the DOD—are often rejected as impossible since the military is not a for-profit business. Lack of a profit bottom line, however, does not prevent the DOD from attaining the cost-effectiveness that many nonprofit government and military organizations enjoy. Management consultant Peter Drucker called one nonprofit organization, the Salvation Army, "by far the most effective organization in the U.S." He noted that "no one even comes close to it with respect to clarity of mission, ability to innovate, measurable results, dedication, and putting money to maximum use."[2]

One of the biggest hurdles to improving the DOD's cost-effectiveness is the lack of a simple, consistently used means of decision making. The department needs a standard decision support system (DSS) akin to business's profit-and-loss spreadsheet to replace the current practice of decision making without clear criteria. Another great plague on military cost-effectiveness is our "stovepiped" approach to planning, programming, and budgeting with changing bases for the analysis and no chain of accountability or penalty paid, either for cost overruns or poor performance relative to plans. Donald Rumsfeld, former secretary of defense, estimated that 25 percent of the DOD's spending is wasted.[3]

The Air Force and DOD can improve their cost-effectiveness with some practical reforms, including adopting and consistently using our version of business's ubiquitous profit-and-loss spreadsheet to realize the tremendous benefit that businesses enjoy from having a common, widely used, and understood means of analysis and decision making. By employing a simple multiple criteria decision making (MCDM) tool such as the one developed by RAND, which uses commercial spreadsheet software, the DOD could reap the advantages of improved analysis, enhanced accountability for results, and more cost-effective resource management.[4]

Nearly all corporate business decisions are made using a spreadsheet, the "ubiqui-

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tous" "core piece of software" that "is utterly pervasive . . . [and] integral to the function and operation of the global financial system."[5] The familiarity and constant use of the income-statement spreadsheet as a common language and tool enable much better analysis and decision making in business organizations. The DOD, however, has no common format or DSS, using only PowerPoint as a support tool. The department makes its decisions on billion-dollar programs with a horrible lack of consistency and quality, without adequate transparency of estimates and analysis, and with no record of the criteria and rationale used to provide accountability. Unsurprisingly, this results in poor cost-effectiveness.

The most important factor in cost-effectiveness for business is not profit but a system that enables real accountability and consequences for measurable results. Profit, return on investment (ROI), discounted cash flow, or net present value are just the chosen metrics for making decisions and tracking results. To establish cost-effective management and decision making, the DOD can use corresponding means to business's nine enablers of cost-effectiveness (see table).

The DOD has been working for a decade to adopt "capabilities based planning," a common framework for planning and managing resources. Many resource-management processes in the Pentagon are now using or trying to use capabilities as the equivalent of a profit bottom line.

Most enablers of cost-effectiveness have been used successfully in some parts of the

Table. Enablers of cost-effectiveness

Business	*Department of Defense*
1. Profit: the bottom line on profit and loss, the common metric	1. Capability: the key criteria, the common metric; reach maximum mission capability, ideally with the flexibility to apply across many scenarios and mission areas
2. ROI (adding in the balance sheet the consequence of asset costs)	2. Capability ROI: the basis for programming, budgeting, and acquisition decisions
3. Accurate cost data	3. Activity-based costing
4. Spreadsheet as the common format for decision making	4. MCDM DSS as the common DOD format
5. "Lines of business" and "profit centers" with profit/ROI goals and a responsible, accountable manager	5. Capability delivery group—a fully costed DOD operating unit or agency that is the basis for planning, budgeting, and operations
6. A chain of accountability—the same organizational entity/manager responsible for planning, budgeting, and operational/fiscal execution	6. Capability delivery group—a fully costed DOD operating unit or agency that is the basis for planning, budgeting, and operations
7. Operating company/division competition for resources (corporate or investor funding)	7. Capability delivery groups compared with MCDM DSS compete for funding in planning, programming, and budgeting process
8. Accurate, near-real-time profit/ROI reports	8. Improved budget execution and performance reporting using MCDM DSS
9. Consequences for achieving ROI objectives—or not – For the firm: success, survival – For the individual: receiving bonuses, retaining job	9. Consequences for outcomes, achieving Capability ROI promises and MCDM DSS claims – Performance weighed in next round of budget competition for the capability delivery group – Personal ratings and bonuses

DOD. Others, like capability delivery groups (CDG) and "Capability ROI" would be new innovations. Achieving cost-effectiveness requires all nine enablers; however, without an integrating framework like Capability ROI, managed via a common MCDM DSS, pulling all enablers of cost-effectiveness together in the DOD is probably impossible.

Despite the optimization goals of planning, programming, budgeting, and execution (PPBE), the DOD's current resource management fails to optimize either military capability or cost-effectiveness. As the Air Force's former budget chief, Maj Gen (now Gen) Stephen Lorenz explained, "It rewards advocates who are the most adept at articulating increases in spending but sometimes punishes programs that can produce savings. Even worse, it lacks fundamental measures of value on which to base decisions. . . . Management processes currently in place provide little incentive to reduce costs and only limited accountability for those costs."[6]

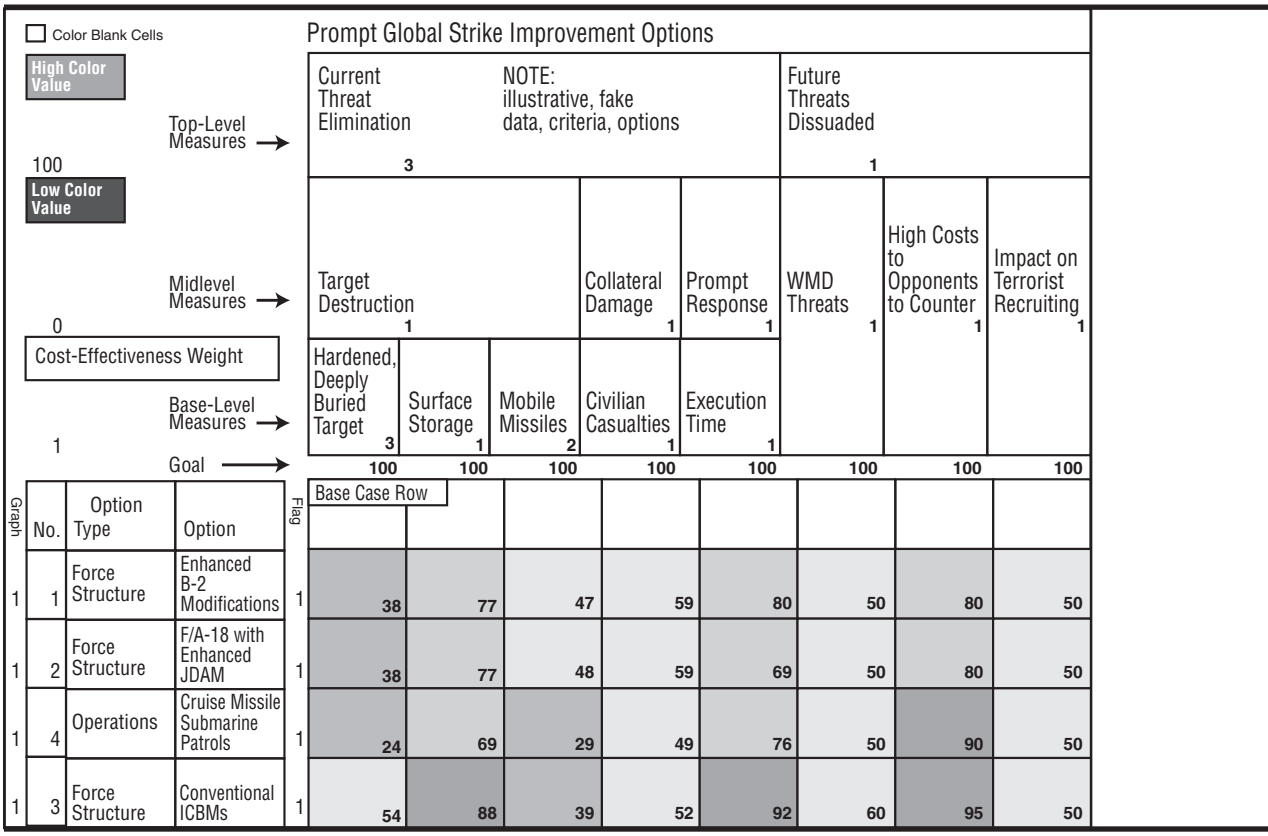
Better DOD Decision Making and Cost-Effectiveness Require a Standardized, Consistently Used, Multiple Criteria Decision Support System

Having just one widely used DSS facilitates better analysis and decision making and improves accountability because the promised results are clearly recorded in a format that everyone can understand. A business will also use the same software throughout the organization, with a very limited, controlled family of software. The DOD, however, with more than 4,000 different business information-technology systems, loses billions annually through this wasteful lack of standardization.[7] Losses from poor decision making due to lack of a standard DSS and cost-effective management framework are probably much higher.

Although the DOD cannot use an income statement as its primary DSS, the DynaRank MCDM DSS has the flexibility to cover a wide variety of objectives and can be used in all of the department's resource-management decision making. A very flexible tool, DynaRank can support the systems approach (assuring consideration of a broad range of alternative programs and strategies), decision analysis (a structured, disciplined analysis), and game theory (consideration of adversaries' reactions), weighing cost as a criterion, and then using operations-research models and simulations for measuring performance. The DynaRank spreadsheet accommodates application of a wide range of analysis techniques and information across a diverse range of decision criteria.[8] Developed by RAND analysts Dr. Paul Davis and Dr. Richard Hillestad, DynaRank has been used to address the highest-level strategy/major-force decisions down to decisions on what system best accomplishes a mission.

The DynaRank "scorecard" (fig. 1) shows four options for carrying out the mission of prompt global strike. Options or alternatives appear in rows. Goals, objectives, and criteria to consider (organizable in a hierarchy with high-level goals on top and lower-level objectives, along with criteria to measure them, below) appear in columns. The ratings of alternatives entered in the cells may be very detailed, objective data where appropriate or just subjective judgments on a scale of one to five. Users can vary the weight applied to the criteria and the different opinions on ratings to do sensitivity analysis for seeking options that consistently rank highest in aggregate score.

This illustrative MCDM scorecard compares four options (in rows) for improving the capability of prompt global strike. The columns list criteria for comparing the options, starting at the top with five high-level criteria: elimination of the current threat (destruction of a target), dissuasion of future threats (likely effect of this force change on an opponent's actions), strategic agility (preference for options that not only help with prompt global strike for countering threats from weapons of mass destruction but also have value in other situations),



ICBM = Intercontinental Ballistic Missile
JDAM = Joint Direct Attack Munition
WMD = Weapon of Mass Destruction

Figure 1. DynaRank scorecard for prompt global strike

political/diplomatic acceptability, and cost. These high-level criteria are then broken down into subobjectives or measurable criteria scored on a 0–100 scale.

The small number next to each criterion is the weight. Here, seven "points" appear at the top criteria level, so cost, with a weight of two, provides about 30 percent of the total score. Users can also adjust weights on how the lower-level criteria add up. For example, this analysis places more emphasis on destroying hardened, deeply buried targets. The MCDM scorecard then adds the weighted criteria scores and ranks them. In this example, the option for enhanced B-2 bomber modifications scored highest, and the conventional-warhead ICBM lowest. The shades of gray help identify high- and low-ranking scores. Clearly, the conventional ICBM option did poorly in the "strategic agility" area. However, changing the weight on strategic agility from three to zero (eliminating it as a criterion), alters the scores but not the rankings of options: the bomber is still first, and the conventional ICBM last. This reflects the real value of the MCDM DSS approach—testing different views, ratings, and criteria weights to identify consistently superior options.

Strategic Agility 0					Political/Diplomatic Acceptability 1			Cost 2		Weight or Minimum Score
Scenarios 1				Multi-Mission Capability 1	Congressional Support 1	Key Allies' Support 1	World Opinion 1	Future Year Defense Program Budget 1	Life-Cycle Capability Cost 1	Weight
WMD Threat 1	Major Theater War 1	Peace-keeping 1	Homeland Defense 1							Weight
										Overall Score Weight
100	100	100	100	100	100	100	100	100	100	Aggregate
										0
64	90	0	0	90	59	70	50	63	89	65
62	90	10	10	100	69	80	60	59	62	61
54	45	10	0	60	45	90	50	78	46	58
79	15	0	0	20	34	60	40	29	59	57

Though simple, the MCDM DSS can "contain" and weigh the effects of very detailed analysis. For example, the estimates of collateral damage under the criterion of current threat elimination come from detailed models of likely civilian casualties. Execution time for the criterion of prompt response may be based on detailed studies or general estimates. The MCDM DSS can use subjective judgments for criteria, such as views of key allies or world opinion. Like an Excel spreadsheet in business, the DOD decision maker can "drill down" to find out what analysis and data generated the score.

The DynaRank MCDM DSS is not intended to "model" a decision or "compute" an answer thoroughly. Rather, it is a flexible, capable tool designed to help consider the objectives of a decision and analyze (as well as shape/alter) alternatives to best meet objectives. RAND's Davis and Hillestad call for using this tool "in a dialogue with decisionmakers, allowing them to select the emphasis on criteria, observe the implications, and iterate the weighting . . . to study the implications of emphasis."[9] Proper selection of goals, objectives, and evaluation criteria is vital to using this DSS successfully. All parties involved in the process need to question the criteria, weights, and metrics—which is feasible if it is a common format and a process familiar to everyone. The example of using MCDM in the GPS program cited on the next page shows how a careful, transparent process can prove very helpful. One of the key criticisms levied by the Government Accountability Office on the Army's now-cancelled Future Combat Systems program had to do with the fact that the con-

Successful Use of MCDM in the Department of Defense

Military planners needed to choose between a variety of options with varying performance and costs for new global positioning system (GPS) technology. They also had to consider commercial users of GPS who had some conflicting objectives. What could have been a very difficult and contentious decision-making process ended up yielding a unanimous, amiable decision as a result of using an objective, quantifiable MCDM approach.

Using "Value Focused Thinking" and the "Analytic Hierarchy Process" (both elements of MCDM), they identified key performance measures for comparing alternatives. For each high-level "goal," they identified second-tier "functions" and third-tier "tasks," ending up with 48 measures. Different GPS customers were interviewed to obtain their recommended weights for criteria. Each group had 100 points to allocate to the various functions that the GPS system would perform.

This approach offered the following advantages:

- Identified the measures and data most important to collect and analyze
- Persuaded people through analysis
- Highlighted some counterintuitive results and trade-offs
- Mitigated bias by focusing the decision on performance measures

Key players said that the results were "surprising and gratifying" and key to getting different GPS user communities to agree unanimously on an alternative.

See Lt Col Lee Lehmkuhl, Maj David Lucia, and Col James Feldman, "Signals from Space: The Next-Generation Global Positioning System," *Military Operations Research* 6, no. 4 (2001): 5–18.

tractor, not the Army, developed objectives and evaluation criteria.

Once users make a decision after this "dynamic" look at (1) the different weights on objectives, (2) the review of ratings if disagreements or uncertainty occurs (perhaps rated by different groups), and (3) the changes to some of the assumptions or ratings, then they can save the MDCM scorecard selected as best and use it to document the decision and the performance results expected. This is precisely how the income statement is used in business. It is not just for planning a line of business and then submitting a budget for it. Once approved, the "plan" income statement is not left buried in a PowerPoint briefing (à la the DOD) but is compared frequently to the "actuals" to see how managers execute the plan—and to hold them accountable for results.

I saw the damage in the DOD from the lack of a ubiquitous DSS tool like the business income spreadsheet when I tried to use DynaRank in the Pentagon: a three-star officer told me that it was too complex and detailed for senior executives. In business, however, executives look at far more complex financial models and spreadsheets, usually "drilling down" into details to probe for bad assumptions to better understand key issues. There was no time to teach them how the DynaRank DSS worked, he argued. Instead, staffers briefed and leaders approved a multi-billion-dollar program change based on multicolor PowerPoint slides, not multicriteria analysis. The lack of a standard DSS for the DOD greatly hinders the rigorous analysis and decision-making reviews common in business—and vital for instituting cost discipline and effectiveness. Some "operations research" analysts in the DOD do use MCDM, though (see the sidebar, above).

RAND analysts have used MCDM for decades to brief senior decision makers; the author and his partner used the DynaRank

MCDM tool to analyze a difficult issue in Iraq and brief Gen David Petraeus. His staff warned that it was too much and too technical to brief, but we insisted. General Petraeus concurred with the analysis, noted that he liked the methodology, and asked us to publish the study.[10]

The diversity and enormity of the DOD does not preclude use of a common DSS—just as businesses in diverse industries all use a profit-and-loss system with the same basic format. Clearly, a need exists for incorporating multiple objectives and criteria into the DOD resource-management DSS, but the DynaRank MCDM offers plenty of flexibility to handle the department's diversity of issues.

An MCDM DSS would allow the Office of the Secretary of Defense (corporate) to dictate certain objectives/criteria that everyone must consider, along with flexibility for different services and agencies at lower levels to add criteria relevant to them. For example, the DOD policy of "cost as an independent variable" was adopted to encourage more attention on "cost-performance tradeoffs to achieve savings."[11] The MCDM DSS example for prompt global strike (fig. 1) showed two cost metrics, included as independent variables or criteria for the decision. Persuading the DOD to really do cost trade-offs has not happened due to problems noted later in this article and the lack of a DSS like DynaRank that facilitates and can force the consideration of cost as an independent variable. In the absence of a mandated DSS with mandated use of cost as a criterion in MCDM, a bureaucracy (actually a collection of often-competing bureaucracies) like the DOD won't change.

This MCDM tool is also a great way to help the department consider risk. It allows adding (and mandating) the consideration of several different defense-planning scenarios and types of conflict. (See the four different scenarios depicted in fig. 1.) The resulting scorecards are also an exceptional tool for doing sensitivity analysis—comparing alternatives across "worst case" as well as "expected" cost and performance estimates.

Despite the DOD's size and diversity, we can use a flexible DSS consistently in resource management. Governments run on standard systems.[12] DynaRank could work in the Joint Capabilities Integration and Development System (JCIDS) and in PPBE processes as both the main analysis tool and DSS to make key resource-management decisions. The DynaRank MCDM DSS would provide a record to track performance, support accountability, do program evaluation, and learn from mistakes. This is especially important in the DOD since both military and civilian leaders tend to change every two to three years.

A common, consistently used, widely understood MCDM DSS offers many other advantages:

- Identification of issues and areas of disagreement that do not matter. Using an MCDM DSS to input opposing views on ratings and criteria often shows that irreconcilable differences are irrelevant to the decision because some scores change but not the overall ranking.
- Elimination of "groupthink."[13] When users write down subjective ideas and fuzzy criteria in a DSS and rate them, they find it easier to "see" questionable assumptions and to challenge them by questioning the rating rather than questioning some forceful speaker in a verbal discussion or PowerPoint briefing.
- Reduction of common human errors in decision making such as the "danger inherent in all analytic approaches, . . . the tendency to close on strategies prematurely: to skip past the creative but uncomfortable stage of inventing new models or strategies."[14] The discipline, transparency, and rigor that a DSS helps to impose are critical because of the innate tendency to judge probabilities, emotions, and irrationality poorly—overreacting to new information and a host of other inadequate "seat of the pants" decision-making practices.[15]

- Enabling of faster interagency decision making during a crisis.[16] Different agencies can independently rate the courses of action and then compare in the event of major disagreements in ratings or criteria weights.
- Simplification of conducting audits, checking decisions, and doing program evaluations by having objectives, criteria, ratings, and alternatives clearly laid out.
- Assistance in breaking down "stovepipes" that lead to duplication and waste. The common language, software, and formats enable better collaboration and information sharing. Business rarely starts with a blank spreadsheet.

The DOD may never achieve the cost-effectiveness of a Procter and Gamble or General Electric, but it can do much better than its current situation. To bring focus on costs and capabilities and to improve the state of analysis and decision making, the department needs to mandate use of one MCDM tool as a standard DSS for resource-management decision making.

Implementing Cost-Effective, Capabilities-Based Management in the Department of Defense

The Planning, Programming, and Budgeting System has changed little since Robert McNamara served as secretary of defense, though it is now called PPBE, with the added "E" for "execution"—a goal of devoting more attention to looking at how we actually spend money and, hopefully, reach desired objectives. Different offices may manage different parts of PPBE in a series of stovepiped processes, but there must be a single basis for analysis and decisions—a single entity for PPBE. The current potpourri of thousands of program elements and constantly changing programming constructs—and then budgeting and execution by operational units—precludes accountability, hinders analysis and decision making, and yields poor cost-effectiveness. This article proposes a new construct for conducing PPBE that would provide the consistency and accountability needed for cost-effective resource management in the DOD.

The department shifted to capabilities-based planning in 2001 to emphasize building more flexible forces with a better likelihood of success in responding to a wide range of uncertain future threats. A 2002 report to the DOD's Senior Executive Council noted many problems in implementing capabilities-based management due to the lack of a DSS and an integrated framework.[17] In 2004 the *Joint Defense Capabilities Study* (the"Aldridge Study") called for a "'capabilities culture' that simultaneously considers costs and needs."[18] DOD decisions may affect dozens of military capabilities and deal with over 100 types of DOD organizations and military units, all budgeted via thousands of program elements—the building blocks of the PPBE process. To integrate capability-management efforts and drive cost-effectiveness improvements, the DOD needs decision making based on Capability ROI—analyzing, deciding upon, and tracking issues via the MCDM scorecard based on capability delivery groups.

A new construct, CDGs allow PPBE to replace the ineffective practice of trying to budget by 6,000 program elements (primarily weapon systems) and hundreds of organizational budgeting entities. Operational units such as the fighter wing (fig. 2) would serve as the basis of CDGs. The costs of headquarters and supporting elements would be allocated to CDGs using activity-based costing. The DOD would plan, program, and budget by CDGs, which are based on the primary operational units used to execute operations and budget. Doing so would yield a much better link between capabilities planning, programming, budgeting, and performance reporting. CDGs would be a much better entity for data feedback on budget execution and accountability.[19]

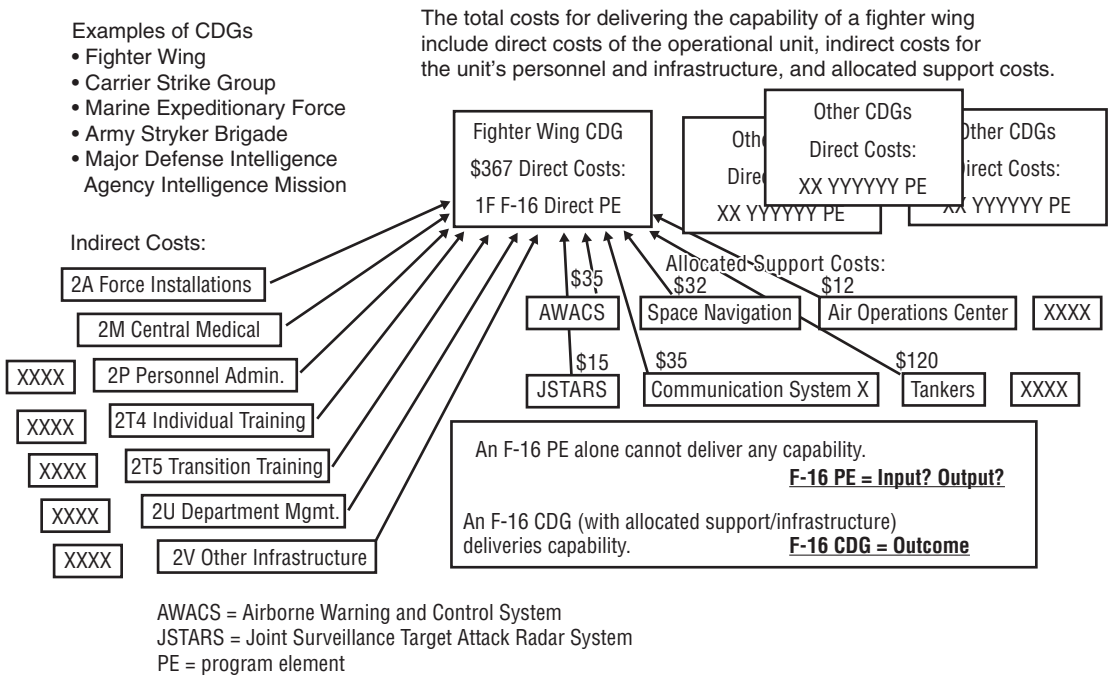


Figure 2. The capability deliver group, a key part of transforming planning, programming, budgeting, and execution into an accountable, cost-effective, capabilities-based resourcing system

Capabilities-based management using Capability ROI focuses on fulfilling capability needs established through the JCIDS process, balancing risks across mission areas. The early part of this process now largely ignores cost-effectiveness. Cost considerations arise later at the "analysis of alternatives" stage, often limited solely to expensive options designed without cost-effectiveness in mind. The lack of an easy-to-use, widely understood "spreadsheet-like" DSS makes it difficult to consider cost issues early in the JCIDS. To design more cost-effective capability options, the DOD must involve budget and cost experts earlier in the JCIDS process, using the common MCDM DSS with cost as a criterion and focusing on a Capabilities ROI "bottom line" at the start of the process.

CDGs would compete in PPBE program/budget reviews, with the Office of the Secretary of Defense selecting CDGs with the best ROI to fill priority gaps. CDGs would serve as a line of business with real accountability and strong incentives to minimize costs to compete better against other CDGs and win funding (fig. 3).

The federal government is pushing performance reporting, but setting goals and measuring outcomes are not enough to produce good management in the DOD because there is no chain of accountability to hold a specific organization or its leader responsible for results. Rather, we have

- numerous plans at many organizational levels,
- program analysis by weapon system or for some capability,
- a budget-by-component organization structure that often does not match a weapon system/program or operational unit that delivers the capability, and
- failure to weigh/consider/budget for all the associated support/infrastruc-

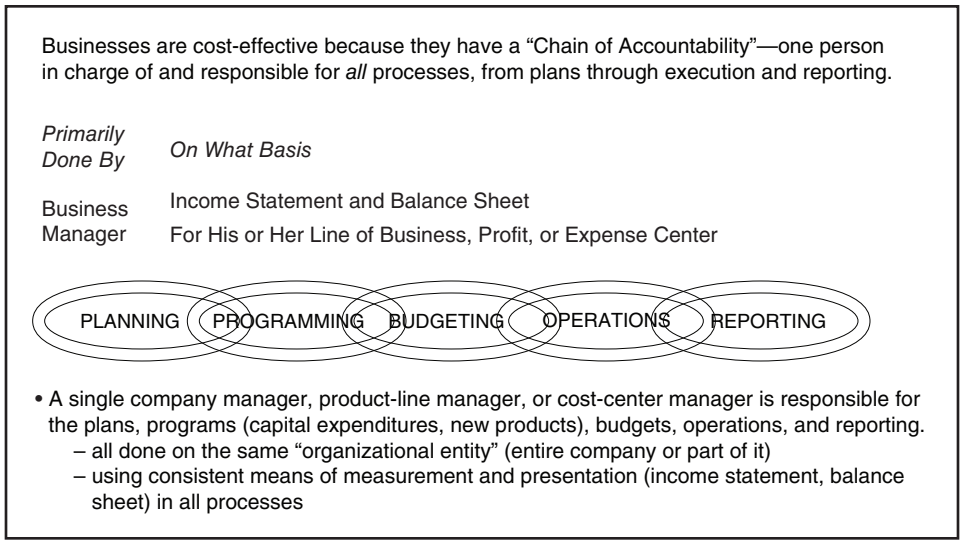


Figure 3. Chain of accountability

ture costs that should rise or fall, based on changes in other DOD organizations' use of them.

So when results are disappointing, what do we blame?

- Bad plans?
- Wrong programming, analysis, or promises?
- Inadequate budget?
- Poor execution of great plans and budgets?

Unless the same organization is the basis for the planning, programming, budgeting, and operational/budget execution, there can be no accountability for delivering promised results. Instead, we have a budget-focused process with incentives to overpromise on performance and fully spend every penny budgeted.

The DOD's reliance on PowerPoint and seat-of-the-pants decision making, with planning, programming, and budgeting by different organizations and managers, yields no accountability and poor cost-effectiveness. Decisions made and "documented" via a PowerPoint briefing do not leave a usable "scorecard" to compare plans and promises to results. A weapon system doesn't operate on its own, and the mishmash of new acquisition programs, old program elements, and operating organizations yields confusion and cover.[20] It's an ideal system for avoiding blame. One organization plans, others acquire equipment and systems, another office does the budgeting, and then different operating units execute the budget. Combining this diffusion of functional and operational decision makers with the lack of a standard, consistent spreadsheet portrayal of "this is what you promised to do / this is what you've actually done" allows perfect deniability. Former DOD officials—including Anthony Cordesman, now with the Center for Strategic and International Studies—note that the department "has been locked into a 'liar's contest' at the level of defense contractors, program managers, every military service, and the Office of the Secretary of Defense where no one is really held accountable."[21]

Many pieces of a capabilities-based management system for the DOD are developing, but without CDGs and an overarching,

common tool for analysis and decision making like DynaRank, they won't survive or achieve integration and cost-effectiveness. Air Force Materiel Command (AFMC) and US Air Forces in Europe (USAFE) have successfully used activity-based cost accounting and capabilities-based planning and budgeting.[22] AFMC succeeded in lowering unit costs and persuading "cost centers" to spend less than their budget, in favor of better cost-effectiveness.[23] USAFE implemented capabilities-based programming.[24] But without a commonly used DSS, a consistent basis for analysis and accountability at all stages of PPBE, and all nine enablers of cost-effectiveness, these isolated efforts will not succeed.

Building accountability and incentives to save budget rather than fully spend a budget won't happen unless spending is tied to the operating entity (CDG) that competes in the PPBE process, using Capability ROI. It is critical that we base the costs used in CDG competition in PPBE not on what the CDG *claims* it can deliver in cost-effectiveness performance, but on what it *actually* cost the CDG to perform in the past year of budget execution. This will give operating units/CDGs the incentive not to "use it or lose it" but to *underspend* their budgets to attain a higher Capability ROI and position themselves for better success in upcoming CDG budget competitions. Supporting services and agencies will also have incentives to cut spending and lower costs or face operating-unit customers that reject their support (and thus allocated costs) as too expensive for the capability they add.

Commitment to initiate a process of CDGs and Capability ROI as the basis for DOD resource management using a common DynaRank DSS is more important than waiting for a perfect, precise, or complete system. It will be difficult to set up and calculate capabilities-based ROI across hundreds of the DOD's CDGs. But if we roll out and enforce a standard analysis and MCDM DSS, the huge analysis, planning, programming, and budgeting staffs in the department can do this. Results will improve rapidly as they share lessons learned from using a common approach and DSS.

Finally, we must dispel the belief that the DOD is simply too big, complex, and diverse to lend itself to cost-effective management. It surely is big, but multinational corporations with more diverse lines of business than the DOD's and operations in over 100 countries manage to consolidate business systems and use common DSS approaches cost-effectively. The DOD has multiple objectives and criteria to consider in its decisions, and an MCDM DSS is clearly essential. RAND's Dr. Paul K. Davis concludes that "it is possible to go from the high concepts of grand strategy down to the nitty-gritty issues of economic choice using one intellectual framework. There is no guarantee that this process of working up and down the ladder of choice will be easy. But it is both feasible and desirable—given strong management, good will, and participation by senior leaders of the defense community."[25]

Finally, we must dispel the belief that the DOD is simply too big, complex, and diverse to lend itself to cost-effective management.

This MCDM DSS, using CDGs and a Capability ROI framework for decision making, will never perfectly capture all the issues and information that might be considered in DOD resource management. Nor will it stop the political interference and problems injected by congressmen who push their favorite weapon systems and pork projects.

But explicitly laying out and organizing the multiple objectives, showing the uncertainties, using a common approach for measuring different types of military capability, estimating metrics even when very subjective, and recording the final rationale for the decision in a spreadsheet for accountability will improve analysis and cost-effectiveness. The overall approach outlined here offers a good way to do the "dynamic" analysis that RAND's Davis and Hillestad advocate to let decision makers take the intuitive shortcuts and simplifications they use to make difficult prioritization, risk, and trade-off decisions. The MCDM DSS, CDG, and Capability ROI approach proposed in this article is not perfect, but no other contender exists now, other than business as usual. It is vital that we pick some improved approach and require everyone in the DOD to use it for analysis and decision making. With widespread and common use, great improvement in the system will come over time.

Many successful chief executive officers have worked in the Pentagon. Some generals have been hired to manage and improve logistics in business.[26] We have very capable, dedicated military and civilian employees working these issues, but they are fatally handicapped by the lack of a common DSS such as the business income statement and spreadsheet. Efforts to make the DOD cost-effective will not succeed until the structure and framework for decision making are transformed into a consistent process with the same organizational entity used in all steps of PPBE. Our fighting men and women and taxpayers need to recover some of the estimated 25 percent of wasted DOD spending. It is long past time for rigorous use of an MCDM tool as part of a Capability ROI–managed, accountable, and cost-effective Department of Defense. ✪

Bagram Airfield, Afghanistan

Notes

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Achieving a Cost-Effective Balance in the Department of Defense

Concurrent and Proportional Recapitalization of the Air National Guard

Lt Col W. Mark Valentine, ANG
Maj Sean Frederick Conroy, ANG*

When Desert Storm kicked off, we had some great capability within the Air National Guard and the A-7 platform. But the active duty [Air Force] was not flying the A-7, and they were concerned with getting the top-of-the-line weapons in the fight, and we were not asked to participate. That seems to me to be a great waste of money. It makes no sense to have a platform that you're not going to use in war.

—Lt Gen Harry Wyatt
Director, Air National Guard
29 July 2009

The Department of Defense (DOD) is engaged in the final stages of its Quadrennial Defense Review (QDR), during which it seeks to identify likely national security challenges and associated response options to better guide future US defense investments. Each service has worked tirelessly to justify and advocate programs that pursue US strategic aims. For the Air Force, the primary goals have included rebalancing the force to increase competencies in irregular warfare and reinvigorating its nuclear enterprise.[1] Through these efforts, the Air Force seeks to better contribute to ongoing conflicts in Iraq and Afghanistan and increase the effectiveness of the US nuclear deterrent.

Strategy is an art of making choices among exclusive options, and the Air Force is developing a strategy to manage tradeoffs in traditional strengths to enable growth in new areas.[2] Today's zero-sum fiscal environment makes such actions difficult. The debate surrounding the structure of the Air Force's current fighter force provides a prominent example of a traditional strength's receiving attention as a likely "bill payer" due to perceived limitations in today's counterinsurgency conflicts. Current decision makers, however, have created a false dichotomy. Freeing resources for emerging mission sets does not necessarily have to come at the expense of the future structure of the fighter force—if the Air Force can maintain the structure in a more efficient manner. By leveraging and investing in the proven, cost-effective Air National Guard (ANG), the Air Force can realize these efficiencies.[3]

*Lieutenant Colonel Valentine, a pilot in the 113th Wing (DC Air National Guard), is chief of the Air National Guard Strategic Studies Group. Major Conroy, a member of the 159th Fighter Wing (Louisiana Air National Guard), is an action officer in the Air National Guard Strategic Studies Group.

Thirty percent of the Air Force's current fighter fleet resides in the ANG, which maintains the majority of air sovereignty alert (ASA) sites, 24 hours a day, 365 days a year, sitting ground alert and patrolling the skies above the United States, tracking potentially hostile targets and other targets of interest, including civilian aircraft in distress.[4] Additionally, ANG fighter units execute deployed missions as full partners in the air and space expeditionary force. ANG aircraft, however, are the oldest in the fighter fleet and among the last scheduled for replacement with fifth-generation fighters like the F-35.[5] Thus, the ANG shoulders the majority of institutional risk of losing aircraft with the consequent loss of capability and relevance. Without a change in the recapitalization plan, the Air Force stands to lose a majority of the most cost-effective portion of its fighter portfolio, with an associated loss in capability. This article presents a solution by means of concurrent and proportional recapitalization of ANG resources.

The Fighter Gap Debate

Grounded in the trade-off discussion above, one debate focuses on the sufficiency of the current fighter force to meet national objectives. The terms *fighter gap* or *fighter bathtub* represent the difference between the fighters the nation needs (to execute its strategy) and those it will have in the future.[6] Three primary variables govern the existence and/or extent of the fighter gap: the fighter requirement, the efficacy of the existing fleet, and the procurement plan for replacement aircraft.

Ultimately, the national military strategy and force-planning construct determine our fighter requirements. The impending QDR will inform both of these. Framing the debate is the fundamental question of how many fighters the United States needs to fulfill its strategic objectives. Notwithstanding Secretary of Defense Robert Gates's comments on the *quality* of the emerging fighter fleet, many factors affect this question, chief among them the *quantity* of fighters needed to execute existing operational plans, the steady-state security posture, and ASA operations. Although most people agree that the new fighter requirement will decrease, they differ on the necessary level.[7] The Air Force's obligation to prepare for two simultaneous major combat operations (MCO) is among the principal considerations for emerging strategic guidance.[8] Further influencing reductions in the fighter force are assumptions that we are not likely to conduct even a single MCO against a conventional force and that improvements will make each aircraft more capable.[9]

Current US plans maintain that we must have 2,250 fighters to avoid a high-risk scenario, based on Air Force assets supporting two MCOs.[10] The current QDR *may* replace the two-MCO construct, but with no definitive guidance to the contrary, we retain the assumption that two MCOs will continue to drive fighter requirements. However, acknowledging strategic uncertainties and the fact that newer aircraft will enjoy increased capabilities and efficiencies, we assume that the nation does not incur high risk until the force structure falls 20 percent below the currently defined requirement. Therefore, we assume that the Air Force's fighter needs lie between 1,800 and 2,250 aircraft.[11] As demonstrated later, however, even a substantial reduction in overall fighter requirements will not significantly alter the existence or magnitude of a capability gap for the ANG.

With the need defined, the next question becomes how long our current fleet will last. Although each type of fighter aircraft has an advertised service life measured in hours, several factors complicate the process of defining actual life expectancy. The first is knowledge that service life determined by the vendor or system program office is not a "magic number" beyond which the aircraft will cease to exist. Rather, the number represents that point at which the engineering community expects the average aircraft to require expensive physical overhauls such as bulkhead replacements

and wing changes. Risk planners should therefore think of service life as an economic threshold beyond which the costs of maintaining and refurbishing an aircraft will exceed the expected value of doing so.

Most readers will have faced a similar dilemma when deciding to replace an old car. In many scenarios, owners stare at a six-digit odometer and weigh the expected costs and benefits of keeping the old car versus purchasing a new one. Sometimes—if the car stops working, for example—they have no choice. Facing a huge repair bill, owners decide that a newer, more reliable vehicle is the best use of their money. Without a breakdown scenario, they must rely on the best advice of their mechanics to compare the expected costs of maintaining the vehicle with those of purchasing a new one.

The discussion of service life becomes more complicated when we acknowledge that many fighter aircraft operate at variance with the engineering assumptions about service life. For that reason, planners and system program offices apply correction factors to original estimates that translate actual flying hours (AFH) into equivalent flying hours (EFH). Again, the car analogy is useful in demonstrating this concept. All of us are familiar with used-car literature that advertises a high-mileage car as having "highway miles," a claim that attempts to communicate to the would-be buyer that the vehicle is in better condition than one would judge, based solely on the odometer. Although the regression methods used to derive the relationship between AFH and EFH lie beyond the scope of this article, EFH is a more reliable indicator of actual aircraft age and thus emerges as the best predictor of aircraft age-out. Therefore, the authors use EFH in this article as the primary indicator of aircraft age.[12]

The number and rate at which the service receives new aircraft constitute the final variable that defines the fighter gap issue. The total number of aircraft purchased is an important variable in the long term. In the near term, however, the procurement rate becomes the critical factor in determining the existence and magnitude of a capability gap. We assume no change in the current F-35 procurement schedule—1,763 aircraft at a rate of 80 per year starting in 2015, with deliveries beginning in 2017.

Assumptions for the three major variables described above (requirement, service life, and procurement) prove useful in illustrating the Air Force's current fighter structure (fig. 1). The upper horizontal line indicates the currently stated requirement of 2,250 aircraft, and the lower horizontal line indicates the 20 percent reduction (1,800), mentioned above. This figure illustrates that the service has done an admirable job of mitigating risk in the near term and faces only a minor capability gap beyond 2024.

But figure 1 does not show how the major variables affect the ANG's fighter portfolio. Using the same assumptions, we consider the ANG's fighter force structure (fig. 2). Here, the light area represents existing legacy or fourth-generation aircraft (A-10s, F-15s, F-16s), and the dark area depicts existing and projected fifth-generation aircraft (F-22s and F-35s). Fielding plans for the F-35, which recapitalize six active component (AC) wings (with 72 aircraft each) before recapitalizing the first ANG squadron in 2019, have a significant effect on the figure's dark area.[13] Significantly, the illustration assumes that as active units receive F-35s, their newer F-16s (primarily block 40 and 50 variants) will cascade down to the ANG to recapitalize older aircraft.

Figure 2 indicates an ANG fighter gap beginning in 2010 and becoming more pronounced through 2015–16, when newer legacy aircraft arrive from recapitalized AC units. The fact that the ANG operates the large majority of the oldest Air Force fighter aircraft accounts for the drastic difference between figures 1 and 2. Following the current Air Force recapitalization plan, which calls for the AC to realize almost 500 F-35s before the ANG sees its first one, means that the legacy fighter force will age out prior to the fielding of a replacement aircraft. For the ANG, therefore, the fighter gap becomes a scenario wherein it will retire aircraft due

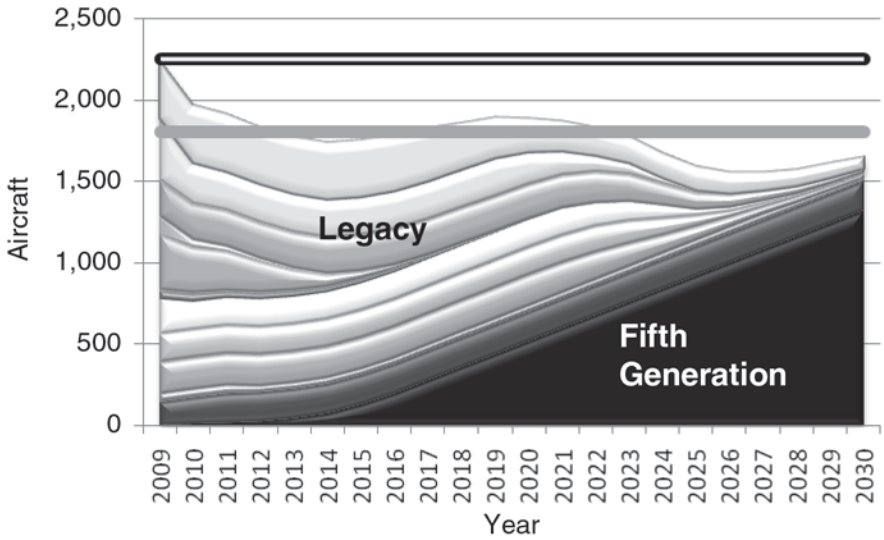

Figure 1. Structure of the Air Force's fighter force. Data on aircraft age is based on the Reliability and Maintainability Information System's June 2009 update. The darkest shades in the bottom of the chart represent fifth-generation aircraft (F-22s and F-35s). The multiple lighter shades represent various models of legacy aircraft (F-16s, F-15s, A-10s). (From National Guard Bureau / Strategic Planning.)

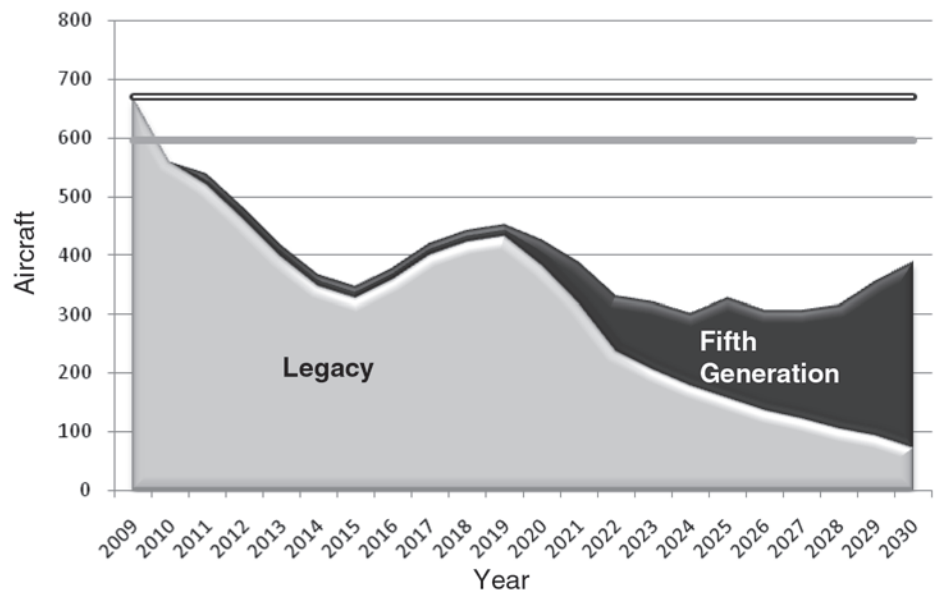

Figure 2. Structure of the Air National Guard's fighter force. (From National Guard Bureau / Strategic Planning.)

to age faster than replacements can support even a reduced requirement.

The solution first requires the Air Force to acknowledge the ANG's shift from a strategic reserve to an operational force. Later, the solution requires concurrent and proportional fielding of new systems between the AC and reserve component (RC). Although the ratio will vary across different mission-design series and/or functional areas, fielding new systems in the AC and RC concurrently will mitigate the ANG's inventory problems and preserve the most cost-effective portion of the Total Force's fighter structure.

The Evolving Air National Guard: Missions

The ANG has always performed as both a strategic reserve and an operational force, delivering critical capability to the US defense strategy by filling the gap when mission requirements exceed the Air Force's force structure. Starting in 1953 and continuing after the end of the Cold War, the ANG performed air defense missions (the historic precursor to ASA) to protect the United States from an air threat. This tasking eventually involved every ANG fighter squadron.[14] Driving this mission was the inability of the AC to man the mission sufficiently while concurrently meeting overseas commitments.[15] Thus, the Cold War period demonstrates the use of the ANG as a strategic reserve that provided a capability shock absorber even as it conducted operational missions instrumental to homeland defense.[16]

Critical ANG integration did not end with the thawing of the Cold War. After Saddam Hussein invaded Kuwait in 1990, the United States mobilized for war, sending hundreds of Air Force assets and thousands of personnel to the Persian Gulf, including 12,456 ANG guardsmen.[17] During the 12 years following the Gulf War, almost every fighter unit in the ANG deployed to the Middle East to enforce the no-fly zones in northern and southern Iraq—many on multiple occasions. Additionally, ANG fighters participated in enforcing the Balkans no-fly zone and in Operation Allied Force. Moreover, when Operation Enduring Freedom kicked off in 2001 and Operation Iraqi Freedom in 2003, ANG units participated from day one, deploying 236 of the Air Force's 863 aircraft (27 percent), 92 of them fighters (31 percent of the total fighters). Over 7,200 air guardsmen deployed for the opening phase of Iraqi Freedom, representing 11 percent of the 64,246-strong Air Force contingent.[18]

In some cases, the ANG took the lead in force presentation. Several guardsmen from operational units, the ANG, and the Air Force Reserve Test Center were instrumental in developing new tactics, techniques, and procedures for integrating emerging fighter capabilities with US and coalition special operations forces. These efforts led to the creation of the 410th Air Expeditionary Wing, an entirely ANG-led wing that integrated ANG, Air Force, and Royal Air Force (British) units. The 410th conducted counter-theater-ballistic-missile missions (a strategic priority of the combined force commander) and provided direct support to teams of special operations forces in western Iraq.[19]

The wars in the Middle East have witnessed the continual presence of the ANG, which has provided fighters; airlift; air refueling; search and rescue; special operations; and intelligence, surveillance, and reconnaissance in five different manned and unmanned platforms alongside active duty counterparts constantly since 2001. The ANG currently provides 25 percent of both remotely piloted vehicle sorties and processing, exploitation, and dissemination services to the joint force.[20] In addition, ANG air operations groups, medical groups, security forces squadrons, and civil engineering squadrons have all deployed in support of overseas contingency operations. Finally, after the attacks of 11 September 2001, the nation tasked the ANG to restart the ASA mission; currently, it operates 16 of the 18 ASA sites. Clearly, as the chief of staff of the Air Force stated, "The Air National Guard is indispensible. . . . [It] is integral to the total

force. . . . The scale has tipped to the Air National Guard as an operational reserve."[21]

The increased operational use of reserve forces culminated in Department of Defense Directive (DODD) 1200.17, *Managing the Reserve Components as an Operational Force*, signed by the secretary of defense on 28 October 2008. This document recognizes the RCs as part of the Total Force, emphasizing that "it is DoD policy that . . . the RCs provide operational capabilities and strategic depth to meet U.S. defense requirements across the full spectrum of conflict" while providing a "connection to and commitment of the American public."[22]

The Evolving Air National Guard: Materiel

Acknowledging use of the RC as an operational force, however, has not translated into a concomitant procurement strategy. Since its inception, the Air Force has continually acquired new aircraft and equipment, passing the old (and generally inferior) models to the RC. For example, as the AC upgraded its second-generation F-102s and F-106s to third-generation F-4s, it passed the older aircraft—those with limited ability to support existing war plans—to the ANG for single-mission tasking in air defense. Once the fourth-generation fighters came on line (F-15s and F-16s), those F-4s went to the ANG. Recapitalization of the fighter fleet in this manner is indicative of the now-outdated notion of the ANG as a mere strategic reserve.

Nevertheless, the trickle-down pattern continues as the Air Force recapitalizes or inactivates squadrons. For example, AC F-16s progressed from Block 10 to 15, 25, 30, 40, and 50, yet only one ANG unit currently flies the Block 50.[23] F-15Cs/Ds replaced F-15As/Bs, and the F-15E production line ended with all of the jets in AC squadrons.[24] In seven AC squadrons, F-22s replaced F-15Cs, many of which flowed to the ANG. Even though the AC has no Block 25s or Block 30s in its inventory the ANG still has Block 25 and 30 F-16 squadrons.

The F-22, however, presents an illustrative case. Air Force procurement of 381 F-22s to fulfill the requirement (reduced from the 750 called for originally) would have greatly alleviated the acute issue of ANG recapitalization. Concepts proposed for equipping the ANG with the F-22 included a plan that would have better supported air defense operations by replacing older aircraft in the four corners of the United States.[25] As it stands, only two ANG units will fly the F-22. The Virginia ANG now flies it in a classic association with an AC unit at Langley AFB, Virginia. In this type of association, the Air Force maintains possession of the aircraft, and ANG personnel fly and maintain it alongside the AC owners. The Hawaii ANG will receive hand-me-down F-22s during fiscal year 2012 with traditional unit ownership of the airframes.

The F-35 program further illustrates the need for concurrent and proportional recapitalization. The plan to recapitalize current ANG fighters follows the pattern outlined above, and the operational risk shouldered by the ANG renders the plan dangerously slow. According to the Government Accountability Office, 11 of 18 ASA units will age out prior to receiving new aircraft.[26] The current F-35 fielding program may be *proportional* in the long run (fig. 3) since the percentage of fighter force structure in the AC and RC is roughly equal at the beginning and end of the program, but it is decidedly not *concurrent* since in the near term the RC loses a disproportionate percentage of aircraft. The chief risk for the ANG, therefore, lies in the possibility of the Air Force's curtailing the F-35 program short of reaching the goal of 1,763 aircraft.

These fears are not unfounded. If history is a guide, then actual F-35 procurement will likely involve far fewer aircraft than the 1,763 currently planned.[27] With the exception of the F-117, the United States has drastically reduced its planned

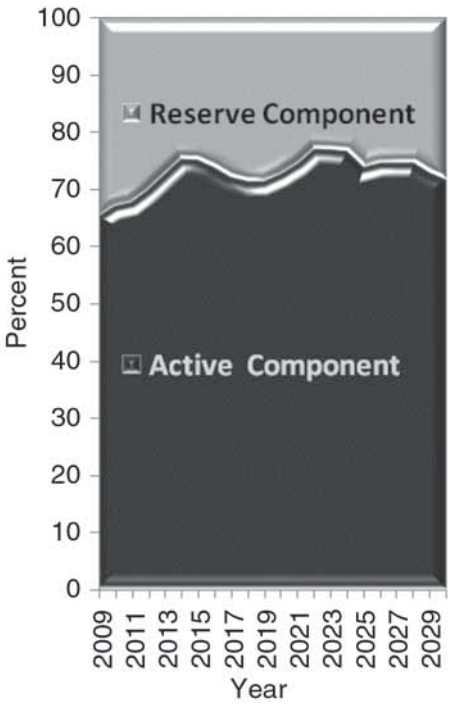

Figure 3. Percentage of fighter force in the active and reserve components. (From National Guard Bureau / Strategic Planning.)

acquisition of low-observable aircraft. The F-117 program saw 59 operational aircraft purchased following a planned procurement of 20.[28] The B-2 and the F-22 programs, however, saw 20 for 132 and 187 for 750, respectively.[29] If a reduced buy occurs, with a consequent delay in the ANG's recapitalization, the ANG cannot sustain current missions, including ASA. The Air Force's need for the RC as an operational force presents the nation with a dire situation—one analogous to an era when the ANG flew outmoded aircraft neither credible enough to deter the nation's enemies nor able to defeat them if deterrence failed. As Secretary Gates said, "The role of the National Guard in America's defense has transformed from being a strategic reserve to being part of the pool of forces available for deployments."[30]

Impact

The impending ANG fighter gap is a symptom of a larger problem—suboptimal fielding decisions on behalf of the DOD and Air Force. As demonstrated earlier, these plans, based on the outdated perception of the RC as solely a strategic reserve, typically replaced RC equipment with hand-me-down equipment from the AC as the latter received newer systems. As illustrated above, the Total Force has abandoned the notion of the RC as a simple strategic reserve or single-mission air defense force; rather, the AC increasingly uses the RC as an operational force and shock absorber for surging demands. In most contemporary cases, the RC is an instrumental part of the frontline fighting force. Yet, even though use of the RC has steadily increased, funding and equipping of the force follows the historical paradigm.

According to Secretary of the Air Force Michael B. Donley and Chief of Staff of the Air Force Gen Norton A. Schwartz, "Our FY10 budget proposal *accelerates the integration of our Guard and Reserve components into new and emerging mission sets, including unmanned aerial systems, F-22 and F-35 missions*. By considering Air National Guard and Air Force Reserve Command for inclusion in emerging mission areas and basing strategies, *we capitalize on the experience and unique skill sets that our Air Reserve Components contribute to the Total Force*" (emphasis added).[31] Despite such Total Force language highlighting the critical and indispensible contribution of the RC, the AC has yet to match words with action—especially in the realm of recapitalization. Ostensibly done to maintain equities in the AC—perceived by senior leaders as the most accessible and responsive part of the force—recapitalization plans based on anachronistic notions of a strategic reserve hurt the Total Force in several ways.[32] For the RC, these plans predictably reduce the component's access to the newest equipment, ultimately reducing its ability to carry out its missions at home and

abroad. The post-9/11 buildup to Iraqi Freedom offers a telling example of this condition.

At that time, the ANG operated most of the Block 30 F-16s. These aircraft lacked critical capabilities for delivering precision-guided munitions increasingly desired by commanders for Operations Northern and Southern Watch. Unable to receive targeting pods from the AC due to budget priorities, the ANG ultimately defined its own requirement for a precision air-targeting system, which led to procurement of the Litening II advanced targeting pod, funded by the National Guard.[33] Additionally, the ANG solved a dearth of data-link capability by fielding the Situational Awareness Data Link. These systems enabled the ANG Block 30 fleet to provide necessary capabilities to combatant commanders, leading to significant ANG participation in ASA, Enduring Freedom, and Iraqi Freedom. Without these National Guard purchases, the ANG's capabilities deficit would have rendered it less effective as an operational force.

For the AC, reduced RC capabilities require that it shoulder a greater burden in terms of missions and tasks. Additionally, recapitalization plans based on historic notions threaten the AC's control over its own acquisition and force-structure programs by invoking the ire of interested parties such as Congress. Evidence of this occurs in the following example of legislative language:

> None of the funds provided in title III of this Act may be obligated for F-16 aircraft modifications until the Secretary of the Air Force submits a report to the congressional defense committees detailing a plan to assign, no later than the first quarter of fiscal year 2002, F-16 Block 40 aircraft, or later model F-16 aircraft, to Air National Guard units which were deployed to Operation Desert Storm.[34]

Only two ANG F-16 units deployed to Operation Desert Storm, one of them the 174th Fighter Wing, New York ANG. Following their return from the Middle East, both units received later-model F-16s. During 1999, ostensibly to open a training base at another Guard base, the 174th swapped its Block 30 F-16s with older Block 25 models from another unit. The New York congressional delegation responded quickly with the statement quoted above. Essentially the New York representatives held every active, Guard, and Reserve F-16 hostage until they received a commitment to upgrade the 174th Fighter Wing. The language that ultimately became part of the act was less severe, but the delegation got its message across: in 2002 the 174th received later-model F-16s, as well as the Sniper Advanced Targeting Pod, and retired the Block 25s.[35]

Members of Congress are willing to engage when they see constituents negatively affected by bureaucracy. As ANG aircraft age and become less relevant against increasingly sophisticated global threats, Congress will likely act, and the results will satisfy only the locals. Procurement of the F-15E Strike Eagle offers another example. Boeing/McDonnell-Douglas delivered 209 F-15Es between 1987 and 1994.[36] Sales then shifted to foreign buyers. During the 1996 to 2001 funding cycles, threatened with a termination of the F-15 production line (and loss of 5,000 jobs), Congress forced an additional 36 F-15Es on a reluctant Air Force. During 1999, Congress funded five additional F-15Es even though the Air Force had not requested any.[37] Of the $220 million appropriated for these aircraft, $70 million came from a reduction in the maintenance budget.[38]

Current, similar examples threaten the Air Force's ability to reap cost savings from the early retirement of legacy systems. Such savings could provide funds to boost F-35 production significantly or develop emerging missions.[39] If the Air Force is convinced that the future of the fighter force lies with the F-35, can it afford to accept new F-16s or even a 4.5-generation fighter like the F/A-18E Super Hornet?

Additionally, the ANG is home to some of the most experienced pilots in the Air Force. The current recapitalization plan allows ANG aircraft to age out prior to replacement, effectively reducing aircraft inventory below the level needed to sus-

tain pilot proficiency. The ANG is a storehouse of flying experience that allows the Air Force to retain expertise while developing new pilots. Without aircraft, severe consequences such as a loss of experience caused by reduced pilot absorption ripples across the Total Force, and initiatives designed to capture the efficiencies of the ANG come to an abrupt halt. Even a proportional recapitalization arrives too late to save the real value of the unit—its people and their experience. DODD 1200.17 mandates cross-component assignments integrating the AC and RC. The current recapitalization plan negates this integration for the entire fighter community unless the Air Force concurrently equips both components with similar capabilities.[40]

The final AC issue becomes one of cost-effectiveness and efficiency. Specifically, both the Government Accountability Office and the Commission on the National Guard and Reserves have found that the average ANG unit operates at approximately 25 percent of the cost of its AC counterpart.[41] Comparing the capabilities that the ANG provides to the Total Force (30 percent) to its portion of the overall Air Force budget (6 percent) presents further evidence of the efficiencies of the ANG.[42] Admittedly, these figures do not reduce the cost of procuring F-35s, but planning their beddown in the Air Force's most cost-efficient franchise seems a prudent move, based on current fiscal realities.

Conclusion: Concurrent and Proportional Recapitalization Will Minimize and/or Eliminate the Negative Effects of the Current Plan

The Air Force can attain the twin goals of concurrency and proportionality without additional monetary investment. It needs only the imagination and will to create a new road map that addresses the concerns discussed above. Critical to this map is commitment on the part of the Air Force to agree to a desired AC/RC fighter force mix and apportion the corresponding percentage to each component each year. This is not necessary early in the program since the majority of aircraft must be coded for testing and training. For example, assuming that the current ANG-to-AC proportion remains constant (approximately one to three), a production of 80 operational aircraft should see 24 of them programmed to recapitalize ANG units, with the remaining 56 flowing to the Air Force. Additionally, to meet the understandable desires of overseas units, the service could generate more operational units faster by initially recapitalizing squadrons in units of 18 versus 24 aircraft.[43] Once each scheduled squadron has reached the 18-aircraft threshold, the Air Force could revisit locations where it desires 24 aircraft.

The Total Force benefits when the ANG can better execute its responsibilities as an operational force and support the Air Force's surge requirements. To ensure that the ANG retains this ability, it must maintain interoperable equipment, which requires concurrent and proportional fielding of new weapons systems. This article demonstrates that immediately commencing concurrent and proportional recapitalization of the RC will allow the Air Force to continue to use the RC as it has done during the past 19 years.

Concurrent and proportional recapitalization also benefits the service in terms of creating a trickle-down effect for the future and the possibility of preventing another ANG capability gap 40 years from now. Contemporary recapitalization choices affect future recapitalization. Concurrent and proportional recapitalization today prevents future leaders from facing the same problem tomorrow.

The authors recognize the inevitable criticism that this article will engender, likely leading to claims that an outmoded ANG fighter mafia is seeking to maintain a foothold in a dying mission area. This is not the case, however, since the authors

merely seek the most efficient manner of fulfilling national security objectives. Concurrent recapitalization is neither a new nor an unusual concept with respect to the AC and RC. In fact, it has occasionally been the norm in the airlift community. As early as 1979, the ANG recapitalized C-130A aircraft with brand-new, off-the-assembly-line C-130Hs.[44]

The director of the ANG recently stated that the Air Force—therefore the ANG—will operate fewer fighters in the future.[45] This is a given; however, the ANG should maintain its fighter-force equities in proportions similar to the presidential budget prior to fiscal year 2010 (approximately one-third). Additionally, the concurrency and proportionality arguments made in this article apply to procurement efforts outside the current fighter debate. Specifically, the concepts described should extend to recapitalization plans that will soon emerge for the C-130 and KC-X, as well as current discussions on the Air Force's transition of all MQ-1s to the ANG to create room for AC procurement of newer MQ-9s.

Areas for Future Study

The Air Force should conduct a new operational analysis to better identify specific numbers of fighters required to meet the nation's security objectives. By definition, this study should be informed by the final QDR recommendations and emerging national military strategy. Next, the Total Force—that is, all of the services—must arrive at a common definition of service life, especially with the fielding of the triservice F-35. Moreover, in this area, the addition of reliable costing data for Service Life Extension Programs (SLEP) and modernization programs would offer leaders better information with which to make investment decisions. Before embarking on a SLEP, given the emerging threats, Air Force leaders must determine how long the existing legacy fighter fleet will remain relevant. Such a determination informs both the SLEP and modernization programs. Finally, this article highlights the need to determine the appropriate force-structure mix between AC and RC forces. Previous studies have done an admirable job of discussing the variables that affect such a mix, but more research is necessary regarding the particulars of how this mix should vary among mission sets and how steady-state, deploy-to-dwell ratios should affect the percentages. ✪

Washington, DC

Notes

1. House, *Department of the Air Force, Presentation to the House Armed Services Committee, United States House of Representatives, Fiscal Year 2010 Air Force Posture Statement, the Honorable Michael B. Donley, Secretary of the Air Force, and General Norton A. Schwartz, Chief of Staff, United States Air Force*, 111th Cong., 1st sess., 19 May 2009, http://www.posturestatement.af.mil/. Hereafter *Fiscal Year 2010 Air Force Posture Statement*.

2. Audrey Kurth Cronin and James M. Ludes, eds., *Attacking Terrorism: Elements of a Grand Strategy* (Washington, DC: Georgetown University Press, 2004), 292.

3. Several sources point to the cost-effectiveness of the ANG, compared to similar Air Force units. See US Government Accountability Office, *Military Personnel: DOD Needs to Establish a Strategy and Improve Transparency over Reserve and National Guard Compensation to Manage Significant Growth in Cost* (Washington, DC: Government Accountability Office, 2007), 21, 41; and US Commission on the National Guard and Reserves, *Transforming the National Guard and Reserves: Final Report to Congress and the Secretary of Defense* (Arlington, VA: Commission on the National Guard and Reserves, 31 January 2008), 65–68.

4. "The Air Force in Facts and Figures," *Air Force Magazine* 92, no. 5 (May 2009): 48, http://www.airforce-magazine.com/MagazineArchive/Pages/2009/May%202009/0509cover.aspx (accessed 10 December 2009).

5. The claims made in this article have their basis in the latest F-35 fielding plans of Air Combat Command. Recent initiatives by the Strategic Basing

Executive Steering Group, led by Assistant Secretary of the Air Force, Installations, have indicated that several ANG bases are candidates for F-35 fielding. A listing as possible candidate bases, however, does not constitute a definitive commitment on behalf of the Air Force to address ANG recapitalization needs.

6. Given the limited size of the forces available, even with fifth-generation capability, the United States would have trouble deterring or defeating a determined and growing Chinese fourth-generation fighter threat supporting a Taiwan Strait expedition. See Frank Camm et al., *Managing Risk in USAF Force Planning* (Santa Monica, CA: RAND, 2009), http://www.rand.org/pubs/monographs/2009/RAND_MG827.pdf (accessed 10 December 2009).

7. John A. Tirpak, "Fighter of the Future," *Air Force Magazine* 92, no. 7 (July 2009): 22–27, http://www.airforce-magazine.com/MagazineArchive/Pages/2009/July%202009/0709cover.aspx (accessed 10 December 2009).

8. Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001 (as amended through 19 August 2009), http://www.dtic.mil/doctrine/jel/doddict/data/m/10567.html (accessed 9 September 2009).

9. Secretary of Defense Robert Gates asks, "Where on earth would we do that?" Robert M. Gates, "A Balanced Strategy: Reprogramming the Pentagon for a New Age," *Foreign Affairs* 88, no. 1 (January/February 2009): 34.

10. The reduction of F-22s from 381 to 183 (now 187) reflected an acceptance of moderate risk in favor of low risk. See Norton A. Schwartz (remarks, Defense Writers Group, Washington, DC, 17 February 2009), http://www.airforce-magazine.com/DWG/Pages/default.aspx (accessed 10 December 2009). Presumably, the same argument holds true about any reduction of the overall Air Force fighter fleet requirement below 2,250 aircraft (assuming that the F-35 buy proceeds at the planned 1,763 aircraft). "The Air Force position remains that a 2250 combat aircraft inventory is the required force." See Senate, *Lt Gen Donald J. Hoffman, SAF/AQ, and Lt Gen Daniel J. Darnell, AF/3/5, Presentation to the Senate Armed Services Committee, Airland Subcommittee: Aviation Programs*, 110th Cong., 2d sess., 9 April 2008, http://armed-services.senate.gov/statemnt/2008/April/Hoffman-Darnell%2004-09-08.pdf (accessed 6 October 2009). The House debated a reporting requirement based upon a projected shortfall of the "2,200" requirement. See *National Defense Authorization Act of 2010*, HR 2647, 111th Cong., 1st sess., *Congressional Record* 155 (25 June 2009): H7265.

11. Chief of Staff of the Air Force Gen Norton A. Schwartz testified that the Air Force's plan to field 2,250 fighters is under review. "Air Force Need for F-35s Is under Review," *Government Executive*, 3 June 2009, http://www.govexec.com/dailyfed/0609/060309cdpm1.htm (accessed 11 December 2009).

12. Each vendor and/or system program office has a different AFH-to-EFH correction factor for each specific model of aircraft.

13. For the purposes of this article, the term *AC* refers to the regular Air Force. The term *reserve component* (RC) indicates both the ANG and Air Force Reserve. The term *Total Force* includes both the AC and RC.

14. There were 70 ANG fighter squadrons at the time.

15. Susan Rosenfeld and Charles J. Gross, *The Air National Guard at 60: A History* ([Arlington, VA]: Air National Guard, 2008), 9.

16. Throughout the Cold War, the Air Force had the capacity to maintain a dedicated home-station alert force in addition to its "wartime" force structure since it had 36 fighter wing equivalents. This option no longer exists because capacity diminished rapidly to 20 fighter wing equivalents after the Cold War. See Adam J. Hebert, "Eighty-Six Combat Wings," *Air Force Magazine* 89, no. 12 (December 2006): 25–29, http://www.airforce-magazine.com/MagazineArchive/Pages/2006/December%202006/1206wings.aspx (accessed 22 September 2009).

17. Rosenfeld and Gross, *Air National Guard at 60*, 16.

18. Gen T. Michael Moseley, *Operation Iraqi Freedom—By the Numbers* (Shaw AFB, SC: US Central Command Air Forces, 30 April 2003), 3, http://www.globalsecurity.org/military/library/report/2003/uscentaf_oif_report_30apr2003.pdf (accessed 17 September 2009).

19. Ibid., 4.

20. Personal communication with National Guard Bureau, Directorate of Intelligence, Surveillance, and Reconnaissance, 29 October 2009.

21. Gen Norton A. Schwartz (remarks, 131st Annual Meeting of the National Guard Association of the United States General Conference, Nashville, TN, 12 September 2009).

22. Department of Defense Directive (DODD) 1200.17, *Managing the Reserve Components as an Operational Force*, 29 October 2008, 1, 2, http://www.dtic.mil/whs/directives/corres/pdf/120017p.pdf (accessed 10 December 2009).

23. "Lockheed Martin F-16CJ/DJ Block 50D/Block 52D Fighting Falcon," Jane's Information Group, http://www.janes.com/articles/Janes-Electronic-Mission-Aircraft/Lockheed-Martin-F-16CJ-DJ-Block-50D-Block-52D-Fighting-Falcon-United-States.html/ (accessed 11 December 2009).

24. "United States—Air Force [Order of Battle]" Jane's Information Group, http://www8.janes.com/Search/documentView.do?docId=/content1/janesdata/binder/jwaf/jwafa297.htm@current&pageSelected=allJanes&backPath=http://search.janes.com/Search&Prod_Name=JWAF&keyword=#toclink-j0011040007747 (accessed 29 October 2009).

25. Senate, *Statement of Hon. Michael W. Wynne, Secretary of the Air Force, U.S. Senate, Subcommittee of the Committee on Appropriations*, 110th Cong., 2d sess., 12 March 2008, http://www.gpo.gov/fdsys/pkg/CHRG-110shrg11069104293/html/CHRG-110shrg11069104293.htm (accessed 29 October 2009).

26. Davi M. D'Agostino, *Homeland Defense: Actions Needed to Improve Management of Air Sovereignty Alert Operations to Protect U.S. Airspace* (Washington, DC: US Government Accountability Office, 2009), 27, http://purl.access.gpo.gov/GPO/LPS114056 (accessed 11 December 2009).

27. Already, emerging strategy proposals are advocating reduced F-35 procurement. Thomas P. Ehrhard, *An Air Force Strategy for the Long Haul* (Washington, DC: Center for Strategic and Budgetary Assessments, 2009).

28. Barry Watts, *The F-22 Program in Retrospect*, CSBA Backgrounder: Strategy for the Long Haul (Washington, DC: Center for Strategic and Budgetary Assessments, August 2009), 11, http://www.csbaonline.org/4Publications/PubLibrary/B.20090908.F-22_Program_in_Re/B.20090908.F-22_Program_in_Re.pdf (accessed 11 December 2009).

29. Ibid.

30. Senate, *Statement on DOD Challenges Submitted to the Senate Armed Services Committee by Secretary of Defense Robert M. Gates*, 111th Cong., 1st sess., 27 January 2009, http://www.defenselink.mil/speeches/speech.aspx?speechid=1337 (accessed 22 September 2009).

31. *Fiscal Year 2010 Air Force Posture Statement*.

32. Albert A. Robbert, William A. Williams, and Cynthia R. Cook, *Principles for Determining the Air Force Active/Reserve Mix* (Santa Monica, CA: RAND, 1999), 11, http://www.rand.org/pubs/monograph_reports/2007/MR1091.pdf (accessed 11 December 2009).

33. The National Guard made this purchase using the National Guard and Reserves Equipment Account and specific congressional additions to the National Defense Appropriations Act. The National Guard determined that the planned AC-to-RC cascade of low-altitude navigation and targeting infrared for night (LANTIRN) pods did not add sufficient capability to the ANG's F-16 fleet. DOD policy now restricts such purchases to the parent service. National Guard Association of the United States, "NGAUS 101: Resourcing the National Guard or 'The Color of Money'" (Washington, DC: NGAUS, 2009), 4, http://www.ngaus.org/ngaus/files/ccLibraryFiles/Filename/000000004992/NGAUS%20101%20Resourcing%20the%20National%20Guard.pdf (accessed 16 September 2009).

34. *Department of Defense Appropriations Act, 2001*, HR 4576, 106th Cong., 2d sess., *Congressional Record*, 7 June 2000, sec. 8110, H4010, http://www.globalsecurity.org/military/library/congress/2000_rpt/hr4576-h.htm (accessed 10 December 2009).

35. The following is the final language in the act: "SEC. 132. REPORT ON MODERNIZATION OF AIR NATIONAL GUARD F-16A UNITS. The Secretary of the Air Force shall, not later than February 1, 2001, submit to Congress a plan to modernize and upgrade the combat capabilities of those Air National Guard units that, as of the date of the enactment of this Act, are assigned F-16A aircraft so that those units can be deployed as part of Air Expeditionary Forces." *Floyd D. Spence National Defense Authorization Act of 2001*, Public Law 106-398, 106th Cong., 2d sess., 30 October 2000.

36. "Boeing F-15E Eagle," Jane's Information Group, http://www.janes.com/articles/Janes-All-the-Worlds-Aircraft/Boeing-F-15E-Eagle-United-States.html (accessed 11 December 2009).

37. United Press International, "F-22 Endures Cut, F-15 Gets Funds," 7 October 1999.

38. Sgt Jon Soucy, USA, "Wyatt Says Air Guard Faces Capitalization Issues," *National Guard News*, 29 July 2009, http://www.ng.mil/news/archives/2009/07/072909-Wyatt.aspx?src-rss (accessed 3 September 2009).

39. The following language was debated in the House version of the National Defense Authorization Act for fiscal year 2010: "Not later than 90 days after the enactment of this Act, the Secretary of Defense shall submit to the congressional defense committees a report on 4.5 generation fighter aircraft procurement. The report shall include the following . . . (6) A discussion regarding the availability and feasibility of F-35s in fiscal years 2015 through fiscal year 2025 to *proportionally* and *concurrently* recapitalize the Air National Guard" (emphasis added). In addition to the report on 4.5-generation aircraft, the House debated language both prohibiting the retirement of "any fighter aircraft pursuant to the Combat Air Forces restructuring plan" and requiring that "at least $344,600,000 shall be expended for continued operation and maintenance of the 249 fighter aircraft scheduled for retirement in fiscal year 2010 pursuant to such restructuring plan." *National Defense Authorization Act of 2010*, H7265, 7300.

40. DODD 1200.17, *Managing the Reserve Components as an Operational Force*, enclosure at 10.i.

41. US Government Accountability Office, *Military Personnel*, 21, 41; and Commission on the National Guard and Reserves, *Transforming the National Guard and Reserves*, 65–68.

42. The 30 percent capability is the ANG's total aircraft inventory (1,213) divided by AC's total aircraft inventory (3,990). The 6 percent figure comes from an analysis of the ANG budget and the total Air Force budget. For a complete breakdown of the analysis, see Commission on the National Guard and Reserves, *Transforming the National Guard and Reserves*, 65n2.

43. Acknowledging the capability increase of fifth-generation aircraft over their fourth-generation cousins gives an additional boost to the concept of a standard AC squadron size of 18 aircraft. See Hebert, "Eighty-Six Combat Wings."

44. Rosenfeld and Gross, *Air National Guard at 60*, 14.

45. Lt Gen Harry M. Wyatt, director of the Air National Guard (remarks, 131st Annual Meeting of the National Guard Association of the United States General Conference, Nashville, TN, 13 September 2009).

A Cyber Proving Ground

The Search for Cyber Genius

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The search for cyber leadership has followed standard military protocols: officers with proven worth in their respective fields have risen to senior ranks and assumed leadership positions in the "cyber mission." Success in the traditional war paradigm, however, does not necessarily equate to success in the cyber realm. Nor does military genius based on Clausewitzian parameters necessarily manifest itself as cyber genius.

I propose a new approach to unlocking potential cyber genius, not on a Clausewitzian battlefield but within the cyber realm itself. This approach derives loosely from the Army's Aberdeen Proving Grounds and involves development of a comparable Cyber Proving Ground (CPG) system. CPGs could allow the US military and other government agencies to discover untapped talent capable of leading and defending America's interests in the cyber realm. I do not suggest that Clausewitzian genius is no longer applicable in an age of cyber warfare, only that it is not necessarily transferable from physical battlefields to cyberspace. Cyber genius does not depend upon the trinity of war, and the US military should not use Clausewitzian standards to search for the Napoléon of cyberspace.

Carl von Clausewitz defined genius as "a very highly developed mental aptitude for a particular occupation" and used it to differentiate between competent and great military commanders.[1] Although genius is an easy trait to describe, Clausewitz asserted that it was exceedingly rare and emerged only during the violence of warfare. He thought that great military genius could not arise without the "paradoxical trinity" of war; specifically, violence, chance, and subordination to policy govern war and its military leaders.[2]

The advent of the cyber domain, however, defies Clausewitzian notions of military genius and challenges traditional approaches to command. For example, the physical violence inherent to war does not exist within the cyber realm. Nor do the demands of traditional war: strength, physical courage, and the ability to cope with violent death. The concepts of cyber and virtual conflicts, unfortunately, seem too abstract for many military leaders to comprehend. Instead, their responses remain consistent with previous approaches to revolutions in military affairs (RMA): deny the revolution, operate as before, and apply tried and true doctrine of past successful models to the RMA (e.g., one need only look at the evolution of the Air Force). In cyberspace the US military has focused on domination and denial, based on the success of current air, land, and sea doctrines, instead of considering more adaptive approaches that could warrant greater successes but at much greater risks.

Where Is the Next Bobby Fischer?

Clausewitz identified only two true military geniuses: Napoléon Bonaparte and Frederick the Great. Both men demonstrated the necessary coup d'oeil, or strategic insight, and the determination that, according to Clausewitz, defined military

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genius; however, without actual wars to reveal their genius, neither may have secured his place in history.[3] War is a relatively rare occurrence since most states regard it as a last resort of political discourse between nations. Therefore, potential military genius may go undiscovered since very few large, modern wars have occurred to test a multitude of military commanders.

In contrast, cyberspace offers numerous opportunities to discover genius. Instead of seeking rare opportunities to demonstrate this trait, prospects can develop and engage in virtual warfare to challenge their abilities as potential cyber leaders. Unfortunately, current military leaders and the military cyber system in which they operate ignore novel ways of discovering leadership abilities and genius. Rather, they adhere to traditional methods of leadership development, promotion, and command selection as the only appropriate means for determining combat leaders.[4] Although some services have attempted to adopt more innovative approaches to recruiting and training (e.g., America's Army and the Air Force MyBase), a Western approach to imparting knowledge remains inherent in these approaches. According to Dr. Parker Palmer, the dominant model of truth telling and truth knowing involves four major elements (see figure).

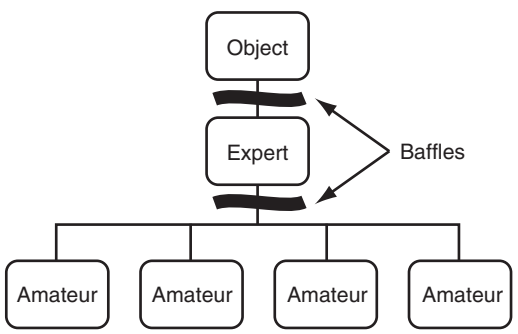

Figure. Elements of truth telling and truth knowing. (Adapted from Parker J. Palmer, *The Courage to Teach: Exploring the Inner Landscape of a Teacher's Life* [San Francisco: Jossey-Bass, 1998], 103.)

Palmer notes that the *object* is the "knowledge that reside[s] . . . somewhere . . . in physical or conceptual space, as described by the 'facts' "; the *experts* are "people trained to know these objects in their pristine form without allowing their own subjectivity" to affect the description of the object. The *amateurs* are "people without training . . . who depend on the experts" to gain knowledge, and the *baffles* occur between the transmissions, serving as the lens through which knowledge flows from the expert to the amateur but usually not in reverse.[5] This model follows the hierarchical model ingrained in the modern US military system and its education system—one that creates tremendous difficulties for any attempt to educate and develop personnel by using new methods that depart from the traditional teacher-student or expert-amateur model. With regard to cyberspace knowledge and experience, though, the paradigm has reversed itself: individuals traditionally considered amateurs or students, based on age and experience, have become the experts. Considered digital or net natives, members of the younger generation, who have grown up surrounded by and using the Internet and associated platforms, are actually teaching members of the older generation, who are digital or net immigrants.

Thus, regarding cyber education, Department of Defense (DOD) leaders must directly challenge the bureaucratic traditions currently embodied by the military services in order to adopt innovative education and training techniques that recognize this shift in the knowledge structure. Similar to civilian organizations that face challenges to their traditional hierarchy, the DOD must "break down deep-rooted biases that inhibit [it] from seizing opportunities to open up innovation."[6] Biases within the DOD's military command and control structure are obvious, beyond the traditional education model employed by the services; that is, officers must meet certain education, age, personal comportment, and physical requirements in order to be considered for command positions. Within each of the ser-

vices, demands for combat experience also limit the pool of potential commanders: fighter pilots dominate Air Force leadership, infantry officers dominate Army leadership, and blue-water ship commanders dominate Navy leadership. Given such self-imposed restrictions on potential leaders, the rarity of Clausewitzian genius comes as no surprise. These stringent standards should not apply to the cyber domain simply because they hinder the DOD's ability to discover and develop cyber genius.[7]

The demand for experts in the highly competitive, continuously evolving world of computer programming, engineering, and cyber applications remains extremely high.[8] The task of finding cyber genius and expertise continues to confront civilian organizations as well as government institutions. In light of this high demand and the challenges of finding and hiring people with the required expertise, any organization seeking to remain competitive must adapt innovative methods for acquiring and retaining this talent. The military, which needs this expertise to remain effective in its national security mission, must seek alternatives to traditional recruiting and education methods that will facilitate the discovery and maturing of cyber genius. If properly developed and nurtured, CPGs not only could mitigate the rarity of genius and provide one method to develop it but also could produce a number of additional benefits. Like the agoras or marketplaces of ancient Athens, modern "ideagoras" "make ideas, inventions, and scientific expertise around the planet accessible."[9]

Based on the concept of an ideagora, CPGs could make diversity of thoughts and ideas an asset to the DOD and other agencies. The ideagora potential inherent in the CPG could provide the next evolution of Goldwater-Nichols.[10] Instead of having to train and practice in the real world at great expense, participants from a multitude of government agencies could interact and train within the CPG, which could easily be a joint military system. The Army's use of a "first person shooter" gaming system to recruit new personnel and the current remotely piloted aircraft systems employed by the Air Force, Army, and Navy establish the military's level of comfort with using cyberspace to enhance performance and mission effectiveness. The CPG could take the military applications of cyberspace to a higher level by incorporating other components within the US government.

Just as participants in the virtual world known as *Second Life* interact with other players via financial and educational applications, so could personnel from multiple agencies interact within military, financial, policing, educational, and infrastructure applications. For example, as members of the military engage in operations such as counterinsurgency, State Department participants can simultaneously involve themselves in establishing government infrastructure. As the CPG adapts to inputs from participants, it can create new challenges for military and State participants. In this example, if military actions taken by DOD personnel result in collateral damage at a nearby school, both the military and State individuals will have to seek a means to overcome backlash from the local population.

This example illustrates a CPG's most obvious benefit: freedom to evaluate a variety of participants continually. In the search for the next cyber genius, a CPG could allow the DOD to test both nonmilitary and military participants—at minimal cost and with much-needed interagency engagement.[11] A CPG could quickly cull marginal or inept participants and promote the more capable ones. With each increasing level of difficulty, the system could narrow the advancing fields while simultaneously evaluating new candidates at introductory levels. A system similar to the "Elo" rating system used in the analog strategies of games like chess and *Go* could track competitors, ranking and bracketing them against each other within the CPG. Participants would receive points based on their performance, which in turn would elevate, sustain, or demote them to the appropriate level of challenge.

Within the world of chess, the Elo ranking system has largely mitigated the as-

sumptions of genius built upon physical successes. In order to reach the level of Clausewitzian genius in the more traditional domains of warfare, one would have to demonstrate physical capability in addition to the mental agility required of coup d'oeil. Someone with perceived physical weaknesses, such as paralysis or even traits associated with gender, could be dismissed outright without any examination of his or her mental ability simply because of the physical demands of traditional warfare. Chess, however, like other games of strategy, relies upon the mental agility and ability of the player to predict an opponent's future moves and has no correlation to physical capability. The demands of cyber operations more closely relate to the rigors of competitive chess than to the rigors of physical combat. In a CPG, the system could measure participants on their performance, similar to the evaluation of chess players.

Failure to learn and adapt could result in an initial denial of "genius" level, but that would not necessarily end the scenario or challenge. The participant could continue to interact with and improve the system as both producer and consumer, or *prosumer*, a term coined by strategist Don Tapscott.[12] Even though a participant may initially fall short of genius-level rating, feedback from the CPG could remediate deficiencies of the individual or group and encourage improved decision-making processes for future conflicts on the cyber battlefield.

In contrast to simulated traditional war games, which fail to replicate the real experience of war, virtual war games will be nearly identical to actual cyber warfare. Thus, the military can safely examine both cyber offensive and defensive tactics in an isolated network environment, an ability that can enable the development of both "attack" and "defense" geniuses. Further, virtual fighting within the CPG would not make the same physical demands on participants. In the CPG system, it will not matter how far or fast someone can run; in fact, he or she may not have to be able to run at all in order to possess genius in the virtual realm created by this system.

Violence Is Inherent in the Traditional System of War

Clausewitz posited that violence is the "first-born son of war."[13] Because of this intrinsic violence, a military genius must possess both physical and moral courage. Cyberspace, however, does not embody or employ violence in the traditional sense. Destruction can occur, but it is neither permanent nor unrecoverable.[14] Destruction in cyberspace, therefore, does not equate to death and defeat. Unlike physical war, cyberspace is not only the medium but also the message.[15] Media theorist Marshall McLuhan suggested that advanced technological communication mediums, such as the Internet or telecommunication systems, have evolved into their own messages to share with the world. Furthermore, McLuhan theorized that evolutions in communication systems would lead to the creation of a global network or village.[16] An enemy cannot permanently destroy cyberspace or eliminate a cyber opponent because they have become too entrenched in McLuhan's global village, with layers of redundancies and ever-increasing dependencies on the cyberspace system. This lack of violence and death enables potential commanders to do something that Clausewitz deemed impossible: purposely discover, learn, and develop genius.

The initial opportunity to develop cyber genius could occur during development of the CPG system. A CPG truly attractive to a variety of participants would need to embrace cutting-edge, "massively multiplayer online role-playing game" (MMORPG) technology with real-world implications and applications. The US government needs to recruit software developers on par with Blizzard or Nintendo programmers in order to develop a viable CPG. It could do so by using the "Goldcorp Challenge."[17] That is, DOD leaders could propose the challenge of

developing a viable CPG on par with the MMORPG *World of Warcraft* or the virtual world *Second Life*, offering a lucrative cash reward along with an implementation contract for the winning format. During the development stage, an integrated product team could be established to allow both DOD and non-DOD personnel to exchange ideas and concepts. The process could result in increased understanding among all parties as well as an interesting and effective simulation.

The notion that one can learn genius resembles Alan Kay's theory that manipulation of "ideas through the medium of the computer would transform the way one thinks."[18] Through a CPG system's iterative process, participants would learn from the system and from one another—a method of teaching and learning posited by Palmer in which the "amateurs" learn about the "object" from each other, allowing them to become "knowers" instead of remaining amateurs.[19] Communities of participants or knowers could exchange ideas and information in efforts to overcome CPG challenges in this ideagora. The mass collaboration among participants and CPG developers would benefit the individuals involved, their respective organizations, and the system itself.

As technology advances, a CPG could evolve into an artificial intelligence system and thus become another form of cyber genius in its own right. As the system interacts with human participants, the CPG could adapt to human responses and craft even more challenging scenarios. Again, the chess world has already demonstrated this possibility with the development of IBM's Deep Blue computer, which defeated world chess champion Garry Kasparov in 1997, the first time a computer had beaten a top-ranked human competitor.[20] (The Elo system had ranked Kasparov number one in the chess world.) This concept, known in the gaming world as "botting," already exists as prosumer gamers develop code to allow automated systems to engage in game play and maximize the human participant's performance.[21] As Kay has theorized and as this new generation of computer programmers has exploited, a learning system "should immediately extrapolate and simulate an idea, offering the user a vision of new worlds and possibilities of his or her own thinking."[22] The CPG would give participants a chance to learn, individually or in groups, and would rank them, based on their abilities, while continually expanding its capabilities. The process could continue as long as the US government employs the system, offering US leaders various options for dealing with potential cyber threats. Context would shape content within the CPG, limited only by human imagination. The CPG could enable humans "to create things that could or couldn't, should or shouldn't, exist."[23]

Conclusion

Within the cyber realm, virtual reality replaces the physical realm, and the traditional knowledge structure has shifted. Violence, the most obvious aspect of traditional war, does not dominate cyberspace conflict. Younger generations possess the knowledge and experience in cyber applications that senior leaders and commanders often lack. CPGs allow commanders to wage actual cyber war with near-instantaneous feedback on successes and failures, speed, clarity, and coup d'oeil while tapping into the experiences and knowledge of their younger subordinates. Genius could reveal itself through this iterative process of in-depth study of past performances, tests, and evaluations. CPGs would allow for continuous assessment of potential cyber commanders and mitigate the physical demands of traditional warfare. Similar to the Elo system of chess ranking, the CPG could assign rankings to participants, based on their performance within the system. Without physical constraints, genius could arise from various backgrounds. Younger, physically or mentally handicapped, elderly, or overweight people; a collection of individuals; or artificial intelligence itself could all develop their own genius beside able-bodied military or nonmilitary leaders. Encouraged

and embraced by their senior leaders, younger generations can step forward to become subject-matter experts.

The cyber realm frees humanity from physical realities associated with traditional war. Within cyberspace, *death is not final*. The discovery of cyber genius does not depend upon actual war; CPGs using an Elo-styled ranking system could quickly discern between commanders with and those without cyber coup d'oeil. CPGs could also continuously evaluate personnel who overcome challenges more effectively while improving the performance of all participants. Just as Clausewitzian genius could arise only on battlefields, so can cyber genius emerge only within the cyber realm. Thus, the search for that genius should take place not on the battlefield but within the cyber domain itself. ✪

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Notes

1. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 100.
2. Ibid., 89.
3. Clausewitz used the French term *coup d'oeil* ("glance") to refer to "the quick recognition of a truth that the mind would ordinarily miss or would perceive only after long study and reflection." Ibid., 102.
4. Paul T. Mitchell and the International Institute for Strategic Studies, *Network Centric Warfare: Coalition Operations in the Age of US Military Primacy* (London: International Institute for Strategic Studies, 2006), 35.
5. Parker J. Palmer, *The Courage to Teach: Exploring the Inner Landscape of a Teacher's Life* (San Francisco: Jossey-Bass, 1998), 102–3.
6. Don Tapscott and Anthony D. Williams, *Wikinomics: How Mass Collaboration Changes Everything* (New York: Portfolio, 2006), 112.
7. Mitchell and the International Institute for Strategic Studies, *Network Centric Warfare*, 35.
8. Tapscott and Williams, *Wikinomics*, 56.
9. Ibid., 98.
10. The Goldwater-Nichols Department of Defense Reorganization Act of 1986 brought numerous changes to the DOD in an attempt to mitigate interservice rivalries by clarifying the roles of the service chiefs and the chairman of the Joint Chiefs of Staff. Established because of failures of the services to communicate effectively during the botched attempt to rescue the Iranian hostages in 1979 and the invasion of Grenada in 1983, the act elucidated the lines of communication between the services and the Office of the Secretary of Defense. Some individuals contend that we need a Goldwater-Nichols II to help streamline communication between the DOD and other government agencies such as the State Department, Department of Energy, and the Central Intelligence Agency.
11. Adam Brate, *Technomanifestos: Visions from the Information Revolutionaries* (New York: Texere, 2002), 217.
12. Tapscott and Williams, *Wikinomics*, 132. Don Tapscott is chief executive of New Paradigm, a think tank and strategy consulting company.
13. Clausewitz, *On War*, 99.
14. See Martin C. Libicki and Rand Corporation, *Conquest in Cyberspace: National Security and Information Warfare* (New York: Cambridge University Press, 2007).
15. Brate, *Technomanifestos*, 195.
16. Ibid., 198.
17. Tapscott and Williams, *Wikinomics*, 9. The Goldcorp Challenge involved efforts by Goldcorp to extract gold from a dying gold mine in Ontario. In 1999 Rob McEwen, chief executive officer of that company, placed all of the geological information from the mine on the Internet and offered $575,000 in prize money to anyone who could figure out how to access the remaining gold. The contestants' identification of 110 substantial deposits of gold transformed Goldcorp from a $100 million company to one worth $9 billion.
18. Ibid., 173.
19. Palmer, *The Courage to Teach*, 102.
20. Dylan Loeb McClain, "Once Again, Machine Beats Human Champion at Chess," *New York Times*, 5 December 2006, http://www.nytimes.com/2006/12/05/crosswords/chess/05cnd-chess.html?_r=1 (accessed 1 December 2009).
21. Most MMORPGs, like *World of Warcraft*, have rules against botting since it gives certain players an unfair advantage over others, particularly in player-versus-player realms.
22. Brate, *Technomanifestos*, 173.
23. Ibid., 177.

The Resurgence of Russian Interests in Central Asia

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On the blogosphere, across the airwaves, and in print, many people have opined about how the Obama administration should approach Afghanistan, Iran, North Korea, and numerous other international and domestic challenges. Despite the air base eviction notice from Kyrgyzstan in February 2009, however, there has been very little public discourse about Central Asia. Practitioners and scholars of airpower realize that access to the region is essential to ongoing operations in Afghanistan. Since Russia has extensive experience in Central Asia and seeks to play a greater role there, analyzing the evolution of its policy toward Central Asia is an important precursor to developing US policy for the region. Indeed, both architects of future engagement strategies and Airmen who ultimately operate within the parameters of such partnerships should seek to grow in their understanding of the nuances of Central Asia. This article does not recommend approaches for US policy—instead, it provides historical understanding to inform policy formulation and execution.

In order to analyze Russia's policy toward Central Asia effectively, one must first understand the Soviet and Russian historical legacy in the region. Following the collapse of the USSR, Russia was initially indifferent—borderline irritated, in fact—toward Central Asia. Not surprisingly, the region's fledgling nations looked for help elsewhere as they ventured out of the Soviet nest. Russia soon became aware that it had lost a great deal of influence in the region, but in the latter half of Pres. Boris Yeltsin's tenure, it regained very little clout since Central Asians perceived a disconnect between Russia's "walk" and "talk." The era of Yeltsin's successor, Vladimir Putin, witnessed both enhanced focus and rigorous reassertion of Russian authority in the region. For each of these three periods, this article analyzes the security, economic, and political aspects of Russian foreign policy toward Central Asia and concisely assesses the results of Russian efforts. Before concluding, it discusses two important developments during Dmitry Medvedev's presidency, a period of assertive Russian foreign policy that is still unfolding.

Historical Development

The term *Central Asia* typically refers to the five former Soviet Republics of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. Russian tsars had conquered the region by the late nineteenth century.[1] The Great Game continued as Russia vied with the British Empire for greater strategic influence in Central and South Asia.[2] Attempting to integrate Central Asia into their own imperial realm, the Russians invested heavily in transportation infrastructure and agriculture; under the Soviet Union, "integration and absorption advanced with new vigor."[3] During the Soviet period, the region's republics supplied resources, served as places of exile, and hosted sites for nuclear testing, the development of biological weapons, and space launches.[4] In 1991 leaders of the Central Asian republics declared independence from the Soviet Union.[5] Since then, rela-

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tions among the Central Asian nations have typically been "limited or frosty," and some nations are "outright hostile" toward each other.[6] These relatively young nations often assume the position of "client states in respect to their former master" even though they are "wary of Moscow's neo-imperial ambitions."[7] Regional experts attribute Russia's lingering influence more to the mixture of proximity, history, and shared culture than to adept foreign policy.[8]

During the new Central Asian nations' first decade of independence, US interests in the region included the security of weapons of mass destruction (WMD), internal reforms, and energy. The United States immediately began ensuring the security of the enormous former Soviet WMD complex; throughout the 1990s, the United States committed billions of dollars in aid to the region, primarily aimed at political and market reforms.[9] But other than Central Asia's "loose nukes," the United States lacked "major interests" during the 1990s; Deputy Secretary of State Strobe Talbott said the United States did not intend to manage regional security and would be content "if the region remained free of great power domination."[10]

Following 9/11, US interests shifted significantly. Toppling the Taliban became the priority, so America sought Muslim partners in the Taliban's "backyard." In preparation for Operation Enduring Freedom, the United States pursued overflight, landing, and basing rights in Central Asia. Basing rights were secured at Manas International Airport near the Kyrgyz capital and at an old Soviet air base near the Uzbek towns of Karshi and Khanabad, 90 miles from the Afghan border.[11] US interests during the Central Asian nations' second decade have been predominantly related to terrorism, with earlier interests in nonproliferation, development, and natural resources decreasing in prominence.

Russia's Policy toward Central Asia in the Early 1990s

From the time the Soviet Union collapsed in 1991 to the mid-1990s, Russia was preoccupied with revolutionary internal reforms and intensely focused on joining Europe. Consequently, Yeltsin had no apparent strategy for Central Asia.[12] A top Kazakh official recalls how Russia "turned its back on Central Asia, seeing it as an obstacle to its quest to join Europe"; Jos Boonstra, European Union–Central Asia Monitoring Project co-chair, concurs that Russia felt Central Asia was a "nuisance that restricted Moscow."[13] Russia's lethargic security, economic, and political policies toward Central Asia during this period embody its annoyance; a summary of the results of these policies reveals that Russia reaped what it sowed.

Russia's security and military cooperation with Central Asia in the early 1990s was typified by very limited rhetoric and even less action. Russia became obligated to several Central Asian states via the Tashkent Collective Security Treaty of 1992, but in practice drastically downsized its military cooperation.[14] Russia's regional border troops and Tajikistan-based 201st Motor Rifle Division were obvious exceptions; that said, these remnants could neither prevent civil war in Tajikistan nor curb the flow of drugs traveling north from Afghanistan.[15] Thus, despite Moscow's announcement of a new regional "Monroe Doctrine," Russia "was neither welcome as a big brother nor capable of playing the role of the regional hegemon."[16] Further demonstrating policy incoherence, Russia assumed the USSR's treaty obligations toward Afghanistan but turned its back on the "Afghan problem," setting the stage for civil war.[17]

Yeltsin's early economic policies toward Central Asia were even more destructive than his dissolution of Russia's southern defense buffer zone. Shock therapy architect Yegor Gaidar forced the Central Asian impediment out of the ruble zone in 1993, leaving the fledgling countries without cur-

rency.[18] While such Russian state practices wreaked havoc, newly formed private Russian companies (e.g., LUKoil, etc.) vigorously pursued business arrangements in Central Asia, especially in the area of natural resources.[19]

Russia's indifference also pervaded its political relationships with Central Asia. Instead of capitalizing on the Commonwealth of Independent States (CIS) as a means for developing cooperation among its former republics, Russia perceived the CIS merely as a tool for overseeing the dissolution of the USSR.[20] Furthermore, Russia ignored Kazakh president Nursultan Nazarbayev's attempt to form a Eurasian Union in 1994.[21]

The proverb "no gardener, no garden!" aptly describes the results of Russia's policy of indifference toward Central Asia in the early 1990s. Due to Russia's virtually nonexistent cultivation in the security, economic, and political realms, it effectively lost the region. The states of Central Asia, lacking military and economic strength and rapidly losing faith in Russia, actively sought "external guarantors of regional security and foreign assistance."[22] In 1994 the countries enrolled in the North Atlantic Treaty Organization's (NATO) Partnership for Peace (PFP) program. In 1995 the defense ministers of Kazakhstan, Kyrgyzstan, and Uzbekistan formed a joint council to assist in coordinating their PFP efforts and constituted the Tsentrazbat (Central Asian Battalion) to conduct PFP training.[23] Russia's significantly reduced level of access to Central Asian natural resources—something it had taken for granted in Soviet days—and heightened awareness that the nations were "throwing off the mantle of the 'little brother'" soon convinced Russia that this "garden" needed a "gardener."[24]

Russia's Policy toward Central Asia in the Late 1990s

During the mid-1990s, Russia's foreign policy took a new direction under new foreign minister Yevgeny Primakov, appointed in 1996. His aim of restoring Russia's regional influence (known to many as "the Primakov doctrine") took precedence over integration with the West.[25] Russia gradually took more interest in the region, perhaps in reaction to the Central Asian nations' ongoing efforts to forge new international relationships "out of necessity."[26] In fact, Primakov wrote that the West was "actively working to prevent Russia from having a special role" in the former Russian republics and accused the West of blocking Russian attempts at a rapprochement with the region.[27]

Developing its slight reawakening toward Central Asia in the latter half of the 1990s, Russia made limited attempts to boost security and defense cooperation with Central Asia. During this time, Islamic radicals had taken control of the Chechen Republic and the Taliban had gained control in Afghanistan, so Russia had become more aware of radical Islam's threat to its national security.[28] The link between Russia and Tajikistan grew slightly stronger when the Tajiks informally granted Russia a basing agreement for the 201st Motor Rifle Division.[29] By the end of 1999, however, border guards were virtually phased out of Kyrgyzstan, and Russian advisers had left Turkmenistan. Adding insult to injury, Uzbekistan pulled out of the Collective Security Treaty, feeling that Russia had not helped stem the Taliban tide.[30] On the whole, Russia's security role declined and mainly centered on "the sale of military supplies, a peace-keeping contingent . . . and coordination with these states over anti-terrorist measures."[31]

Russian efforts to achieve the Primakov doctrine in the economic realm were aimed primarily at hydrocarbon transport. Moscow asserted its "right" to transport Central Asian hydrocarbons across Russian territory and opposed efforts to bypass Russia.[32] But other than limited oil-export collaboration with Kazakhstan and Turkmenistan, Russia did not concentrate on strengthening economic cooperation—in fact, overall trade volume decreased below the level of the early 1990s.[33]

Similarly, Russia made very little effort in the realm of multilateral cooperation

with Central Asia during this period. Relations became strictly bilateral since the CIS had "become ineffective" after accomplishing its purpose of conducting the former republics' "civilised divorce."[34] Russia's only multilateral success story was the resolution of the Tajik civil war in cooperation with Iran and Uzbekistan.[35]

In sum, despite new leadership in the Foreign Ministry, Russia failed to strengthen its position in Central Asia in the late 1990s. Scholars attribute Russian shortfalls to lack of consensus among senior leadership, numerous policy inconsistencies and contradictions (due to the rapid turnover of prime ministers late in Yeltsin's tenure), and economic and military weakness.[36] Russia did not fully grasp the importance of the region to its long-term security or economic interests. Regional experts Vladimir Paramonov and Aleksey Strokov assert that Russian leaders essentially "had it backwards" by thinking that in order to strengthen its position in Central Asia, Russia first needed to "recover its international status."[37] Not surprisingly, the Central Asian nations continued to lose faith in Russia. They did not appreciate how Russia's lofty pronouncements regarding its intentions for Central Asia were rarely converted into sensible actions; furthermore, they recognized Russia's economic and military weakness and continued to rely on their own limited internal resources and external relationships.[38]

Russia's Policy toward Central Asia under Putin

Under Putin's leadership, Russian policy toward Central Asia markedly changed from the rhetoric largely unaccompanied by actions of the 1990s to a more determined, proactive approach. Boonstra explains that Russia perceives the 1990s as merely a "brief interval of lack of influence" in the region against the broad historical timeline including Imperial Russia and the Soviet Union.[39] Putin affirmed that Central Asia "constitutes a major foreign policy priority and a zone of Russian national interests," reflecting the Russian belief that "while the Americans are here now, we are in the region for ever."[40] In the Putin era, Russia began aligning its words regarding the need for close cooperation with its actions but did not achieve unequivocal success.

Russia's activism in the realm of military and security cooperation in the Putin years heralds an aspiring hegemon awakening after a long hibernation—attempting to "make up for lost time" and frustrated with outside influences in its domain. In April 2000, Russia led members of the Collective Security Treaty in creating rapid-reaction forces to combat terrorism; in 2001 Russia established the Kyrgyz branch of Moscow's CIS Anti-Terrorism Center.[41] Following 9/11, Putin justified American presence in the region as a helpful defense against the Taliban and the Islamic Movement of Uzbekistan—clear threats to Russian interests.[42] Roy Allison explains that Russia's initial acquiescence to US presence soon devolved into a "sense of grievance and zero-sum thinking" among elites concerned about Russia's "strategic displacement" from Central Asia.[43] He cites Russia's opening of Kant Air Base in Kyrgyzstan in October 2003 as "the most prominent example of the Russian interest in reconstituting at least some trappings of a forward security zone in Central Asia under the mantle of collective security."[44] Russia also seized the moment when Uzbek-US relations soured in the wake of the Andijon massacre, signing a "Treaty on Allied Relations" with Uzbekistan in November 2005.[45]

Under Putin's leadership, Russia also reasserted its economic interests in Central Asia, especially regarding hydrocarbons. Allison contends that Russia views these resources as "both a strategic asset and a strategic instrument."[46] As an asset, Central Asian hydrocarbons are vital for Russia's trade with Europe, the main importer of Russian energy resources.[47] For example, gas exports from Turkmenistan and Uzbekistan supplied Russia's domestic market at very low prices, enabling Russia to sell its Western Siberian gas to Europe at much

higher prices (e.g., $100 per 1,000 cubic meters versus $250 per 1,000 cubic meters).[48]

With regard to viewing hydrocarbons as an instrument, Russia's monopoly on export pipelines enables Moscow to pressure Central Asian states to yield control of their hydrocarbons. The 2007–30 plan published by Russia's Institute of Energy Strategy unambiguously states that "Russian control over a large share of Central Asian gas needs to be maintained."[49] Stephen Blank, professor of national security at the US Army War College, contends that Russia's recent claim that it has no imperialistic intentions in Central Asia does not mesh with the facts. That is, its pipeline monopoly allows Moscow to pay far below market price for gas; Russian unwillingness to invest in the industry prevents suppliers from competing on a global scale; and attempts by suppliers to diversify export routes are seen as "a threat to [Russian] vital interests."[50] Foreign Minister Sergei Lavrov has even threatened to use "every conceivable economic pressure tactic" against uncooperative CIS regimes.[51]

The Russians also reasserted influence in Central Asia by establishing and actively participating in several multilateral organizations. Boonstra explains that the Kremlin perceived stability in Central Asia as a guarantor of Russian national security and intended to build stability through a "variety of regional organisations that overlap in membership and purpose."[52] The Collective Security Treaty Organization (CSTO), Eurasian Economic Community (EurAsEc), and Shanghai Cooperation Organization (SCO) exemplify Russian attempts to meet this objective.

Formed in 2002, the CSTO has its roots in the Tashkent Treaty of 1992, mentioned above.[53] Paramonov and Strokov's review of Russia's leadership of CSTO activities from 2002 to 2007 provides ample evidence in support of other scholars' assertions that Russia used the CSTO as a counter to NATO.[54] Russia, Belarus, Kazakhstan, Kyrgyzstan, and Tajikistan signed the EurAsEc Treaty in 2000 to facilitate trade among member nations; after observing EurAsEc's substantial progress, Uzbekistan joined in 2006.[55] The SCO was formed after 9/11 when Uzbekistan joined the "Shanghai Five" countries (China, Russia, Kazakhstan, Kyrgyzstan, and Tajikistan). The Shanghai Five was originally formed to help "demilitarize the border between China and the former Soviet Union," but the SCO has pursued a much broader agenda, including terrorism, trade, and trafficking.[56] Russia collaborated with China to use the SCO to curb US influence in Central Asia, flying in the face of airpower's ability to contribute to coalition operations in Afghanistan. In 2005 Russia expressed its discomfort with American air bases (Karshi-Khanabad and Manas) by encouraging the SCO to demand that the United States develop a timeline for its withdrawal from the region.[57]

Russian policy toward Central Asia under Putin had mixed results. On the one hand, Russia regained some of the confidence lost during Yeltsin's tenure through its more stable, pragmatic, and well-funded policies.[58] Catering to Central Asian autocrats' heartfelt vulnerability in light of Saddam Hussein's overthrow and Georgia's Rose Revolution, Russian policy makers portrayed their "image as a traditional, reliable partner."[59] On the other hand, Russia's consistent, paternalistic attitude toward its "unequal partner[s]" has been harshly criticized by some of the region's leaders.[60] Furthermore, scholars have noted that Russia perceived the geostrategic importance of the region too narrowly—as a mere tool for reviving its great-power status and securing its energy supply.[61]

Recent Developments

Putin protégé Medvedev took up his mentor's mantle in May 2008. Putin has played an active role in foreign policy from his current position as prime minister, so Russia's ongoing activist stance toward Central Asia can be seen simply as a continuation of the policies of his presidency. Since the Medvedev presidency is still arguably in its infancy, it is too early to fully analyze

the results of Russian policy toward Central Asia under his leadership. Nonetheless, a brief examination of his "Foreign Policy Concept" (FPC) and an assessment of Russia's recent ambivalent posture toward operations in Afghanistan will prove useful to US policy makers.

The July 2008 FPC, a document similar in nature to the US national security strategy, resounds with Russia's perceived resurgence in both global aspirations and responsibilities near abroad. The FPC asserts a "real capacity to play a well-deserved role globally" as one of the "influential centers in the modern world."[62] One of Russia's chief foreign policy objectives, per the FPC, is "to promote good neighborly relations with bordering States, to assist in eliminating the existing hotbeds of tension and conflicts in the regions adjacent to the Russian Federation . . . and to prevent emergence of the new ones."[63]

Another primary objective, according to the FPC, is to pursue partnerships aimed at stability—the essence of Putin's multilateral efforts, discussed above. The CSTO, EurAsEc, and SCO are specifically mentioned as instruments for ensuring mutual security and combating widespread threats such as "terrorism, extremism, drug trafficking, transnational crime, and illegal migration" in the CIS.[64] In its section on "International Economic and Environmental Cooperation," the FPC describes Russia's interest in energy security and its goal of strengthening "strategic partnership[s] with . . . leading producers" in order to ensure secure transit.[65] Such verbiage is consistent with Russia's demonstrated willingness to play hardball in the energy domain.

The FPC acknowledges Russia's perception of the "deepening crisis in Afghanistan" as a "threat to the security of the . . . CIS boundaries" and describes Russia's intent to cooperate with multilateral organizations to prevent spillover effects and resolve the situation.[66] Prior to the release of the FPC, Russia had expressed interest in discussing Afghanistan via the NATO-Russia Council framework, but this effort was shelved indefinitely after Russia invaded NATO partner Georgia in August 2008.[67]

In light of Russia's statements in support of the Afghanistan mission (such as those found in the FPC and elsewhere) and the realization that Russia is a primary beneficiary, US policy makers are frustrated by Russian efforts to impede US- and NATO-led efforts. Following Russia's undisguised involvement in convincing the Kyrgyz to evict the United States from Manas Air Base, parliamentarian and Putin loyalist Igor Barinov acknowledged that the Kremlin "shares many goals with Washington" but expressed both bitterness over "the attitude that NATO takes" and regret that little "attention had been paid toward Russia's opinion."[68] Secretary of Defense Robert Gates responded that the Russians were "trying to have it both ways," making "positive noises about working with us" but "working against us in terms of that airfield."[69]

Recent developments indeed confirm Russia's reassertion of a "zone of influence" in this portion of the former Soviet Union.[70] Andrei Serenko, cofounder of a Russian think tank focused on Afghanistan, confirms that "Russia wants to be the only master of the Central Asian domain" and "to the maximum extent possible [will] . . . mak[e] things difficult for the U.S.—in making the transfer of American forces into Afghanistan be dependent on the will of the Kremlin."[71] Exhibiting its penchant for having the last word in the region, in the wake of the eventual Manas-eviction rollback, Russia rattled Uzbekistan by announcing plans to open a CSTO base at Osh in southern Kyrgyzstan.[72]

Conclusion

Since the breakup of the Soviet Union, Russian policy toward Central Asia has progressed from passive and annoyed to active and engaged. Early in the Yeltsin years, Russia concentrated on conducting domestic reforms and integrating with the West; the new Central Asian nations, in turn, lost confidence in Russia and pursued new part-

nerships. Russia paid slightly more attention to Central Asia during the late 1990s, but economic weakness and policy inconsistencies prevented meaningful progress. Under Putin, Russia demonstrated its "ultimate intention" for the Central Asian nations—namely, to "limit [their] sovereignty . . . and expand control over their foreign policies."[73] Medvedev's FPC and recent actions in Central Asia confirm both Russia's hegemonic aspirations and its intense focus on security and energy interests. Mindful of the evolution of Russia's Central Asia policies, armed with an appreciation for Russia's historic sense that the region is in its "zone of influence," and attentive to Russia's zero-sum thinking regarding areas near abroad, US leaders and airpower practitioners will be better prepared to craft and implement mutually agreeable, contextually sound strategic policy for Central Asia. ✪

Washington, DC

Notes

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Global Dynamic Operations

Allocation of Remotely Piloted Aircraft among Combatant Commands

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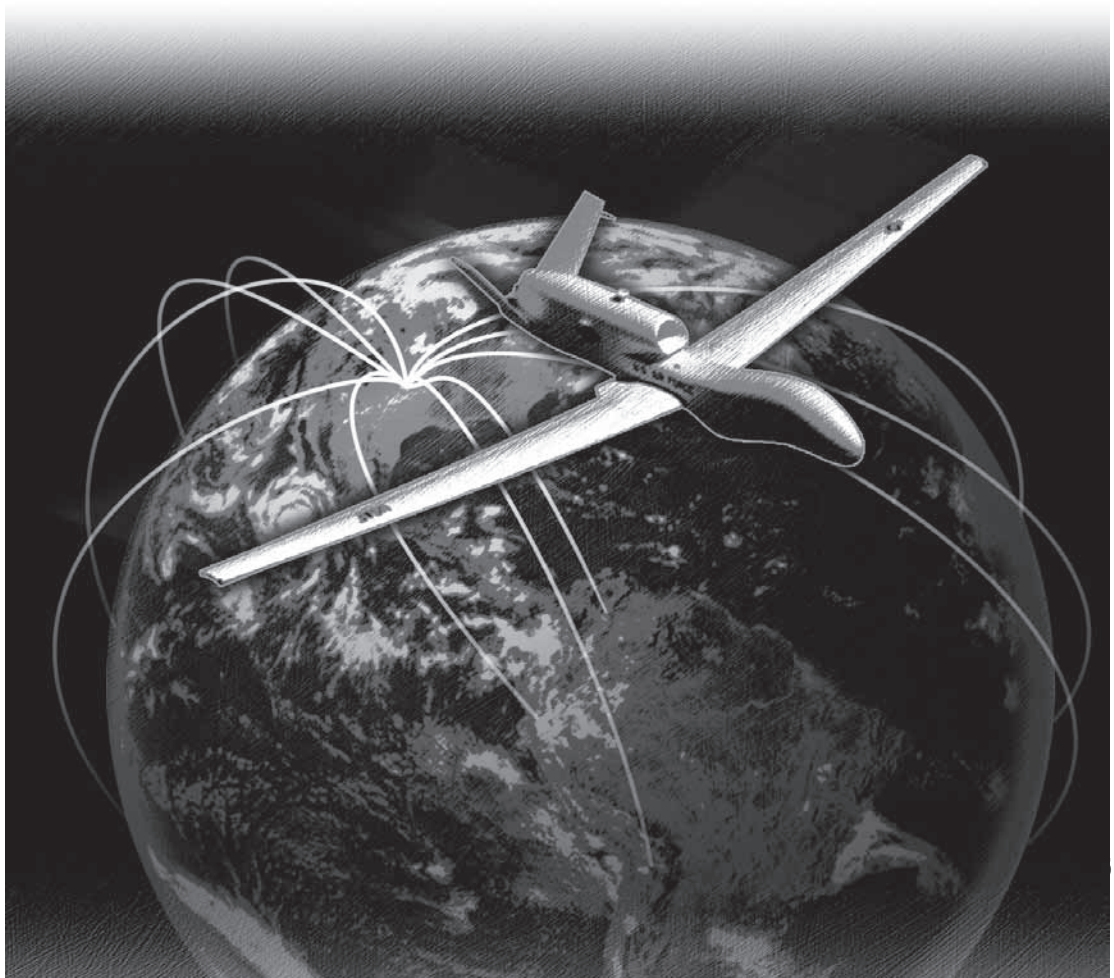
The range of military aviation is being extended so rapidly that the Atlantic will be cancelled out as a genuine obstacle within two years, the Pacific within three years. After that, in five years at the outside, the ultimate round-the-world range of 25,000 miles becomes inevitable. At that point, any nation will be able to hurl its aerial might against any spot on the face of the globe without intermediary bases. By the same token every country will be subject to assault from any direction anywhere in the world. The blows will be delivered from home bases, regardless of distance, with all oceans and bases in between turned into a no man's land.

—Alexander P. de Seversky
Victory through Air Power, 1942



The Potential and the Problem

One of the most valuable attributes of airpower is its flexibility—the inherent ability to project power dynamically across large swaths of an operational area. Airpower's capability to operate in three dimensions, coupled with increased platform speed and range, enables commanders to reallocate airpower over great distances. Flexibility is exponentially enhanced when applied within a command and control (C2) construct involving remotely piloted aircraft (RPA) flying remote split operations (RSO).[1] Such remotely piloted RSO missions provide a unique capability unlike any other in history—the ability to "virtually" move RPA aircrews between aircraft and across the globe in minutes. In this sense, these aircrews are a resource that the US military can assign, apportion, and allocate in a manner similar to its handling of traditional forces and capabilities.

US Central Command (CENTCOM) has executed RSO allocation of theater-based, virtual RPAs since 2003—specifically, in Operations Enduring Freedom and Iraqi Freedom.[2] In these operations, an aircrew controlling an RPA in either Afghanistan or Iraq terminates control of that platform and establishes data-link control with another such aircraft in the other theater of operation. The entire transfer process can be completed in minutes. This capability enables CENTCOM to flex RPA aircrews among multiple theaters in response to dynamic and changing mission requirements.[3] This resource-allocation model provides a microcosm of the possibilities for employing RPA aircrews at the operational and strategic levels.

The next evolutionary step calls for allocating virtual RPA aircrews on a global scale, executed among combatant commands (COCOM). Although CENTCOM currently contains the preponderance of remotely piloted RSO aircraft operations (and, hence, the requisite associated maintenance and bandwidth), all other geographic COCOMs seek to employ these resources when available. A future scenario is quickly approaching in which all geographic COCOMs can execute remotely piloted RSO aircraft operations—a capability that will require a global mission-management construct to employ the global RPA enterprise effectively.

Maintaining such a construct for remotely piloted RSO aircraft operations has the strategic value of providing national decision makers a mechanism to dynamically translate changing strategic priorities into forces and capabilities. According to Joint Publication 3-0, *Joint Operations*,

> The SecDef [secretary of defense], with assistance from the CJCS [chairman of the Joint Chiefs of Staff], determines where the US military should be focused and where the nation can afford to accept risk. Continually assessing the relative importance of the various theater operations remains imperative. Integrated planning, coordination, and guidance among the Joint Staff, combatant commanders (CCDRs), and OGAs [other government agencies] ensures that changing strategic priorities are appropriately translated into clear planning guidance and adequate forces and their associated capabilities for CCDRs.[4]

Furthermore, dynamic allocation of RPA aircrews maximizes resources, enabling them to better respond to changing mission requirements among multiple COCOMs. This allocation construct can help achieve a degree of global strike and global, persistent surveillance capability as a form of power projection due to its ability to reallocate resources, irrespective of space.[5] The *Quadrennial Defense Review Report* of 2006 emphasizes power projection as critical to providing leadership with a broader range of military options in response to twenty-first-century security threats.[6] A problem does exist, however.

Specifically, although the technology for remotely piloted RSO aircraft affords the potential to achieve a level of power projection, we currently do not have either an organization or a construct to take advantage of these capabilities. As a process, Global Force Management (GFM) allows leaders to create capabilities that operational com-

manders need to implement the national defense strategy. Force management "seeks to integrate new and existing human and technical assets from across the Joint Force and its mission partners to make the right capabilities available at the right time and place."[7] However, current GFM organizational structures, policies, and processes involved in global force allocation are not designed (nor were they ever envisioned) to conduct *dynamic* inter-COCOM allocation. Furthermore, current GFM organizational command structures, policies, and procedures are highly centralized and bureaucratic, thereby inhibiting the speed with which remotely piloted RSO aircraft can be dynamically reallocated across the COCOM's geographic boundaries. Finally, policy and processes are organized along static and artificial COCOM boundaries that hinder dynamic inter-COCOM resource allocation of remotely piloted RSO aircraft.

This article uses *global dynamic operations* (GDO), a unique, nondoctrinal term to describe a futuristic concept of conducting dynamic allocation of RPA aircrews in a global distributed operations architecture, focusing on reallocation of aircrews, not platforms.[8] For our purposes, the proposed GDO concept encompasses organizational, policy, and process initiatives. In order to maximize the current and future capabilities of remotely piloted RSO aircraft, we must develop complementary command structures, policies, and processes.

Global Force Management Allocation

GFM seeks to align force assignment, apportionment, and allocation methodologies in support of national defense strategy, joint force availability requirements, and joint force assessments. All functions of GFM affect the GDO concept, but GFM allocation most directly and significantly affects GDO because resources are employed and transferred among COCOMs within this function. Inherent to GFM allocation is the role of Joint Forces Command, designated as the primary joint force provider for conventional forces, including remotely piloted RSO aircraft resources. That command uses guidance developed and approved by the Global Force Management Board to recommend global sourcing solutions to the chairman of the Joint Chiefs of Staff and the secretary of defense, who is the final authority in the GFM allocation process.

Attributes

The GFM allocation process consists of two methods—rotational force allocation in support of the COCOM's annual force needs and emergent force allocation in support of the COCOM's emerging or crisis-based requests. An eight-step process, emergent allocation focuses on satisfying requests for forces (RFF) or capabilities (RFC) within a 120-day timeline. To initiate the emergent allocation process, COCOMs submit an RFF/RFC to the Joint Staff, which validates these requirements and assigns them to a joint force provider. As the joint force provider for conventional forces, Joint Forces Command evaluates alternative sourcing solutions and generates a recommendation to the chairman of the Joint Chiefs of Staff and secretary of defense. Resources are allocated upon the secretary's approval. When the RFF/RFC process is not practical due to time considerations, policy permits the use of a voice order of the commanding officer (VOCO) to allocate forces.

Decisions concerning both rotational force and emergent force allocation are driven by established national priorities, as stated in the guidance of employment of forces (GEF), whose priorities are based on the mission. Prioritization is important in a resource-constrained environment. As a primary resource used for intelligence, surveillance, and reconnaissance (ISR) operations, RPAs are a well-recognized low-density, high-demand (LD/HD) asset. The US Air Force's concept of operations for theater ISR notes that "because ISR is conducted by low-density, high-demand . . . assets and

personnel, it is one of the few military operations that must prioritize among multiple plans and strategies both globally and within a theater."[9] Priority-based allocation is a critical requirement for LD/HD RPA assets.

Despite recognition of the need for priority-based allocation, GFM emergent allocation does not blindly follow a static priority list when allocating RPA resources. GFM subject-matter experts attempt to bring both art and science to the allocation process, applying art through creative problem solving as a means of seeking synergies among capabilities in order to provide more effective RPA operations. A plan may be designed in a manner that allocates resources to a lower-priority requirement. Consider the following example: Priorities dictate that COCOM X be routinely allocated a high percentage of RPA resources. COCOM Y has few RPAs allocated; however, reallocating resources from X to Y will disproportionately increase the percentage of capability in Y but only slightly decrease X's capability. In such a situation, the allocation will be discussed.

Memoranda of understanding/agreement (MOU/MOA) between combatant commanders offer another mechanism for reallocating resources among COCOMs. They typically come into play when a combatant commander needs a resource for a specific event and/or time; however, MOUs/MOAs can also cover routine/reoccurring missions. If combatant commanders cannot reach amicable terms, the secretary of defense can override/direct allocation, as necessary.

Deficiencies

The organizational structure, policy, and processes of current GFM emergent allocation do not satisfy the global, dynamic requirements for the allocation of RPA aircrews. From an organizational perspective, the VOCO position (designed to handle a limited number of dynamic, time-sensitive allocation requests on a nonroutine basis) is inadequate for handling the potentially high volume of requests that the GDO concept would generate. Ad hoc, time-sensitive requests are viewed as the exception, not the norm. Conversely, GDO will make time-critical reallocation requests the norm, not the exception.

Regarding policy, use of the VOCO is the most responsive allocation model offered by GFM at present. The VOCO has delegated authority to execute all functions of the eight-step emergent allocation process. However, the VOCO should be used only when time limitations make the standard process impractical. Granted, this policy adequately supports rotational force-allocation requirements, but it fails to acknowledge the frequency and tempo inherent in the execution of some GDO constructs. Furthermore, the current policy process is overcentralized—an untenable situation, given the volume of dynamic allocations possible through a GDO construct.

The MOU/MOA policy is also unrealistic in a GDO construct. That policy works best when conducted between no more than two COCOMs for preplanned missions in order to limit the level of complexity. GDO, however, is an inherently complex construct in that it supports multiple COCOMs simultaneously and on a continuous basis against ad hoc, unplanned tasking. Thus, applying the MOU/MOA policy approach for a GDO concept is unworkable. GFM policies must be developed that give a global mission-management entity the responsibility and authority to execute a GDO concept based on the GEF's priority. Complementary to this change is the need to alter the way priorities are communicated.

The GEF must articulate its priorities more clearly, with the mission and intent better defined in order to support the dynamic allocation of RSO RPAs. Current priorities are too broadly defined and do not provide mission managers the level of fidelity needed to conduct dynamic allocation between competing requirements. For instance, if counterterrorism is a high-priority mission maintained by multiple COCOMs, then the GEF's priorities must adequately communicate mission and intent, enabling global mission managers to exercise profes-

sional judgment in deciding which COCOM has the higher-priority counterterrorism mission. This level of fidelity is not required under traditional GFM allocation policy because manned assets are not responsive enough to force a dynamic allocation decision. However, due to the flexibility offered by a GDO concept, COCOMs will likely seek opportunities for RPAs to execute their high-priority targets. Therefore, clearly articulated priorities with mission and intent give the necessary guidance to exercise priority-based allocation in a dynamic, global environment.

The organizational structure, policy, and processes of GFM emergent force allocation fail to satisfy GDO concept requirements. Air Force–distributed intelligence and global air mobility operations—two well-established mission areas—deal with global force allocation. The Air Force's Distributed Common Ground System (DCGS) enterprise conducts global distributed intelligence operations routinely, similar to those conducted according to the GDO concept, and Eighteenth Air Force's tanker airlift control center (TACC) executes intertheater reallocation decisions of global air mobility forces. Some aspects of these two entities may translate to a GDO concept.

Air Force Distributed Common Ground System

As the Air Force's primary intelligence planning, collecting, processing, analysis, and dissemination system, the DCGS is a network-centric, global enterprise comprised of multiple distributed ground system sites operating worldwide.[10] Just as the GDO concept seeks to dynamically allocate RPA aircrews among COCOMs in support of national tasking, so does the Air Force DCGS execute dynamic allocation of intelligence processing, exploitation, and dissemination (PED) resources among COCOMs in support of national tasking. The complexities involved in the Air Force's DCGS distributed operations require robust, global mission management—a function carried out by the service's DCGS wing operation center (WOC).[11]

As the nerve center for executing C2 and mission management of the Air Force's DCGS global PED, the WOC is responsible for reconciling tasking and guidance with PED capacity resident throughout the worldwide Air Force DCGS enterprise. The WOC not only conducts preplanned allocation but also, during execution, dynamically allocates PED across the Air Force DCGS enterprise. In making allocation decisions, the WOC assesses mission impact, identifies idle capacity, reconfigures network systems (if required), monitors maintenance status, and identifies "fix" actions. In 2007 it reallocated 20 percent of tasked sorties, based on changing requirements, node capacities, and/or network issues.[12]

Maintaining adequate situational awareness and target knowledge for the tasked area of operation represents one of the challenges of conducting global distributed operations. The Air Force realizes tremendous efficiencies by using all of its available worldwide DCGS resources. However, analysts face significant obstacles in maintaining proficiency across the numerous disparate and unrelated environments from which targets emerge. To help mitigate this operational reality, the Air Force DCGS has structured itself along "focus areas." Identifying the core Air Force distributed ground system site as the "subject-matter expert" for each particular area helps build resident target depth while leveraging the Air Force DCGS enterprise as a whole.

Even though the WOC has responsibility for global mission management of the Air Force's DCGS PED, it does not maintain operational control (OPCON) of the respective distributed ground system sites that comprise the enterprise.[13] Rather, these sites remain under OPCON of their respective geographic COCOMs.[14] This break in C2 authority complicates the WOC's ability to execute its global mission-management functions. Efforts to establish a joint task force for global management of PED in or-

der to provide GFM for the PED function could extend to the DCGS elements of all military services that conduct PED within the overall DCGS enterprise, thereby providing unity of command and effort.[15]

Eighteenth Air Force Tanker Airlift Control Center

Like the Air Force's DCGS, the service's air mobility maintains a global responsibility that requires it to execute global force allocation. Multiple common users compete for limited air mobility forces, necessitating priority-based allocation. A fixed air and space operations center, Eighteenth Air Force's TACC serves as the organizational mechanism used to execute this priority; it "plans, coordinates, schedules, tasks, and controls air mobility missions worldwide."[16]

The TACC exercises centralized command of global air mobility forces in order to conduct approved intertheater allocation quickly.[17] Normally, US Transportation Command, rather than a geographic commander, retains the preponderance of these forces. Air and space forces that concurrently support more than one COCOM, such as those involved in air mobility, are best organized under a functional organizational structure.[18] However, a small portion of global air mobility forces are assigned to geographic commanders in support of high-priority, emerging requirements.[19] When a COCOM requires additional forces of this type, the chairman of the Joint Chiefs of Staff may convene a joint transportation board to adjudicate the situation and reallocate resources. The secretary of defense approves all reallocations, and the TACC executes from this approved reallocation.[20]

Examination of the Air Force's DCGS and Eighteenth Air Force's TACC teaches valuable lessons regarding global force allocation and distributed operations. The performance of the WOC and TACC suggests that maintaining a centralized global mission-management entity has value in optimizing LD/HD resources. Priority-based allocation is essential in reconciling competing theater requirements. Dynamic intertheater reallocation demands the empowerment of global mission management with formal tasking authority. Organizing distributed sites along subject-matter-expert focus areas in order to build habitual relationships with supported units further enhances effectiveness. Presenting forces through a mix of functional and geographically based models not only facilitates intertheater reallocation but also provides dedicated capability to theater commanders. A global mission-management entity exercising centralized control is best postured to balance this mix. The GDO concept draws from these lessons as it seeks to optimize the global enterprise executing remotely piloted RSO missions.

Emergence of Global Dynamic Operations

A futuristic concept, GDO seeks to attain a degree of power projection by dynamically allocating RPA aircrews to areas defined by national priority. It does so by exploiting two unique operational characteristics of RSO RPA technology: (1) the ability to allocate RSO RPA aircrews across vast distances in minimal time and (2) the capability to employ RPAs independently of dedicated aircrews.

Concept of Operations

Assuming requisite bandwidth and deployed footprint, current RSO technology enables the "virtual allocation" of RPA aircrews across the globe with unprecedented speed. Unlike traditional force-allocation models that allocate platforms, the GDO concept allocates aircrews—a departure from the usual procedures that allocate remotely piloted RSO aircraft capability per mission and/or combat air patrol.[21] The GDO concept also exploits multiaircraft

control, an existing technology that enables a single ground-control station to control multiple RPAs. In such operations, a single pilot can actively control one RPA while monitoring others.[22]

Multiaircraft control technology, enabled by RSO virtual allocation, permits aircrew allocation in two different configurations: active or monitored mission status. In the former, an RPA sortie employs with a dedicated aircrew, whereas a monitored mission employs with an aircrew that operates two or more RPAs (see figure).[23] This type of unique employment construct forms the foundation of the GDO concept: *dynamic allocation of active and monitored RPA missions*.

Organization and Policy

Organizationally, the GDO concept calls for establishment of a robust global mission-management entity to execute rotational and emergent force allocation of RPA aircrews across COCOMs, based on national priority as defined in the GEF. In the GDO concept, global mission management has formal authority to provide unity of command for joint-force RPA aircrews that would otherwise be employed piecemeal among disparate COCOMs. It is also postured to provide unity of effort for multinational and interagency RPA operations. Therefore, global mission management in a GDO construct seeks high degrees of unified action through the dynamic allocation of active and monitored RPA missions.[24]

The GDO concept advocates significant policy changes, the most notable of which transfers RPA resource authority from the secretary of defense to the GDO global mission manager—a change essential for the success of GDO. Experience with the Air Force's DCGS indicates that global mission management requires formal authority when it executes dynamic, priority-based allocation in a resource-constrained environment. Formal authority also yields the tools to conduct allocation art when solving complex allocation problems.

Policy changes also occur regarding command authorities and relationships. Because the GDO concept views RPA aircrews as a resource that can be assigned, apportioned, and allocated apart from the aircraft, it is both possible and desirable to separate OPCON of the aircrews from that of the aircraft in order to achieve maximum flexibility. In a proposed GDO environment, a functionally oriented, global mission-management entity has OPCON of the preponderance of RPA aircrews, which are considered an attached force to the supported geographic COCOM.[25] When allocated to a geographic COCOM, such aircrews remain under tactical control of the combatant commander for the duration of the tasked mission.[26] The geographic combatant commander has both OPCON and tactical control of RPAs and associated intheater support resources.[27] However, the GDO concept allows for assignment of a portion of RPA aircrews to a geographic COCOM, as the situation demands. This overall construct is similar to distributed intelligence operations and the use of global air mobility forces that involve organizing and commanding resources along a mix of functional and geographic lines.[28]

Allocation Processes for Rotational Forces

Proposed GDO processes involved in GFM rotational and emergent force allocation are articulated in the form of active and monitored RPA missions. The GDO concept provides predictable RPA capability to combatant commanders by employing a portion of active and monitored RPA missions in a prescribed, rotational force-allocation structure. In accordance with traditional GFM policy, rotational forces are allocated to a combatant commander, typically for a specified period of time. With traditional rotational force allocation of manned platforms, this structure trades flexibility for predictability. However, the active and monitored RPA mission structure provides flexibility *and* predictability because, within a GDO con-

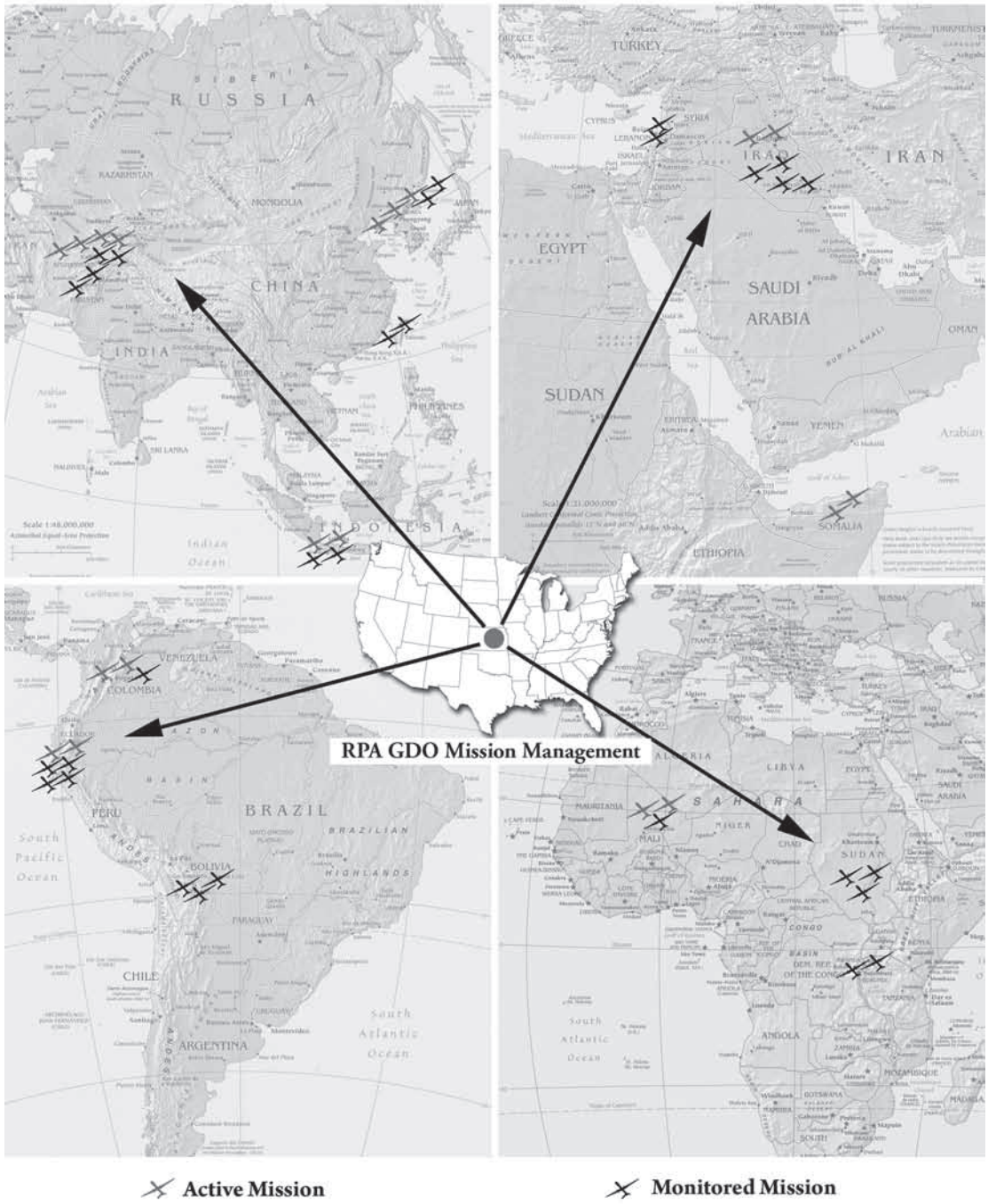


Figure. Global dynamic operations of remotely piloted aircraft systems

struct, RPA aircrew resources can be tailored to specific rotational-force requirements.

The GDO concept provides for the effective and efficient allocation of rotational forces. In a notional GDO example, COCOM X employs 10 RPA aircrews to operate 10 active RPA missions (see table). COCOM Z employs four RPA aircrews to execute 13 RPA missions, based on COCOM requirements. Using the traditional GFM model, COCOM Z would have absorbed 13 RPA aircrews to support 13 RPA missions, even though the requirement could have been satisfied with four RPA aircrews in a monitored mission status. The GDO concept retreats from the one-size-fits-all allocation construct currently employed by GFM and precisely applies LD/HD RPA resources when and where needed. This concept—the essence of "requirements-driven allocation"—illustrates how the military can realize economy of force in terms of RPA aircrews at the strategic level.

Rotational force allocation conducted in a GDO model also offers the opportunity to create a "strategic reserve" of RPA aircrews. After the minimum number of aircrews are allocated to rotational force requirements, five RPA aircrews remain untasked and available for emergent allocation (see table). National decision makers and global mission management may view this complement of aircrews as a strategic reserve available for full-time, flexible employment, based on dynamic, changing national priorities, thus obviating the need to reallocate aircrews from their assigned COCOM tasking. Therefore, national decision makers achieve a degree of flexibility while combatant commanders retain predictability of their rotational resources of RPA aircrews. This allocation model mirrors those in Iraqi Freedom whereby operational-level echelons retain a portion of RPA assets in order to respond to emerging, ad hoc requirements, while tactical echelons receive predictable RPA capability.[29] This model is

Table. Global dynamic operations of remotely piloted aircraft: rotational and emergent force-allocation response to crises

Rotational Force Allocation (Steady State)		
COCOM	Active/Monitored Missions	Minimum no. of aircrews required*
X	10 Active	10
	0 Monitored	
Y	5 Active	6
	4 Monitored	
Z	1 Active	4
	12 Monitored	
Total minimum aircrews required		20

Total RSO RPA enterprise aircrews available	25
Remaining aircrews available for emergent allocation	5

*Aircrew manning for monitored missions is calculated using a multiaircraft control ratio of one aircrew per four RPAs.

Emergent Force Allocation: Single Crisis		
COCOM	Precrisis Allocation	Crisis Allocation
X	10 Active	Unchanged
	0 Monitored	
Y	5 Active	Unchanged
	4 Monitored	
Z crisis	1 Active	6 Active
	12 Monitored	12 Monitored

Emergent Force Allocation: Multiple Crises		
COCOM	Precrisis Allocation	Crisis Allocation
X crisis	10 Active	15 Active
	0 Monitored	4 Monitored
Y	5 Active	0 missions
	4 Monitored	
Z crisis	1 Active	6 Active
	12 Monitored	12 Monitored

also representative of a force tasked in a "general support" role, supporting combatant commanders as a whole but not any particular theater.

The number of strategic reserve resources can be adjusted, based on the level of volatility expected both near term and midterm. A large number of RPA aircrews may be "apportioned" for emergent allocation if crises are expected in multiple COCOMs, thereby necessitating flexible, dynamic, inter-COCOM allocation. However, if the security environment is such that dynamic shifts in resources between COCOMs are not expected, then fewer RPA aircrews can be apportioned for emergent allocation and more committed to rotational force requirements. The ratio of active and monitored missions can also be adjusted, based on the availability of RPA resources and mission requirements. These concepts are similar in function to theater-based air apportionment, which entails adjusting the level of air effort, as articulated by varying airpower missions according to the situation.[30]

Allocation Processes for Emergent Forces

Similar to its effect on rotational force allocation, the GDO concept also revolutionizes emergent force allocation by enabling unprecedented flexibility and responsiveness for dynamic, inter-COCOM allocation in single and multicrisis environments. Emergent force allocation seeks either to allocate RPA aircrews made available as a result of rotational force allocation or to use formal tasking authority to allocate aircrews from one COCOM to another. In terms of the scenario depicted in the table, the five aircrews made available from rotational force allocation are dynamically allocated to COCOM Z. Furthermore, due to multicrisis requirements, the scenario shows how global mission management operating in a GDO construct can reallocate aircrews from COCOM Y to COCOM X, leaving the former with no RPA aircrews outside the theater. This demonstrates the potential beneficial and adverse effects of priority-based allocation.

As exercised in a GDO model, emergent forces are subject to priority-based allocation. RPA aircrews tasked with low-priority targets in a particular COCOM may be allocated to a COCOM that maintains higher-priority targets.[31] On the one hand, this allocation model has the advantage of guarding against theater-scale "penny packeting" of RPA aircrews, whereby a lower-priority COCOM may seek to husband its allocated RPA resources in response to competing, higher-priority COCOMs. On the other hand, it requires a high level of risk mitigation. In situations calling for reallocation of resources from a COCOM, global mission management must work aggressively to leverage the global enterprise in order to mitigate the loss of resources while maximizing potential opportunities.

When conducting GDO-based emergent allocation, global mission management executes the role of force provider, not force employer, and adheres to the tenet of centralized control, decentralized execution.[32] In a complex operating environment, lower-level commanders know best how to employ RPA forces in a tactical context. Therefore, in a GDO concept, the global mission manager provides RPA aircrews, but theater commanders employ them in an active/monitored mission configuration tailored to their operations. Throughout the spectrum of operations, mission management must view itself as a supporting entity, responsible for the success of the supported theater commander.

In order to increase responsiveness, transparency, and access for combatant commanders, the GDO model procedurally allows COCOMs to submit time-sensitive RFFs directly to global mission management. With its delegated authority from the secretary of defense, global mission management is postured to make responsive allocation decisions, based on GEF priorities. This effectively moves execution operations out of national-level staffing organizations and into the hands of an operationally oriented organization.

Challenges

Even though the GDO concept promises great advances in the allocation of RPA aircrews, significant challenges threaten to limit its effectiveness, the foremost of which involves COCOM "ownership" of those aircrews. Geographic COCOMs will likely want to retain OPCON of RPA aircrews rather than cede the preponderance of such control to a functional command. To reconcile this challenge, the GDO concept must show that support can be more beneficial than ownership. Similar to operations involving distributed intelligence and global air mobility, GDO leverages the entire force rather than a smaller, theater-based force. Such global sourcing and joint interdependence provide geographic commanders greater capability. Ultimately, GDO performance will become the key in building trust with the geographic COCOMs.

The GDO concept's ability to realize power projection depends upon the pre-positioning of RPA resources in/near respective theaters of operation, a scenario that poses two challenges: access and resource availability. Launch and recovery elements for remotely piloted RSO aircraft must be located in proximity to the target area. Even as the capabilities of these aircraft increase in terms of speed, range, and duration, access of the launch and recovery elements will remain a critical employment consideration. Moreover, the elements themselves (remotely piloted platforms, aircrews, communications equipment, and maintenance facilities) are finite and must be increased in proportion to the level of power projection desired. The GDO concept assumes the availability of these resources.

Complexity induced by the expanding global RPA enterprise will prove problematic for global mission management. The proliferation of RPA platforms and capabilities, sensor capabilities, networked C2, and joint service and multinational partners adds capability to the enterprise but also complicates mission management.[33] Horizontal integration between interdependent entities, such as the RPA and DCGS enterprises, must limit seams as both expand in size and scope. Vertical integration among strategic, operational, and tactical echelons will blur as linkages become more diffuse.

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RPA aircrew training, theater familiarization, and tactical integration represent another hurdle. Each theater maintains its own unique operating environment in terms of organization, policy, procedures, and operating culture. RPA aircrews must have the mental agility to flex between environments, maintaining proficiency in each theater. Furthermore, those aircrews tasked with supporting multiple theaters of operation in different COCOMs must contend with the need to develop habitual relationships with supported units.

Recommendations

The GDO concept requires an organizational structure that provides unity of command and effort, independent of service and COCOM bias. A functional joint task force's organizational structure, empowered with formal authority to make timely reallocation decisions between COCOMs, satisfies these requirements. Establishing and assigning a GDO joint task force under US Strategic Command (STRATCOM), which commands eight other functionally based, globally oriented missions that conduct daily planning and execution for their respective primary mission areas, would offer the same sort of orientation needed for launching and sustaining the proposed GDO mission.[34]

As a global distributed operation networked among multiple federated partners, the GDO concept facilitates robust horizontal, lateral, and cross-department information flows. In this environment, command and sensors tend to decouple from traditional command authorities.[35] This operational environment requires fluid, dynamic, and adaptable command authorities and relationships. The military must develop and implement doctrine, policies, and procedures in order to realize these ends and foster a further degree of organizational trust among the services.

Conclusion

> *Strategy decides the time when, the place where, and the forces with which the engagement is to be fought, and through this threefold activity exerts considerable influence on its outcome.*
>
> —Carl von Clausewitz

According to Clausewitz, strategy should determine the timing and placement of forces. The GDO concept offers national decision makers a mechanism to dynamically translate changing strategic priorities into globally postured RPA forces for combatant commanders. In essence, this concept gives them employment options (which the current GFM construct fails to provide) when formulating strategy, as they seek to reconcile ends, ways, and means. Traditional GFM organization, policy, and procedures are not designed to satisfy this requirement at a tempo generated by the dynamic allocation of RPA aircrews. The GDO concept proposes bold changes to traditional force allocation in order to bridge this gap. As noted by the *Quadrennial Defense Review Report* (2006), "The principles of transparency, constructive competition to encourage innovation, agility and adaptability, collaboration and partnership should guide the formulation of new strategic processes and organizational structures."[36] The GDO concept is guided by this spirit of innovation.

Even though this concept seeks bold change, it remains pragmatic—grounded in the shared tenets of air and space power.[37] The allocation of RPA aircrews is centrally controlled and decentrally executed, using flexible and versatile methods. Centralized, global mission management helps to ensure the concentration of purpose, priority, and balance necessary to maximize LD/HD RPA resources. A mix of allocation art and science produces synergistic effects in order to attain persistence in the forms of surveillance and global strike.

Regardless of how the GDO concept contributes to the global mission management of RPAs, future efforts must continue to seek optimum solutions in areas of dynamic inter-COCOM allocation, adaptive command relationships, and net-centric global mission management. The *National Defense Strategy* of 2008 reminds us that "implementation of any strategy is predicated on developing, maintaining and, where possible, expanding the means required to execute its objectives within budget constraints. . . . The challenges before us will require resourcefulness and an integrated approach that wisely balances risks and assets."[38] ✪

Notes

1. "Split operations are a type of distributed operations. The term describes those distributed operations conducted by a single C2 entity that is separated between two or more geographic locations. A single commander must have oversight of all aspects of a split C2 operation." Air Force Doctrine Document (AFDD) 2-8, *Command and Control*, 1 June 2007, 47, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_8.pdf (accessed 21 September 2009). "Distributed operations occur when independent or interdependent nodes or locations participate in the operational planning and/or operational decision-making process to accomplish goals/missions for engaged commanders." Ibid., 46. "The system['s] . . . components include the necessary equipment, data communication links, and personnel to control and employ a remotely piloted aircraft. The remotely piloted aircraft is composed of six components: the aircraft, payloads, data communication links, ground control stations, ground support equipment, and ground operators." Joint Unmanned Aircraft Systems Center of Excellence, *Joint Concept of Operations for Unmanned Aircraft Systems*, 2d ed. (Creech AFB, NV: Joint Unmanned Aircraft Systems Center of Excellence, November 2008), GL-11.

2. To date, theater-based, virtual RSO RPA allocation has been conducted only in CENTCOM due to the fact that the preponderance of medium-altitude RSO RPAs has supported Enduring Freedom and Iraqi Freedom since 2003.

3. Situations that may precipitate a reallocation of RSO RPAs include, but are not limited to, changing priorities, weather implications, and communications availability.

4. Joint Publication (JP) 3-0, *Joint Operations*, 17 September 2006 (change 1, 13 February 2008), I-2, http://www.dtic.mil/doctrine/jel/new_pubs/jp3_0.pdf (accessed 14 September 2009).

5. Global strike is "responsive joint operations that strike enemy high value / payoff targets, as an integral part of joint force operations conducted to gain and maintain battlespace access, achieve other desired effects and set conditions for follow-on decisive operations to achieve strategic and operational objectives." Department of Defense, *Global Strike Joint Integrating Concept*, version 1.0 (Washington, DC: Department of Defense, 10 January 2005), 2-1, http://www.dtic.mil/futurejointwarfare/jic.htm. Persistent surveillance is "a collection strategy that emphasizes the ability of some collection systems to linger on demand in an area to detect, locate, characterize, identify, track, target, and possibly provide battle damage assessment and retargeting in near or real-time. Persistent surveillance facilitates the prediction of an adversary's behavior and the formulation and execution of preemptive activities to deter or forestall anticipated adversary courses of action." JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001 (as amended through 19 August 2009), 416. Power projection is "the ability of a nation to apply all or some of its elements of national power—political, economic, informational, or military—to rapidly and effectively deploy and sustain forces in and from multiple dispersed locations to respond to crises, to contribute to deterrence, and to enhance regional stability." JP 1-02, *Department of Defense Dictionary*, 426.

6. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: Office of the Secretary of Defense, 6 February 2006), v–vii, http://www.defenselink.mil/qdr/report/Report20060203.pdf (accessed 15 September 2009).

7. Department of Defense, *Force Management Joint Functional Concept*, version 1.0 (Washington, DC: Department of Defense, 2 June 2005), 1, http://www.dtic.mil/futurejointwarfare/concepts/fm_jfc_v1.doc.

8. This article borrows the term *Global Dynamic Operations* from Col Allan W. Howey's paper of the same name (Maxwell AFB, AL: Airpower Research Institute, College of Aerospace Doctrine, Research and Education, Air University, April 2001), http://handle.dtic.mil/100.2/ADA391117. Colonel Howey's concept envisions a centrally controlled or coordinated air and space campaign that employs globally capable low density / high demand (LD/HD) air and space assets in a global, multitheater environment. This article, however, uses GDO differently, envisioning global, dynamic reallocation of RPA resources.

9. US Air Force, "Theater ISR CONOPS" (Washington, DC: Department of the Air Force, 4 January 2008), 2.

10. AFDD 2-9, *Intelligence, Surveillance, and Reconnaissance Operations*, 17 July 2007, 33, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_9.pdf (accessed 21 September 2009).

11. Located at Langley AFB, VA, the WOC provides global mission management for the US Air Force DCGS enterprise, including active duty and Air National Guard DCGS units.

12. The WOC reallocated 953 of 4,696 sorties in 2007.

13. Operational control is "the authority to perform those functions of command over subordinate

forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission." JP 1-02, *Department of Defense Dictionary*, 398.

14. Each Air Force distributed ground system site is under the operational control of its respective intelligence group, subordinate to a numbered air force, which directly supports a COCOM's Air Force component commander at the operational and tactical levels.

15. Col Kimberly Sievers, division chief, Intelligence, Surveillance, and Reconnaissance Global Force Management, USSTRATCOM/JFCC-ISR, 2006–2009, to the author, e-mail, 8 April 2009.

16. AFDD 2-6, *Air Mobility Operations*, 1 March 2006, 8, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_6.pdf (accessed 21 September 2009).

17. Ibid., 13–15.

18. AFDD 2, *Operations and Organization*, 3 April 2007, 45–46, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2.pdf (accessed 21 September 2009).

19. AFDD 2-6, *Air Mobility Operations*, 11–12.

20. Ibid., 72.

21. In the context of RPA operations, a combat air patrol describes an RPA mission sortie. Current force management communicates RSO RPA capability in terms of the number of such patrols assigned to a theater. That is, COCOM X has 10 MQ-1 Predator combat air patrols assigned, meaning that it may execute 10 Predator missions for the stated period of time.

22. Joint Unmanned Aircraft Systems Center of Excellence, *Joint Concept of Operations*, III-6. The operational trade-off in a multiaircraft-control construct is that monitored missions may be less tactically responsive than active missions. The advantage is that such a construct enables employment of a larger number of platforms per RPA aircrew than would be possible in a 1:1 manning model.

23. The terms *active mission* and *monitored mission* were developed and first used during initial multiaircraft-control operations conducted at Nellis AFB, NV, in 2006.

24. "The term 'unified action' in military usage is a broad term referring to the synchronization, coordination, and/or integration of the activities of governmental and nongovernmental entities with military operations to achieve unity of effort." JP 1, *Doctrine for the Armed Forces of the United States*, 2 May 2007 (incorporating change 1, 20 March 2009), xii, http://www.dtic.mil/doctrine/jel/new_pubs/jp1.pdf (accessed 21 September 2009).

25. Ibid., IV-3. Attached forces are those that are temporarily transferred to a joint force.

26. Tactical control is "command authority over assigned or attached forces or commands, or military capability or forces made available for tasking, that is limited to the detailed direction and control of movements or maneuvers within the operational area necessary to accomplish missions or tasks assigned." JP 1-02, *Department of Defense Dictionary*, 537.

27. In-theater resources entail the launch and recovery element, which includes the aircrews, aircraft, maintenance, and communications resources.

28. AFDD 2, *Operations and Organization*, 57.

29. Raymond T. Odierno, Nichoel E. Brooks, and Francesco P. Mastracchio, "ISR Evolution in the Iraqi Theater," *Joint Force Quarterly*, no. 50 (3d quarter 2008): 51–55, http://www.ndu.edu/inss/Press/jfq_pages/editions/i50/14.pdf (accessed 21 September 2009). Partial apportionment shows a balance of ISR assets—allocation not entirely based on either organic control or centralized priority. In partial apportionment, a portion of RPA capability is retained by a higher echelon in order to respond to emerging requirements without tapping into assets allocated to lower echelons.

30. Apportionment (air) is "the determination and assignment of the total expected effort by percentage and/or by priority that should be devoted to the various air operations for a given period of time." JP 1-02, *Department of Defense Dictionary*, 40.

31. "Prioritization—Because operational needs for intelligence often exceed intelligence capabilities, prioritization of collection and analysis efforts and . . . ISR resource allocation are vital aspects of intelligence planning. Prioritization offers a mechanism for addressing requirements and effectively managing risk by identifying the most important tasks and applying available resources against those tasks." JP 2-0, *Joint Intelligence*, 22 June 2007, xiv, http://www.dtic.mil/doctrine/jel/new_pubs/jp2_0.pdf (accessed 21 September 2009).

32. "Centralized control of air and space power is the planning, direction, prioritization, synchronization, integration, and deconfliction of air and space capabilities to achieve the objectives of the joint force commander. . . . Centralized control maximizes the flexibility and effectiveness of air and space power; however, it must not become a recipe for micromanagement, stifling the initiative subordinates need to deal with combat's inevitable uncertainties. Decentralized execution of air and space power is the delegation of execution authority to responsible and capable lower-level commanders to achieve effective span of control and to foster disciplined initiative, situational responsiveness, and tactical flexibility. It allows subordinates to exploit

opportunities in rapidly changing, fluid situations." AFDD 1, *Air Force Basic Doctrine*, 17 November 2003, 28, http://www.dtic.mil/doctrine/jel/service_pubs/afdd1.pdf (accessed 21 September 2009).

33. "The future direction of UAS [unmanned aircraft system] C2 is to move away from point-to-point data links to network data links to facilitate more collaborative and 'common use' of UAS. NATO defines five different Levels of Interoperability (LOI) that identify the flexibility in control for all active UAS. The most robust LOI, Level 5, enables operators to pass full control of the aircraft and/or payload from one operator to another. This capability permits users from different military Services and government agencies to operate other Service agency UA platforms within a given UAS constellation." Joint Unmanned Aircraft Systems Center of Excellence, *Joint Concept of Operations*, III-6, 7.

34. STRATCOM's functional components include JFCC-Global Strike (JFCC-GS), JFCC-Space (JFCC-SPACE), Joint Task Force-Global Network Operations (JTF-GNO), JFCC-Network Warfare (JFCC-NW), JFCC-Integrated Missile Defense (JFCC-IMD), JFCC-Intelligence, Surveillance, and Reconnaissance (JFCC-ISR), Joint Information Operations Warfare Command (JIOWC), and USSTRATCOM Center for Combating Weapons of Mass Destruction (SCC-WMD). "Functional Components," United States Strategic Command, http://www.stratcom.mil/functional_components/ (accessed 17 April 2009).

35. David S. Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority*, 2d ed. rev., CCRP Publication Series (Washington, DC: DOD C4ISR Cooperative Research Program, February 2000), 120, http://www.dodccrp.org/events/12th_ICCRTS/CD/library/html/pdf/Alberts_NCW.pdf.

36. Office of the Secretary of Defense, *Quadrennial Defense Review Report*, 1.

37. The tenets of air and space power include centralized control and decentralized execution, flexibility and versatility, synergistic effects, persistence, concentration of purpose, priority, and balance. AFDD 1, *Air Force Basic Doctrine*, 27–33.

38. Department of Defense, *National Defense Strategy* (Washington, DC: Department of Defense, June 2008), 18, http://www.defenselink.mil/pubs/2008NationalDefenseStrategy.pdf (accessed 17 April 2009).

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Cyber This, Cyber That . . . So What?

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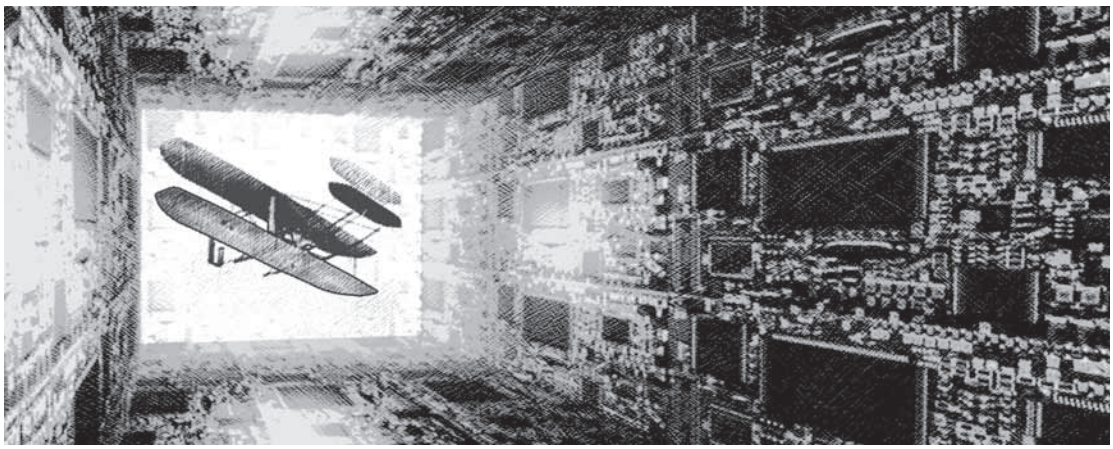

You have to know the past to understand the present.

—Carl Sagan

Revolutions in warfare rarely take place in one's lifetime. Rather, an evolution based on the innovative use of available technology and human ingenuity steadily occurs.[1] Is the ubiquity of cyberspace operations and technology such a revolution? Perhaps. However, any revolution should not compel us to leave behind lessons learned from the age before cyberspace. Assiduous students of warfare will still find that books on military history, theories of war, doctrines, and publications on past conflicts are invaluable. Cyberspace does not change the principles of war or the tenets of airpower from the Airman's perspective. At an even more granular level, only minor changes are required to the US Air Force's air and space (and cyberspace) functions.

When the chief of staff and secretary of the Air Force added cyberspace to the service's mission statement in December 2005, it became powerfully clear that the Air Force was serious about its role in providing capabilities in cyberspace operations to the joint fight.[2] As a result, the Air Force community, along with its counterparts in other services, has been busy developing supporting documents and guidance to define and focus what the fledgling mission area means to the force. Cyberspace is everywhere we turn; it is an essential part of our daily mission and activities. However, we must remember that our fundamental functions as an Air Force have not changed.

This article endorses the idea that cyber operations may be conducted in all warfighting domains: air, space, cyberspace, land, and sea. In addition, despite the immaturity of cyberspace operational doctrines, the doctrines from air and space remain relevant and applicable to the cyberspace domain. Cyber operations are just another set of tools in the commander's toolbox. Although cyber operations have distinct ways of achieving effects, from an Air Force perspective they are similar to other air and space operations that support air and space (and cyberspace) functions. Known and established cyber operations provide war fighters with viable options to kinetic means. This article highlights the role of cyber operations in supporting the air and space functions.

Lastly, we add a new function, *countercyberspace*, to the 17 Air Force functions (see table). Past Air Force doctrine has used different nomenclature but has not made the importance of countercyberspace completely clear until recently. For this reason, the new function necessitates adjustments to the existing information operations (IO) function to account for duplication. By showing that cyber operations are just another set of tools, we can integrate previously defined supporting operations in an initial development of cyberspace operations doctrine. Eventually, a more concrete Air Force cyberspace doctrine will evolve as prescribed by lessons from history and future events.

Doctrine is an integrated collection of lessons learned from experiments, exercises, and past engagements that we accept as the *best practices* for conducting warfare.[3] Still in their infancy, cyberspace operations consequently lack the history of experience vital for establishing sound doctrinal statements. Dr. David Lonsdale remarked that "new or developing methods of warfare require doctrinal and theoretical development [that] should be grounded in, and informed by, experience, historical knowledge, and the work of the universal theorists, most especially Carl von Clausewitz and Sun Tzu."[4] Air Force strategists are struggling to create doctrinal principles for cyber warfare in the form of Air Force Doctrine Document (AFDD) 2-11, "Cyberspace Operations," now several years in draft. However, we must be careful to derive cyber doctrine and strategy from the proven methods of previous documents and must examine how we can employ cyberspace operations in support of Air Force functions.

The Air Force functions defined in AFDD 1, *Air Force Basic Doctrine*, are those specific responsibilities that enable the service to fulfill its legally established roles as noted in Title 10, *United States Code*, section 8013. The operational functions listed in the table are the "broad, fundamental, and continuing activities" of air, space, and cyberspace power.[5] "They are not necessarily unique to the Air Force . . . but together they do represent" how the service fulfills its assigned missions.[6] The following sections address each of the air and space functions, discussing how cyberspace operations can provide the same effects and serve as the appropriate foundation for cyberspace doctrine.

Strategic Attack

The goal of strategic attack is to apply force systematically against enemy centers of gravity in order to produce the greatest effect for the least cost in dollars and lives.[7] As illustrated by Col John Warden's five strategic rings, these centers may be material (infrastructure) or nonmaterial (populace support) in nature. He further advocates attacking the three elements of command—information gathering, decision making, and communication (e.g., bombing

Table. Air Force air, space, and cyberspace functions

Function	*General Definition*	*Air and Space Example*	*Cyber Tasks*
Strategic Attack	Systematic application of force against enemy centers of gravity	Destroying leadership, power, and communication hubs	Attack on supervisory control and data acquisition and Internet traffic
Counterair, Counterspace, Counterland, Countersea	Operations conducted to attain and maintain a desired degree of superiority within a domain while denying an adversary use of that same domain	Air interdiction, close air support, suppression of enemy air defenses, jamming satellite up/downlink frequencies	Manipulating databases, images, power/controls of a weapon system
Information Operations	Actions to support commanders' ability to assess the operational environment and enhance their observe-orient-decide-act loop	Influence operations, electronic warfare, military deception, counterintelligence	Manipulation of Web content, e-mail "leaflets"
Airlift, Air Refueling, Spacelift	Activities that extend the reach of personnel and materiel in order to provide rapid, functional, flexible, timely, and responsive options	Intratheater airlift, operational support airlift, deployment launch	Messaging e-mail, Web pages, remote network administration
Intelligence, Surveillance and Reconnaissance	Activities that contribute to the creation of the intelligence preparation of the battlespace in order to provide commanders detailed knowledge that helps them better understand and know the enemy	U-2s, remotely piloted aircraft, national assets, human intelligence	Search engines, network enumeration, honey pots, packet sniffing
Special Operations	Operations that use mobility in denied territory, surgical firepower, and special tactics to conduct low-visibility, covert, or clandestine military actions	Special reconnaissance, psychological operations, counterterrorism	Address masking, Internet cafes, botnets
Combat Support, Command and Control, Combat Search and Rescue, Navigation and Positioning, Weather Services	Actions that enable the war fighter to focus on and successfully carry out those operations related to the above functions	Aircraft maintenance, air and space operations center, global positioning system satellites, National Oceanic and Atmospheric Administration satellites	Net-centric operations, command and control, and network terrain packets
Countercyberspace	Operations conducted to attain and maintain a desired degree of cyberspace superiority by destroying, degrading, denying, deceiving, disrupting, or exploiting the enemy's cyberspace capability	Bombing server buildings	Software exploits

Derived from Air Force Doctrine Document 1, *Air Force Basic Doctrine*, 17 November 2003, 39–58, http://www.dtic.mil/doctrine/jel/service_pubs/afdd1.pdf (accessed 8 December 2009).

Iraq's communications infrastructure during Operation Desert Storm, as shown on Cable News Network).[8]

The cyberspace domain provides adversaries a new environment to conduct offensive and defensive operations. In addition, cyber operations offer the means to expedite other operational functions previously conducted through other domains. "In the effort to influence—whether focused on an individual, an organization, or an entire society—cyberspace is a key operational medium via which 'strategic influence' is conducted."[9] However, considering modern organizations' and nations' dependence on the world's cyberspace infrastructure, new sources of vulnerabilities are tempting targets for strategic attack, especially from an asymmetric form of warfare.

Over the past few years, the ability to use cyber operations as an avenue for strategic attack has become evident. In 2007 the Idaho National Laboratory for the Department of Homeland Security simulated a cyber attack on a test power station. The simulation demonstrated an exploitation of a software vulnerability in Supervisory Control and Data Acquisition (SCADA) systems, the computer systems that control electric, water, and chemical plants throughout the United States. Designed with minimal security protection, many of these systems remain vulnerable to cyber attacks. Even terrorist organizations are interested in the vulnerabilities of strategic systems like SCADA.[10] Examples include the virtual shutdown of the Estonian government via its Internet infrastructure and the Russian/Georgian conflict of 2008, during which Russian military forces orchestrated a wave of cyber-related operations against Georgia prior to an invasion. Coordinated through a Russian online forum, the online assault appeared to have been prepared with target lists and details about vulnerabilities. The cyber attacks were carried out before the two countries engaged in a five-day ground, sea, and air war.[11]

Counterair, Counterspace, Counterland, Countersea

These operations are conducted "to attain and maintain a desired degree of superiority" within any of the physical domains by destroying, degrading, denying, deceiving, disrupting, or exploiting the enemy's capability within that same domain.[12] They are characterized by actions that are either offensive or defensive in nature. Offensive counteroperations inhibit the enemy from exploiting a particular domain to his advantage.[13] One goal of offensive counterair involves destroying the enemy's offensive air and missile assets before he can do the same in order to establish freedom from attack for friendly forces. Defensive counteroperations "preserve US/friendly ability to exploit" a domain in order to protect friendly capabilities.[14] During Operation Iraqi Freedom, coalition forces conducted a defensive counterspace operation to destroy an adversary's "ground-based global positioning system (GPS) jammers to preserve freedom to employ GPS-aided munitions by friendly forces."[15]

US military assets across all operational domains are infused with cyber technologies, as is the case for most modern militaries. The *Quadrennial Roles and Missions Review Report* of January 2009 outlines the Department of Defense's (DOD) desire to seek "strategic, operational, and tactical cyberspace capabilities that provide . . . warfighting effects within and through the cyberspace domain that are synergistic with effects within other domains."[16] Cyber-related tools and operations have become commonplace, if not prerequisites, in military operations. Systems such as data links shared among platforms and command and control (C2) centers, the Blue Force Tracker utilized by the US Army, and GPS-aided carrier-landing technologies employed by the US Navy have changed the execution of specific operations. However, they exist to support the same service functions.

Hackers have already demonstrated their ability to break into the DOD's and contractors' networks.[17] Gaining access to C2 databases on the Internet presents an opportunity to affect the timing of launching forces from garrison, the direction they take, and their actions upon arrival. A successful breach of weapon system communication/data-link architectures would easily allow us to disrupt the enemy's ability to execute his mission. Infiltration of the enemy's cyber-enabled systems would also let us manipulate his operating picture or influence the delivery of electric power or the operation of satellite control systems.

Information Operations

As defined by AFDD 2-5, *Information Operations*, IO exists to support commanders in determining the situation, assessing threats and risks, and making timely and correct decisions. Reliance upon accurate information and its speed of travel make dominating the information spectrum more important than ever. Currently, IO consists of influence operations, network warfare operations, and electronic warfare (EW) operations.[18] With the advent of cyberspace operations, it is apparent that network warfare operations fall under this new concept. However, a debate continues over the future of EW. After the publication of a doctrine for cyberspace operations, AFDD 2-5 must be revised to incorporate these changes.

This does not mean that the two are mutually exclusive. IO can be conducted in the cyberspace domain, as it has been for decades in other operational domains. However, not all IO can be considered cyberspace operations. For example, influence operations seek to achieve effects resulting in a change in the enemy's observe, orient, decide, act loop. Traditional means include dropping leaflets or using human messengers to conduct psychological operations (PSYOP). EW operations seek to achieve effects across the electromagnetic domain, including radio frequencies as well as optical and infrared regions of the spectrum. Traditional EW operations conducted by aircrews over the past 50 years are considered non-cyber by entire communities.[19] "In Operation ALLIED FORCE . . . multi-service capabilities were combined in the form of 'jam to exploit,' demonstrating how opponent communications users can be herded to frequencies which intelligence may collect and exploit."[20] IO often consists of nonkinetic actions to defend our decision cycle and influence the adversary's, but it can also take the form of physical attack against tangible information infrastructures.

The offensive counterinformation activities of PSYOP, military deception, and information attack all have a place in the cyber realm. Well-trained cyber forces can influence enemy decision cycles by presenting misleading Web content or even changing information presented by reputable sources. Defensive counterinformation activities such as information assurance and operational-security protocols are already in place at all Air Force installations, some in non-cyber form.

Airlift, Air Refueling, Spacelift

Airlift, air refueling, and spacelift extend the reach of personnel and materiel to provide rapid, functional, flexible, timely, and responsive options necessary to apply strategic global power to various crisis situations worldwide. Airlift capabilities are vital for delivering expeditionary forces and infrastructure with minimum delay.[21] These assets link theaters and locations within the same theater. Air refueling broadens the range of employment options available to the joint force commander. It enables fighter, bomber, cargo, and rotary aircraft to operate from bases safe from attack and conduct multiple missions without having to return to base when they are low on fuel. Spacelift deploys space systems to establish operational capability, sustains failed satellite constellations or replaces failing satellites, and augments constellations to in-

crease capability when the demand of current global operations is on the rise.[22]

These three functions are characterized by their ability to increase the range of military assets and deploy materiel to the fight. They are a measure of our capacity to project air and space power abroad. Operations within the cyberspace domain achieve the same effect with information as the payload. *Cyberlift* occurs regularly among computers connected via the Internet or other network infrastructures. That is, packets of data pass over Ethernet cables and wireless connections as messages communicated among users. Network administrators who frequently push patches and software updates are exercising cyberlift operations. Images and intelligence information are communicated globally. Just as airlift, air refueling, and spacelift are the physical assets of our forces, so are cyberspace operations the information enablers. Cyberlift permits the precision delivery of information. Getting the right information to the right person at the right time is critical in today's operational environment, whether for conducting time-sensitive targeting or air-dropping supply pallets to locations "outside-the-wire." The logistics behind focused information flow represents a challenge that we can answer by using appropriate cyberlift tactics, techniques, and procedures.

Intelligence, Surveillance, and Reconnaissance

Information collected by intelligence, surveillance, and reconnaissance (ISR) assets, such as the U-2 Dragonlady, satellites, and/or undercover personnel, contributes to creation of the intelligence preparation of the battlespace (IPB), which provides information to commanders to help them understand and know the enemy.[23] The easiest, and often most overlooked, way to conduct cyber ISR is merely to make use of Internet search engines. Operations-security practices to safeguard critical information are often disregarded or loosely implemented, giving us an opening to collect required intelligence easily. Network enumerating, another activity of cyber ISR, involves scanning an adversary's networks for vulnerabilities in his security architecture, allowing us to build plans for exploiting those networks during wartime. Additionally, establishing decoys within our own networks grants US cyber forces a facility for learning the type of information that our enemies look for and the techniques they employ for undermining our security protocols. By utilizing packet sniffers, we can capture and analyze packets that travel our networks. All of these activities allow us to characterize enemy capabilities with our cyber means, thus providing additional information to the IPB. Once inside our adversaries' networks, we can leverage cyber-ISR operations to conduct IPB.

Special Operations

Special operations use airpower operations to conduct actions that include, but are not limited to, unconventional warfare, special reconnaissance, PSYOP, and counterterrorism.[24] The difference between special operations and conventional operations lies in the degree of physical and political risk, overtness, operational techniques, mode of employment, independence from friendly support, and dependence on detailed operational intelligence and indigenous assets.[25]

The inherently clandestine nature of special operations parallels the ease of conducting stealthy cyber operations. In 2007 cyber attacks assailed the nation of Estonia. Newspaper, banking, and governmental agencies were subjected to a distributed denial-of-service attack by almost one million computers enslaved by cyber terrorists. National servers, routers, and switches were flooded with traffic and rendered essentially useless. Many fingers pointed to the Russian government. Attacks poured in from all over the world, but computer security officials say that some of the attackers were identified by their Web addresses, many of

them Russian and some from Russian state institutions.[26] However, a major issue with network attacks has to do with pinpointing the source. As Dr. Martin Libicki notes, "One will not be able to make reasonable attribution unless the attacker virtually announces its role."[27] Thus, one cannot respond without reasonably attributing the attacks. Even then, the attacks may come from allies or one's own systems.[28] This bodes well for those able to exploit the vulnerabilities of their enemies without leaving a cyber trail.

Combat Support, Command and Control, Combat Search and Rescue, Navigation and Positioning, and Weather Services

Combat support, C2, combat search and rescue (CSAR), navigation and positioning, and weather services are the backbone of the previously mentioned air and space power functions. Without the success of these functions, other functions cannot and will not succeed. Combat support is the product of successful logistical, medical, and force-support operations, whose synergy with other operations is essential for creating combat capability across the range of military endeavors.[29] C2 encompasses motivating forces into action to carry out the mission (command) and regulating those same forces to execute operations aligned with the commander's intent (control).[30] Effective C2 enables the joint force commander to utilize available Air Force platforms at the right place and time, despite the fog of war, and degrade the enemy's capability to intercede.[31] CSAR is the method that the Air Force uses to support joint personnel recovery in "uncertain, denied, or hostile environments."[32] Personnel recovery operations are essential to sustaining unit morale, preserving critical combat resources, and preventing the enemy from gaining intelligence.[33] By providing accurate location and time of reference, the navigation and positioning function enables military forces to maneuver precisely, synchronize actions, locate and attack targets, and locate and recover downed Airmen. Weather services offer timely and accurate information regarding the space and atmospheric environments. This information is critical in timing, planning, and conducting air and space operations, thus influencing "the selection of targets, routes, weapon systems, and delivery tactics."[34]

Cyberspace operations enable these functions, and communication over the cyberspace domain facilitates them. For the most part, precise navigation and timing rely on the cyberspace domain for signal transmission and dissemination of GPS data. Netcentric operations have made way for continued, efficient support of war fighters from bed, bullets, and beans to the C2 elements required. The weapon system represented by the Air Force air and space operations center consists of hundreds of servers running various information systems, each one operating in cyberspace.

Countercyberspace

We propose the following definition for *countercyberspace: a function consisting of operations to attain and maintain a desired degree of cyberspace superiority by the destruction, degradation, or disruption of an enemy's capabilities to use cyberspace*. This definition is similar to those of the other counter-domain functions listed above. Although it does include the requirement of superiority within the domain, this differs considerably from how we view air or space superiority. The draft version of AFDD 2-11 defines cyberspace superiority as "the degree of advantage possessed by one force over another that permits the conduct of operations in cyberspace at a given time and place without prohibitive interference by the opposing force."[35] Air and space superiority is characterized by freedom of action and simultaneous freedom from attack. Freedom of action is a characteristic of cy-

berspace superiority; however, due to the ubiquitous nature of the Internet, freedom from attack cannot be assured and thus is not a requirement for cyberspace superiority. An appropriate summary of cyberspace superiority would be "freedom of action through attack" (i.e., the ability to act even while under attack and after an attack). Gen Kevin P. Chilton, commander of US Strategic Command, concluded that "we went out in our mission-oriented protective posture (MOPP) gear and fixed airplanes, loaded airplanes, and flew airplanes. We conducted operations in a hostile environment. That's what operating under attack in cyberspace is going to be like."[36] We can be certain that cyberspace will remain a contested environment, but this should not constrain our ability to operate within the domain.

As a function, countercyberspace is comprised of various types of cyber and noncyber-related operations. For example, if the desired effect is to disrupt Internet service, then physical attack or destruction of cyber-related equipment (e.g., routers and buildings housing Internet service providers) can be considered operations in support of countercyberspace. The effect also may be delivered in the form of a software exploit to disrupt legitimate Internet traffic from flowing properly. Consider one unclassified example. In May 2007, Pres. George W. Bush ordered the National Security Agency to conduct a cyber attack against cell phones and computer networks that Iraqi insurgents used to plan roadside bombings.[37] The agency's efforts helped US forces commandeer the Iraqi fighters' communication system. Former Bush administration officials involved with the decision to execute the attack "credit the cyberattacks with allowing military planners to track and kill some of the most influential insurgents," eventually helping turn the tide of the war.[38]

Both physical and cyber operations may produce the same direct effect in support of the countercyberspace function, but they have varying levels of indirect effects that must be considered. On the one hand, like any other attack, strikes against structures housing physical cyber assets have the potential to result in collateral damage. On the other hand, attacks through cyberspace against cyber assets can also result in cascading collateral damage. The fear of such side effects had kept American leadership from pulling the trigger of cyber weaponry. Prior to the recent US invasion of Iraq, DOD leaders considered a plan to disable the Iraqi banking network. However, they subsequently abandoned it after determining that it could also hinder the French banks so closely tied to Iraqi institutions and could potentially migrate to the other allies, including the United States.[39]

We must give serious consideration to employing a cyber "munition" because it is not usually destroyed during an attack. Once released, such a weapon is easy to capture. Cyber forces can then deconstruct and analyze its code to determine appropriate countermeasures for future attacks and for use as a weapon against its sender.[40] To attain cyberspace superiority, we must execute successful offensive, defensive, and mainte-

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nance operations through network attack, network defense, and network operations, respectively, in order to attain the level of control required to operate unimpeded while preventing the enemy from gaining advantage from the use of cyberspace.[41] Elevating countercyberspace operations as an Air Force function will help provide focus and set boundaries for the service and joint community.

Conclusion

Any cyberspace operational doctrine must take into account the similarities between and relationships with air and space operations. Many people agree with the draft cyberspace operations doctrine's statement that the cyberspace domain is a *man-made* virtual domain. Further study reveals its *natural* similarities to the other domains, as defined by the electromagnetic spectrum environment. Viewing the cyberspace domain as the fifth dimension (to air, land, sea, and space), more people conclude that it is no different than the other four dimensions, where we develop and use man-made technology to enter, maneuver, and exploit those domains.[42] In addition, the unique characteristics of the cyberspace domain dictate how we operate within it.

Cyberspace is a loaded term that invokes various definitions from different organizations and people.[43] Having limited operational experiences in cyberspace, the Air Force must use its experience in other warfighting domains in order to develop sound doctrine. After all, cyberspace operations support the same functions as air and space operations. As former secretary of the Air Force Michael W. Wynne wrote, "All aspects of air war will have some equivalent role in cyber war."[44] With the advent of cyberspace operations, some changes do need to take place, to include differentiating cyberspace operations from IO. Further, a new countercyberspace function should be added to underscore its importance as a separate Air Force function in the cyberspace domain. As Lonsdale points out, "Although cyberspace has a part to play in all of the dimensions, it does not fundamentally alter anything of real significance in strategy. Thus, like the air dimension before it, cyberspace affects the grammar of war, but not its logic."[45]

With time, our experience in conducting cyberspace operations and working in the cyberspace domain will grow and become embedded in our daily operations; we will accept those operations in the same way we do air and space operations. Cyberspace doctrine will evolve so that we can translate ideas into practice in the most effective way possible. In the meantime, we must examine and learn from the similarities and differences among air, space, and cyberspace operations in support of air, space, and cyberspace functions. ✪

Notes

1. "Observers constantly describe the warfare of their own age as marking a revolutionary breach in the normal progress of methods of warfare. Their selection of their own age ought to put readers and listeners on their guard. . . . It is fallacy, due to ignorance of technical and tactical military history, to suppose that methods of warfare have not made continuous and, on the whole, fairly even progress." Cyril B. Falls, *A Hundred Years of War* (London: Duckworth, [1953]), 13.

2. Hon. Michael W. Wynne, "Flying and Fighting in Cyberspace," *Air and Space Power Journal* 21, no. 1 (Spring 2007): 3, http://www.airpower.au.af.mil/airchronicles/apj/apj07/spr07/spr07.pdf (accessed 8 December 2009).

3. Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, 17 November 2003, 3, http://www.dtic.mil/doctrine/jel/service_pubs/afdd1.pdf (accessed 8 December 2009).

4. Dr. David J. Lonsdale, "The Impact of Cyberspace on Strategy," *High Frontier* 5, no. 3 (May 2009): 23, http://www.afspc.af.mil/shared/media/document/AFD-090519-102.pdf (accessed 8 December 2009).

5. AFDD 1, *Air Force Basic Doctrine*, 39.

6. Ibid., 39–40.

7. AFDD 2-1.2, *Strategic Attack*, 12 June 2007, 2, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_1_2.pdf (accessed 8 December 2009).

8. Col John A. Warden, *The Air Campaign: Planning for Combat* (Washington, DC: National Defense University Press, 1988), http://www.au.af.mil/au/awc/awcgate/warden/warden-all.htm (accessed 8 December 2009).

9. Dr. Dan Kuehl, "From Cyberspace to Cyberpower: Defining the Problem," in *Cyberpower and National Security*, ed. Franklin D. Kramer, Stuart H. Starr, and Larry K. Wentz (Washington, DC: Potomac Books, 2009), 6.

10. Kim Zetter, "Simulated Cyberattack Shows Hackers Blasting Away at the Power Grid," 26 September 2007, *Wired*, http://www.wired.com/threatlevel/2007/09/simulated-cyber/ (accessed 8 December 2009).

11. Brian Krebs, "Report: Russian Hacker Forums Fueled Georgia Cyber Attacks," *Washington Post*, 16 October 2008, http://voices.washingtonpost.com/securityfix/2008/10/report_russian_hacker_forums_f.html (accessed 8 December 2009).

12. AFDD 1, *Air Force Basic Doctrine*, 41.

13. AFDD 2-1.1, *Counterair Operations*, 1 October 2008, 5, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_1_1.pdf (accessed 8 December 2009).

14. AFDD 2-2.1, *Counterspace Operations*, 2 August 2004, 3, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_2_1.pdf (accessed 8 December 2009).

15. AFDD 1, *Air Force Basic Doctrine*, 43.

16. Department of Defense, *Quadrennial Roles and Missions Review Report* (Washington, DC: Department of Defense, January 2009), 16, http://purl.access.gpo.gov/GPO/LPS108437 (accessed 8 December 2009).

17. Associated Press, "Hacker Forces 1,500 Pentagon Computers Offline," 21 June 2007, http://www.msnbc.msn.com/id/19358920/ (accessed 15 August 2009).

18. Joint Publication 3-13, *Information Operations*, 13 February 2006, and DOD Directive 3600.01, *Information Operations*, 14 August 2006, more specifically list electronic warfare, computer network operations, psychological operations, military deception, and operations security as the five core capabilities of IO.

19. "Simply stated, EW is not part of Cyberspace. Cyber is a customer of EW. It certainly uses limited aspects of EW, but EW serves four other Domains—Land, Sea, Air and Space—that also need to achieve Spectrum Control. Within the Joint Service, the prevailing sentiment would indicate that EW will indeed remain an articulated mission area to exercise the critical care for and protection of the Spectrum, and not to be assimilated by any new peer mission area, such as Cyber." Lt Col Jesse Bourque, "Does EW + CNO = Cyber?" *Journal of Electronic Defense* 31, no. 9 (September 2008): 34.

20. AFDD 2-5, *Information Operations*, 11 January 2005, 23, http://www.carlisle.army.mil/DIME/documents/afdd2-5InformationOperations.pdf (accessed 8 December 2009).

21. AFDD 2-1, *Air Warfare*, 22 January 2000, 17, http://www.dtic.mil/doctrine/jel/service_pubs/afd2_1.pdf (accessed 8 December 2009).

22. Ibid., 18–19.

23. Ibid., 20–21.

24. AFDD 1, *Air Force Basic Doctrine*, 53.

25. AFDD 2-7, *Special Operations*, 16 December 2005, 3, http://www.fas.org/irp/doddir/usaf/afdd2-7.pdf (accessed 8 December 2009).

26. Ian Traynor, "Russia Accused of Unleashing Cyberwar to Disable Estonia," *Guardian*, 17 May 2007, http://www.guardian.co.uk/world/2007/may/17/topstories3.russia (accessed 1 July 2009).

27. Dr. Martin Libicki, "Deterrence in Cyberspace," *High Frontier* 5, no. 3 (May 2009): 18, http://www.afspc.af.mil/shared/media/document/AFD-090519-102.pdf (accessed 8 December 2009).

28. Shane Harris, "The Cyberwar Plan," *National Journal Magazine*, 14 November 2009, http://www.nationaljournal.com/njmagazine/cs_20091114_3145.php (accessed 14 November 2009).

29. AFDD 1, *Air Force Basic Doctrine*, 47.

30. AFDD 2-1, *Air Warfare*, 14–15.

31. AFDD 2-8, *Command and Control*, 1 June 2007, 4–6, http://www.fas.org/irp/doddir/usaf/afdd2-8.pdf (accessed 8 December 2009).

32. AFDD 2-1.6, *Personnel Recovery Operations*, 1 June 2005, 10, http://www.e-publishing.af.mil/shared/media/epubs/AFDD2-1.6.pdf (accessed 15 December 2009).

33. AFDD 1, *Air Force Basic Doctrine*, 57.

34. AFDD 2-1, *Air Warfare*, 24.

35. AFDD 2-11, "Cyberspace Operations," draft, 4 February 2008, 13.

36. Gen Kevin P. Chilton, "Cyberspace Leadership: Towards New Culture, Conduct, and Capabilities," *Air and Space Power Journal* 23, no. 3 (Fall 2009): 10, http://www.airpower.au.af.mil/airchronicles/apj/apj09/fal09/fal09.pdf (accessed 8 December 2009).

37. Harris, "Cyberwar Plan."

38. Ibid.

39. Ibid.
40. Ibid.
41. AFDD 2-11, "Cyberspace Operations," draft, 13–17.
42. Kuehl, "From Cyberspace to Cyberpower," 4.
43. In a Deputy Secretary of Defense memorandum of 12 May 2008, the DOD defines *cyberspace* as "a global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers." Air Force doctrine defines it as "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." AFDD 2-11, "Cyberspace Operations," draft, 1.
44. Wynne, "Flying and Fighting in Cyberspace," 8.
45. Lonsdale, "Impact of Cyberspace on Strategy," 21.

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P-51 Escorts

Legend or Myth?

Dr. David R. Mets*

As recently as the fall of 2009, a distinguished lecturer at the US Air Force's Air War College repeated a "truth" that has been with us for 60 years. So strongly held, it has seldom, if ever, been questioned. This assertion arises, I suppose, from historians' common tendency to go into the record with the question "Why were they so dumb?" or "Why were they not as smart as the present generation?" The revealed "truth" holds that interwar Airmen were so hypnotized by their own strategic bombing wisdom that they failed to reasonably predict that bombers would require fighter escorts to survive and that such fighters were technologically feasible.

What were the real reasons why such luminaries as Kenneth Walker, Haywood Hansell, Carl Spaatz, and Claire Chennault (yes, Mr. Fighter Pilot himself) *all* concluded that the idea of escort fighters for long-range bombers was impractical—desirable, but impractical?[1] Is it possible that it was not ignorance but logic that made them so conclude?

National Policy in 1935

Postwar critics sometimes do not consider the context in which the air planners worked. Airmen of the prewar period had been living in a strictly isolationist society since 1920 at the latest. The public and most politicians were firmly persuaded that America would never again commit itself to a European war especially. Thus, US national security policy was strictly defensive. The B-17 (fig. 1) at first was sold as a weapon for coastal defense—part of the reason for calling it the "Flying Fortress." This stance prevented any public debate on the bombing of advanced industrial societies, and any such idea was bound to receive a cold reception by the Army General Staff.

USAF photo

Figure 1. B-17

Technology in 1935

In the interwar period, many of the homes in rural areas lacked electricity. Many still had neither telephones nor indoor plumbing. Even radio was a novelty. Anyone working in un-air-conditioned Montgomery, Alabama, would have required a miracle of foresight to predict the advent of radar in five years and to understand its implications.

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USAF photo

Figure 2. B-10

USAF photo

Figure 3. P-26

In 1932, when strategic bombing theory was in its genesis, the first all-metal monoplane fighters and bombers came on the line. The B-10 (fig. 2) had no external wing bracing, an enclosed cockpit, and retractable landing gear. Its wing was stressed to somewhere around 3 Gs. That bomber's contemporary fighter, the P-26 (fig. 3), had external wire bracing for its wings, an open cockpit, and fixed landing gear. Its wings were stressed for something like 6 Gs. To anticipate that the United States could develop a cantilever wing that strong, yet thick enough to accept retractable landing gear and machine guns in three years or so would have been extraordinary. As it was, the P-26 could hardly fly faster than the B-10, and the aircraft took a long time to get to bomber altitude because of its slow rate of climb.[2]

Drop-Tank Idea in 1935

In 1925 Billy Mitchell wrote about drop tanks used in World War I.[3] P-12s flying from Selfridge Field, Michigan, to Washington in the interwar period frequently used external tanks to extend their range. The idea was not unique.[4]

Escort Fighter Requirements

Generic requirements for escort fighters included long range, maneuverability equal to that of the enemy's interceptors, armament about equal to the adversary's, and at least equal speed.[5] We needed a sufficient number of them to distract the interceptors long enough for the bombers to escape. Because escort pilots had to master cruise-control techniques, superior navigation skills over unfamiliar territory, and basic fighter maneuvers, they required more training than their interceptor counterparts. At the end of the battle, if an interceptor pilot ran out of gas, he might be able to dead-stick his craft to a safe landing, or at least parachute to his home. But escort pilots had to have enough fuel to reach friendly territory plus a reserve in case they encountered fog over East Anglia. The extra fuel requirements alone seemed to guarantee that the escort would be heavier and less agile than the interceptor. Finally, escort pilots needed at least the same training as interceptor pilots in instrument landing.

Requirements for Doctrinal and Technology Planners

No nation or military service has infinite resources. Yet, especially on the defensive, a vast number of possible dangers exist. Thus, planners must almost inevitably select a limited number of scenarios for which they can prepare, compelling them to plan for the most probable occurrences rather than all possibilities. That is why 9/11, Pearl Harbor, Barbarossa, and Inchon succeeded—in the short run. The aggressor can plan for one improbable approach. But counting on a short war can prove foolhardy.

Ambassador's Reports during the Battle of Britain

We all know how the Battle of Britain turned out. At the time, American Airmen did not. Joseph Kennedy, our ambassador to Great Britain, reported that the British were likely to go down. Spaatz, Gen Henry "Hap" Arnold's observer in England at the time, predicted that Britain would stand.[6] Moreover, in 1940 Arnold's agents told him that the German twin-engine Me 110, designed as an escort fighter, was a failure in the battle, even requiring escorts of its own to survive.[7] Whom could we believe? That fall, Winston Churchill called the outcome the "Narrow Margin." Keeping in mind that Germany was still allied with the USSR, would a second Battle of Britain in 1941 have the same outcome? If Stalin did not predict the Nazi onslaught in Barbarossa, why should American Airmen do so? In *Mein Kampf*, Hitler himself had criticized the kaiser for having permitted a two-front struggle in World War I.[8]

Motives for B-36 Development Plans

After France fell in May 1940, and during the Battle of Britain, the US Army Air Forces (USAAF) began plans for the B-36 program.[9] Why would American Airmen push for a 10,000-mile bomber if they could reasonably predict the availability of numerous B-17 bases in East Anglia within range of Berlin? Many Fortresses could be built for the price of one B-36. Was it conceivable that the bombers headed for Berlin would have to depart from North America? Would drop tanks for fighters *then* do the job?

"Lessons" of the Battle of Britain?

Long after the war, Hansell remarked that it was fortunate that theorists at the Air Corps Tactical School (ACTS) had not forecast the coming of radar because it would have caused them to abandon the strategic bombing idea, with unfortunate results.[10] As improbable as it seemed to most people, radar did come, and Spaatz and others learned about it during the summer of 1940. By then, the Air Corps had a huge investment in strategic bombing theory and the development of four-engine bombers. The implications of radar for air defense were only dimly perceived, and it was possible to write off Germany's failure to bad tactics, poor aiming, insufficient bomb loads, light defensive armament, and undersized bombers. In any event, escort fighters clearly seemed inadequate for the Luftwaffe.

P-51 Design: Science or Dumb Luck?

The glib lecturer of the twenty-first century speaks of the Mustang design solution as though it were obviously inevitable and should have come much sooner. But that is open to question because some fortuitous elements occurred in its development. At first, neither the Air Corps nor USAAF had a hand in the program. Before Pearl Harbor, North American Aviation had rapidly put together the early design in response to a British requirement, originally considering the aircraft a ground-attack bird—the A-36.[11] Powered by Allison engines, the first models had neither the fuel economy nor power sufficient for the Berlin escort mission. The National Advisory Committee for Aeronautics had conducted experiments in wind tunnels with various designs during the 1930s, but the laminar flow wing was not fully tested until 1938. The British ordered the Mustang with a laminar flow wing but hedged with a contract requirement that if it did not test out, then the company had to rapidly convert to a more conventional design. It did test out but very late in the game. Still, the originals were not sufficient. It fell to Maj Thomas Hitchcock, the US air attaché in England, to fly one with the Allison engine. He speculated that retrofitting the aircraft with a Rolls-Royce Merlin would significantly improve its performance. That idea proved successful and completed the package—but the major was not a part of the official development structure.[12]

The Trouble with German Fighter Development during Wartime?

The P-35 and P-36 flown by the Air Corps in the mid-1930s had internally braced wings, closed cockpits, and retractable landing gear. The Luftwaffe and Italian air force still used biplanes. However, Germany passed the United States with the Messerschmitt Bf 109 in 1937.[13] But after the war started, German fighter development was somewhat arrested. First, reasoning that development of new designs reduced production, Hitler mandated that no new aircraft be undertaken without the assurance that they could come on the line within two years, thinking that the war would be over by then. According to some of the surviving Luftwaffe veterans, though, when the tide turned, Hitler was taken with the idea that Germany should focus on bombers in order to punish the oncoming Allies. Supposedly, he intervened at a critical moment in the development of the Me 262 jet to try to transform it from an interceptor to a fighter-bomber.[14] When a few got on the line toward the end of the war, they outclassed the P-51, but it was too late. The numbers of the Allied forces were simply overwhelming. Thus, the success of the Mustang escort depended in part on bad technological decisions made in Germany—something that the Allies hardly could have counted upon.

Ultra

The P-51 got on the line in numbers in January 1944. By then, P-47s, bomber gun-

ners, and Russians had killed a good many of the Luftwaffe's original fighter pilots. Fuel shortages limited the number of training hours the Germans could give to the replacements. The average experience level among interceptor pilots was declining rapidly. Knowing this from reading German mail through Ultra intelligence, USAAF commanders deliberately started launching bomber raids, notwithstanding their awareness that the targets were socked in. This action flushed the fledgling interceptor pilots, many of whom died without ever coming in contact with the Americans. Insufficiently trained, they had to make low-ceiling instrument approaches and land tail-dragger fighters on icy runways. Some days more of them were killed by accidents than by P-51s. Could anybody at the ACTS in 1935 have possibly imagined that outcome?

P-51 with 1935 Bomber versus P-51 with 1944 Bomber?

Recollect that both aerodynamic and engine technologies were on the steep parts of their development curves in the 1930s and 1940s. Prewar planners were necessarily dealing with abstract scenarios. Teaming up the P-51 with bombers of earlier generations on a route of limited distance worked. Those planners *had* based part of their thinking on the performance of the contemporary B-10s and P-26s of the 1932 era. But when the Mustangs escorted bombers of their own generation—B-29s (fig. 4)—they did not succeed. Drop tanks no longer sufficed. Six thousand Marines died to seize an escort base at Iwo Jima, halfway to the target.[15]

USAF photo

Figure 4. B-29

Parasite Fighters and the B-36

The 10,000-mile bomber came on the line shortly after World War II. Where would we get escorts for it? The Navy hammered the B-36 program because the bird allegedly was so slow that the new jets would kill it easily. Yet early jets were notorious fuel burners. How could the 36s be escorted? We tried parasite fighters, but a bomb bay filled with a fighter cannot carry bombs. B-36s could tow F-84s, but that did not help their own range.[16]

Theory behind Selection of the B-47 and B-52

Part of the reasoning for converting to jet bombers maintained that they would penetrate enemy air defenses because of their high speed. Their velocity would make deflection shots impractical, and interceptor attacks would almost always become stern chases—during which they would be vulnerable to tail guns. But jet bombers also guzzled fuel. The possibility of air-to-air refueling was well known before World War II, but providing a fleet of tankers sufficient for the attack on Germany would prove too much even for the American economy. In those days, bomber crews had to make 25 (or later, 35) trips to Germany. But now, because of nukes, the new theory assumed that the war would be over in two or three days; thus, overall attrition would be acceptable with unescorted jet penetration.[17] But who in his right mind in 1935 or even 1941 would have predicted the appearance of a city-busting bomb in 1945? In the end, all of the B-52s lost in combat went down to fire from the ground. For a while in the early 1950s, Strategic Air Command did have some fighter escort units, but they had disappeared by the end of the Eisenhower administration.

Conclusions

In our adolescence, we had a rather strong tendency to conclude that our parents' generation was pretty dull—and, by extension, all earlier generations. But the difficulty in stamping out either smoking or teenaged driving under the influence is proof enough of one generation's similarity to its predecessors. It is all too easy to look out of context at the problems of past generations and conclude that they were much simpler than ours. Only when we become parents ourselves do we realize that the difficulties are more complex than we had imagined. So, too, when we become commanders ourselves, we discover that the difficulties of planning are more complicated than we had thought.

Military planners of a nation with a defensive strategy cannot know the future. They cannot plan for all possibilities. To do so may well guarantee weakness everywhere. The luminaries at the ACTS in 1935 hardly could have guessed that Hitler would soon start a war, the laminar flow wing would succeed, radar would come within five years, the aircraft carrier that was the British Isles would survive, Hitler would attack Russia before Britain was finished, Japan would end US isolationism, the Rolls-Royce Merlin engine would turn an attack plane into an effective dogfighter with superior range, Hitler would retard fighter development, Germany would not go to full mobilization until 1943, the Norden bombsight would not have pinpoint accuracy, Ultra would enable wonderful intelligence, Luftwaffe training would go to the dogs, the German people could endure the burning of Hamburg and Dresden yet go back to factory work, and on and on. To do so would have required predicting that a whole host of interdependent miracles would occur. Planners can only hope that their guesses are closer to reality than those of their enemies and that their system can adapt to the appearance of sudden miracles more rapidly than can their enemies'.[18]

Pierre Beauregard in 1861, Adolf Hitler in 1939, and Isoroku Yamamoto in 1941 all banked on a short war. Their offensive strategy might well have worked if their short-war assumption had held. It enabled them to concentrate their forces against a dispersed enemy who did not know the time and place of the attack and had to plan for several locations. But when their wars did not fit the assumption, their enemies had time to work it out. If Hitler's assumption of two years had proved valid, then the P-51 would have come three years too late.

The P-51 solution owed as much to interdependent, fortuitous events as to the wisdom of the wartime generation. According to H. L. Mencken, "There is always an easy solution to every human problem—neat, plausible, and wrong."[19] Carl von Clausewitz himself tried to teach us that war is the province of uncertainty, fog, and chance. Would it be more becoming of us to recognize that the leaders of the interwar period did about as well as could be expected, given the complexity of the times? ✪

Notes

1. Martha Byrd's *Chennault: Giving Wings to the Tiger* (University, AL: University of Alabama Press, 1987) is the least partisan work on Chennault and his "struggles" at Maxwell Field; see also Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, vol. 6, *Men and Planes* (1955; new imprint, Washington, DC: Office of Air Force History, 1983), 217, which shows that the idea persisted up to the coming of the war.

2. John W. R. Taylor, ed. and comp., *Combat Aircraft of the World, 1909 to the Present* (London: Ebury Press and Michael Joseph, 1969), 527, 453; and Haywood S. Hansell Jr., *The Air Plan That Defeated Hitler* (Atlanta: Higgins-McArthur / Longino & Porter, 1972), 18.

3. William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power—Economic and Military* (New York: G. P. Putnam's Sons, 1925), 169.

4. Craven and Cate, *Men and Planes*, 218, explains that we further pursued the idea before Pearl Harbor as a means of extending the ferrying range of aircraft to save on seaborne shipping.

5. That would be true for fighter-on-fighter combat, which involved violent maneuvering requiring a high rate of fire in order to maximize the probability of hitting the target. However, for fighter-on-bomber combat, toward the end of the war, the Germans felt compelled to increase calibers on some of their interceptors so that once a round hit, it had to be robust enough to damage the more heavily constructed bombers. Further, the higher calibers enabled fighters to stand outside the range of the bombers' guns and take more careful aim. Thus, they increased the probability of kill once a round hit, but the slower rate of fire and lesser ammunition supply reduced the probability of hitting. US escorts' targets were seldom bombers; in any event, they were equipped with a superior gun and especially with great ammunition. Moreover, the lower calibers had a flatter trajectory than the large guns, which also helped in the air-to-air battle. See AVM John R. Walker, RAF, *Air Superiority Operations* (London: Brassey's, 1989) for a clear explanation of aerial battle. I am also indebted to Dr. Richard Muller for that clarification.

6. Carl A. Spaatz, "Leaves from My Battle of Britain Diary," *Airpower Historian* 4, no. 2 (April 1957): 66–75; and Carl Spaatz to Henry Arnold, letter, 31 July 1940, Spaatz Collection, Manuscripts Division, Library of Congress, Box 7.

7. Derek Wood with Derek Dempster, *The Narrow Margin: The Battle of Britain and the Rise of Air Power, 1930–1940* (1961; new imprint, Washington, DC: Smithsonian Institution Press, 1990), 29.

8. Writing in jail in the early 1920s, Hitler makes no secret of his ambition to expand eastward, hoping for the cooperation of England, which would have the whole world outside the continent to itself. Although he puts principal blame for Germany's defeat in World War I on a betrayal within that country, especially on the Jews, he also is critical of the foreign policy that forgot the paramount principle that one should not take on more than one enemy at a time. Adolf Hitler, *Mein Kampf*, trans. Ralph Manheim (Boston: Houghton Mifflin, 1943), 256, 892, 894, 898, 925, 950, 965.

9. Taylor, *Combat Aircraft*, 455, 464; and Craven and Cate, *Men and Planes*, 244.

10. Maj Gen Haywood Hansell, interview by the author, Hilton Head, SC, 14 December 1982.

11. Craven and Cate, *Men and Planes*, 219.

12. Ibid.; and R. Cargill Hall, ed., *Case Studies in Strategic Bombardment* (Washington, DC: Air Force History and Museums Program, 1998), 210–11.

13. Taylor, *Combat Aircraft*, 182.

14. After the war was over and both Hitler and Goering were gone, the survivors may have tended to blame all they could on them. However, unreliable engines and a cautious Luftwaffe leadership evidently caused the late appearance of the jet. See "Messerschmitt Me 262A Schwalbe," National Museum of the Air Force, http:/www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=509 (accessed 7 October 2009).

15. Elmer B. Potter, ed., *Sea Power: A Naval History*, 2nd ed. (Annapolis, MD: Naval Institute Press, 1981), 348–49.

16. A less-far-out idea regarding parasite fighters involved carrying a jet F-84 relatively close to the target, launching it for a high-speed reconnaissance run, and then recovering it in a safe area for the return trip home. See Marcelle Size Knaack, *Post–World War II Bombers* (Washington, DC: Office of Air Force History, 1988), 38–39.

17. We began development of postwar refueling to extend the ranges of B-29s and B-50s. Even with the availability of overseas bases, the reciprocating-engine bombers did not have the range required to deliver nuclear weapons to targets in the USSR. At first, we used converted bombers (KB-29s and KB-50s). In the probe-and-drogue method—the early system—the fuel flow through the hoses was too slow for large-capacity bombers, so we developed the boom system for them because it permitted faster transfers. When it became clear that the B-36 was too slow for effective penetration, tankers became imperative for refueling the jet bombers, whose consumption was higher but whose speed facilitated safe passage through defenses. Clearly, the use of reciprocating-engine tankers was inefficient because they could not reach jet altitude. Yet jet tankers were so much more expensive that we used the KC-97 into the 1960s, sometimes with auxiliary jets under its wings. Knaack, *Post–World War II Bombers*, 118n, 130–31n, 168n, 175.

18. This idea has many fathers, one of the main ones Michael Howard. See his "Military Science in an Age of Peace," Chesney Memorial Gold Medal lecture, 3 October 1973, reprinted in *Journal of the Royal United Services Institute* 119 (March 1974): 3–11.

19. H. L. Mencken, *A Mencken Chrestomathy* (New York: A. A. Knopf, 1949), 443.

Hablan los generales: Las grandes batallas del conflicto colombiano contadas por sus protagonistas edited by Glenda Martinez Osorio. Grupo Editorial Norma (http://www.carvajal.com.co/CarvajalIng/empresas-eng/grupo-editorial/grupo-principal.html), Bogotá, Colombia, 2006, 340 pages, $12.50, ISBN 958049312X.

Despite its title, not all of this anthology's authors are generals, but they all give revealing, firsthand accounts of Colombia's violent campaigns against guerrillas, drug lords, and other outlaws since the early 1960s. A prologue by Dr. Alfredo Rangel comments on the 14 chronologically organized chapters. Referring to the Fuerzas Armadas Revolucionarias de Colombia (FARC) insurgency, Rangel notes, "That guerrilla group has always demonstrated an immense capacity to survive, resist, and persist, but a weak ability to definitively tilt the political and military balance to its side" (p. 35), an assessment one might make of many insurgent groups. However, his remark that "the city is by its own nature a dangerous place for clandestine and irregular groups" (p. 14) might amuse veterans of urban warfare in Baghdad. Chapters 2 and 3 describe Colombian military manhunts to find incredibly violent criminals. The author of chapter 11 is an anonymous undercover agent who cooperated with US officials to intercept cellphone calls and use unmanned aerial vehicles to track down leaders of Cali drug cartels. Chapter 12 is an ordinary soldier's bizarre account of how FARC guerrillas wiped out his unit and held him prisoner for years, an ordeal that literally drove him insane.

Readers will find many familiar nuggets of counterinsurgency (COIN) wisdom. Gen Álvaro Valencia, who penned two chapters, observes that "in guerrilla warfare, nothing can remain fixed or stable. Mental, physical, and methodological flexibility constitute a true principle" (p. 62). Because Colombian insurgents often fill power vacuums in remote regions, sometimes serving as de facto local governments for decades, Colombian military leaders understand the need for an integrated civil-military strategy. Regarding one operation, General Valencia says that "the plan's emphasis would be on the combination of civil and psychological actions, which would have priority over any combat operation" (p. 45). When Colombian forces entered rebel-controlled areas, local residents often hesitated to confide in them until convinced that the government would stay and provide basic services. Cultural awareness is as essential in Colombia as it is anywhere else, but Colombian COIN forces have the advantage of operating in their own country. Nevertheless, the Colombian military struggled many years to adapt. Reflecting on the failed Operation Marquetalia against the FARC in 1964, Gen José Bonnet philosophically remarks, "Without knowing it at that moment, a new army was born there, a modern army" (p. 108).

Airpower proved essential in Colombian COIN campaigns. During operations against communist guerrillas in the 1960s, Colombian Air Force C-47 transports landed troops on an open field, float planes landed troops on a river, and other aircraft dropped leaflets urging residents not to support the guerrillas. In 1990 helicopters and fighter-bombers participated in an intense air-ground assault against the FARC's Casa Verde stronghold where Gen Humberto Correa wished for even more airpower because "we found ourselves short of helicopters, a considerable number of them having taken hits while landing troops" (p. 214). International cooperation figured prominently. US officials supplied information about the immense "Tranquilandia" cocaine factory hidden in the jungle and gave the Colombians the aircraft they needed to capture it. When the FARC attacked Mitú, a remote town beyond helicopter range of the nearest Colombian base, guerrillas hid in a hospital and schools where aircraft could not easily bomb them due to worries about collateral damage. The Colombian military arranged to use a nearby Brazilian air base as a staging area for a helicopter assault. The ensuing Operation Angel Flight marked a watershed for the Colombian Air Force, which implemented "the policy of centralized control-decentralized execution . . .

in order to increase reaction speed" (pp. 290–91). Gen Yair Perdomo comments that "never . . . prior to that moment in Colombian history, had we fully appreciated the importance of the logistical system for aircraft operating at distances greater than one hundred miles" (p. 302).

This thought-provoking book contains both strengths and limitations. The chapters seem relatively candid; however, General Valencia is clearly defensive about his unit's role in killing renegade priest (and family friend) Camilo Torres, who had joined a rebel group. The general subsequently fended off repeated government inquiries, a communist backlash, and even an assassination attempt. Such episodes make readers wonder how much suffering the Colombian government could have avoided by maintaining enough presence in remote areas to prevent hostile groups from becoming deeply entrenched. The book says little about right-wing paramilitary groups, but the absence of a chapter about the manhunt for notorious drug baron Pablo Escobar is most surprising. There is no index, but the maps are helpful. An abstract and brief author biography begin each chapter, but they contain errors. Chapter 13's abstract refers to Operation Angel Flight of 1998 as the debut of the AC-47 gunship, but chapter 9 describes using those planes eight years previously. Overall, readers will be impressed with the Colombian military's perseverance. Anyone interested in the military's role in COIN and counterdrug operations would find *Hablan los generales* instructive.

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Barbarossa: The Air Battle, July–December 1941 by Christer Bergström. Ian Allan Publishing (http://www.ianallanpublishing.com/home.php), Riverdene Business Park, Molesey Road, Hersham, Surrey KT12 4RG, United Kingdom, 2007, 144 pages, $49.95 (hardcover), ISBN 1857802705.

There are a few battles of World War II that one could certainly call epic. Among them are the invasion of the Normandy coastline in 1944; the invasion of Iwo Jima; and the Battles of Britain, Midway, and the Coral Sea. Operation Barbarossa, Germany's invasion of the Soviet Union, is no less an epic struggle. But in several respects, Barbarossa stands on its own. Aside from the sheer scale of the endeavor—in terms of manpower as well as battle frontage—the ferocity of this fight from its start in June 1941 gives Barbarossa claim to its own distinct pedestal.

As we've studied Barbarossa's air and land operations in our profession, we know of the problems the Germans faced with logistics; the constantly changing objectives as Hitler focused on Moscow and then Leningrad and then Kiev, as well as others over the course of the war; the Russian winter; and the battle of attrition, for which the Germans were not prepared. Less well known, perhaps, is the fact that the Germans had not anticipated that the Soviets would prove so determined, well organized, and highly motivated—traits for which history has certainly given the Soviets credit.

In *Barbarossa: The Air Battle, July–December 1941*, author Christer Bergström gives what I consider a very readable and well-researched account of the first six months of the battle. The book isn't just a dry narrative of activities and battle losses. Quite the contrary, Bergström goes to great lengths to relate the battles and activities to specific people. It's this personal touch, coming from diaries, logbooks, and other unprinted (unpublished) records, that sets *Barbarossa* apart from most other chronicles of historical battles that I've read.

Throughout the book, the reader follows individuals such as *Oberst* Werner Mölders from the time he becomes a 100-count ace until his death several months later in an accident. The reader will possibly chuckle at fighter pilot *Major* Hannes Trautloft, who, while touring the German front lines near Leningrad, comes under attack by Soviet fighters and exclaims, "Where the hell are our fighters?" (p. 86). Bergström also takes the reader into the Soviet pilots' world, where the amazing feats of airmen such as *Leytenant* Mikhail Garam and *Leytenant* Aleksandr Pavlichenko come to light. In a moment of battlefield humor that illustrates the Soviets' severe lack of training and desperation as they fought to defend Moscow, the reader will smile at *Mladshiy Leytenant* Boris Kovzan's tale of hacking down a German aircraft with his own propeller. Kovzan had to force-land his MiG-3 as a result. His response to his commander as to why he'd used only half of his ammunition but had resorted to the *taran* (air-to-air ramming) to bring down his opponent: "I don't know how to shoot!" (p. 107).

Without a doubt, the fighting on the German Eastern Front was bitter. The author drives home the point that this was a war fought be-

tween probably the two most motivated armies in the world at the time, with opposing ideologies as a driving force (summarized on p. 115). The accounts that Bergström lays out throughout *Barbarossa* serve to illustrate this bitterness.

Skill and valor on both sides also played a significant part in these first six months of combat. The author cites some very good analysis showing that Germany's reliance on its technological advantage did not always fare better than numbers of troops. Even as early in the conflict as the last months of 1941, the Soviets were able to begin closing the technology gap (examples abound—the T-34 tank and the Il-2 *Shturmovik* among them).

Barbarossa is well worth the read. Bergström's account made me feel like I was reading the play-by-play of a key match; at times, I found myself almost pulling for one side and then the other as the author relayed both sides' dire day-by-day struggles for air superiority. We all know how the match turned out. Bergström gives us much better insight into why this battle front evolved the way it did. *Barbarossa* is insightful, informative, and a pleasure to read.

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F-100 Super Sabre at War by Thomas E. Gardner. Zenith Press (http://www.zenithpress.com), 729 Prospect Avenue, P.O. Box 1, Osceola, Wisconsin 54020, 2007,128 pages, $19.95 (softcover), ISBN 0760328609.

Few aircraft have made their appearance under as auspicious circumstances as the North American F-100 Super Sabre. Designed by the same team responsible for the legendary P-51 Mustang and the superb F-86 Sabre, the F-100 was the world's first production fighter capable of flying at supersonic speeds in level flight. In service, however, the F-100 never lived up to the standards set by its illustrious predecessors. Early examples proved exceedingly hazardous to fly. By the time the aircraft's problems were solved, later and better fighters had entered service. The F-100 eventually settled into the role of a fighter-bomber, in which it provided solid service in the Cold War as well as the Vietnam War and into the 1980s.

Thomas E. Gardner's *F-100 Super Sabre at War* is an uneven work. Its good points include a commendable description of the aircraft, with comparisons to its contemporaries—the F4D Skyray and the MiG-19. Moreover, the author uses illustrations from technical orders to illustrate many points. Unfortunately some of these illustrations are too small to be easily read, at least by this reviewer's eyes. The book also includes an abundance of photographs of the F-100, many in color, and describes its service in the air forces of Denmark, France, Taiwan, and Turkey.

One would expect a book whose title contains the phrase "at War" to concentrate on the aircraft in combat. The book does offer fascinating descriptions of two specialized uses of the F-100 in the Vietnam War—on Misty forward air controller and Wild Weasel missions. Alas, it includes barely any descriptions of the aircraft's bread-and-butter combat missions—close air support and battlefield interdiction in South Vietnam. Also missing is any mention of combat that the F-100 saw in service with France, Taiwan, and Turkey. Although not actual combat, other notable operational roles of the F-100 included sitting on quick-reaction alert with nuclear weapons and flying air shows in the colors of the Thunderbirds and Skyblazers aerial demonstration teams. Many F-100s ended their lives as remote-controlled target drones, shot down as part of training and test activities. Gardner covers these significant roles only in passing or not at all.

F-100 Super Sabre at War is at least the third popular history of this aircraft to be published recently. The other two (*F-100 Super Sabre in Action* by Larry Davis and David Menard, and a lengthy article by Jon Lake in *International Air Power Review* 11 [Winter 2003]) are better works. I recommend that readers wishing to learn about this significant fighter take a look at one or both of the alternatives instead.

Kenneth P. Katz
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Dawn over Baghdad: How the U.S. Military Is Using Bullets and Ballots to Remake Iraq by Karl Zinsmeister. Encounter Books (http://www.encounterbooks.com), 900 Broadway, Suite 400, New York, New York 10003, 2004, 237 pages, $25.95 (hardcover), ISBN 1594030502; $16.95 (softcover), ISBN 1594030901.

Since the invasion of Iraq in 2003, the future of that country and its people remains uncertain.

Security is a serious issue in most regions, civilian casualties remain high, and basic amenities such as electricity and running water are still considered a privilege. Nearly 4,000 American troops have died fighting for their country, and a majority of the American public wants to bring its Soldiers home. However, in *Dawn over Baghdad*, Karl Zinsmeister points out that there is hope for the Iraqis and that the suffering and loss of US troops are necessary to win the war on terror.

The author's travels throughout Iraq with different Army divisions provide an insightful look into today's fighting military men and women. His book reveals the stories of numerous modern-day American heroes and gives a firsthand account of what daily life is like in tumultuous Iraq. Zinsmeister accompanied Soldiers to local Iraqi political meetings and elections, insurgent searches, and even raids on villages and houses. With his straightforward style and everyday prose, he paints an accurate picture of what it is like to be an American Soldier and an Iraqi civilian in Iraq.

Zinsmeister introduces his time in Iraq by first describing his high admiration and respect for the members of today's armed services. His numerous accounts of specific Soldiers instill pride in both the United States and its military. Such sentiments are most evident when he states that

> it's easy for critics on both the left and the right to convince themselves that the United States is a decadent society, that our young people have gone soft, that we will never produce another generation like the men who climbed the cliffs at Normandy on D-day. That judgment, I'm here to report, is as wrong as wrong can be. We've got plenty of soldiers in uniform today whom Americans can trust with any responsibility, any difficulty, any mortal challenge (p. 19).

The bulk of *Dawn over Baghdad* focuses on the wide array of activities that US Soldiers are performing, from helping Iraqis decide what should be done with Saddam's abandoned buildings, to sitting in on city council meetings to ensure that local politicians are making wise decisions. Clearly, US Soldiers are taking on unfamiliar assignments. The Soldiers' ability to adapt to these unpredictable situations increases the level of respect they deserve.

Beyond creating an immense amount of reverence towards American troops, Zinsmeister's narrative also creates a sense of hope in Iraq that is missing in American media reports. He describes how the majority of Iraqi people favor a government structure similar to that of the United States and points out that the insurgents represent only a small percentage of the Iraqi population. However, he also relates how the Iraqi people do not follow the same moral code as do Americans and predicts that the road to a successful and effective democracy will be a long one with many challenges along the way.

Zinsmeister finishes with a powerful assessment of how the United States needs to continue its fight in Iraq and uses the conflict as grounds to reassess who America's true allies are. He points out that the world's perception is that the US population is not willing to endure a long-term overseas conflict and that by continuing the war in Iraq, America is proving that belief wrong.

Overall, *Dawn over Baghdad* is an inspiring account of the US military's actions in Iraq. However, no book is perfect, and Zinsmeister's work does have a few flaws. At times, he seems too optimistic and is easily satisfied with only slight majorities in his polling. Also, his writing appears random and scattered, but he does a good job of tying his points together at the end of each chapter. Unfortunately, the book is somewhat dated, but his preface, written in 2005, addresses some of the more recent developments.

I highly recommend *Dawn over Baghdad* to any American who wishes to read a straightforward and informative book about the war in Iraq—and especially to anyone who will be deploying to Iraq in the near future. Zinsmeister not only provides a multitude of insightful information but also creates a great feeling of pride in the reader. The author makes it clear that the US Soldiers who have died in Iraq deserve our respect and admiration as well as our gratitude for willingly fighting the war on terror in the Middle East so that we do not have to fight it in our own backyards.

Cadet Fourth Class Samuel Major
Rice University

Korea: A Lieutenant's Story by Gen Robert C. Mathis, USAF, retired. Xlibris (http://www2.xlibris.com/bookstore/index.asp), International Plaza II, Suite 340, Philadelphia, Pennsylvania 19113-1513, 2006, 162 pages, $27.89 (hardcover), ISBN 1-42570-548-0; $17.84 (trade paperback), ISBN 1-42570-547-2.

In this short snapshot of a biography, Gen Robert Mathis recounts his experiences as a young officer in Korea from 1950 to 1951. A

reader can't help imagining that he is sitting beside the author, who recounts story after story, recalling memories of years gone by. Numerous anecdotes of friends and family and of his training at West Point and Willie Field all serve to set the stage for the few small joys and many great losses the Korean War would bring to this young man. Some accounts seem insignificant as the pages go by, but they were all important memories for General Mathis, looking back over a lifetime of military service.

In those two short years, Robert Mathis held a wide variety of jobs. He flew the F-80 in Korea as one of the Air Force's first jet fighter pilots. Having graduated from West Point in 1948, he also put his soldiering skills to work as a forward air controller (FAC), both on the ground and as an airborne FAC in the T-6 Mosquito. Mathis even suffered through serving as a general's aide for a few months.

On 26 November 1950, Mathis was directing air strikes at night when the Chinese massively overran his FAC position. Despite being shot in the chest, he charged back through the Chinese lines to rejoin his own lines and avoid capture at all costs. His gallantry that night earned him a Silver Star.

What does the book have to offer the reader? Besides a peek into the day-to-day life of a modest American hero, there are other takeaways. Mathis was *joint* before anyone ever used the word to describe interservice operability. As a fighter pilot in the one-year-old Air Force, he saw airpower as a way of helping his 1948 West Point classmates who had their boots on the ground. Mathis also points out lessons that he learned along the way as a young officer: the wisdom in seeking counsel from good noncommissioned officers, remembering who got him where he was, the frustration and benefits of additional duties, overcoming obstacles along the way, the value of moral courage, and the high price of military service paid by many of his friends.

The book shows Robert Mathis as a man with few pretenses. He was an all-American boy from Texas who wanted to serve his country as a military pilot. He volunteered for duties since he believed that doing so would help save the lives of others. While recounting the hardships he endured, he is quick to acknowledge the many people who suffered worse than he—and the many who did not return from the war in one piece. After numerous accounts of close calls with death, he simply credits his guardian angel: "It is hard not to believe that God has a strong hand in all that we do" (p. 148). It's refreshing to read about a humble four-star fighter pilot.

Korea: A Lieutenant's Story is just that—one man's story about the early years of his life. While some books are made into audio versions these days, this one seems as though it started that way: "Okay, General, when I press 'record,' tell me about your time in Korea."

Chaplain, Maj Matthew P. Franke, USAF
Washington, DC

Boeing versus Airbus: The Inside Story of the Greatest International Competition in Business by John Newhouse. Alfred A. Knopf (http://www.randomhouse.com/knopf/home.pperl), 1745 Broadway, New York, New York 10019, 2007, 272 pages, $26.95 (hardcover), ISBN 1400043360; 2008, $14.95 (trade paperback), ISBN 1400078725.

In the early 1990s, a visitor to the Boeing company's main aircraft-assembly plant near Seattle, Washington, would enter a huge, multiwing building and see in every direction brand-new commercial aircraft under construction. Standing out in the crowd were the 747 jumbo passenger jets with both US and foreign airline logos already painted on the fuselages of the ones nearing completion. It was an impressive sight and a vivid testimony to the world's then-largest aircraft producer and America's biggest exporter.

Today, Boeing's fortune has changed. No longer can it claim dominance as the premier manufacturer of both commercial and military aircraft. Put into perspective, the venerable 747 is becoming a bit dated. It's hard to imagine, but the first versions went into airline service more than 40 years ago.

Although there is limited domestic competition for profitable airplane contracts, overseas business is a different story. A single company stands out—Airbus, a European consortium of nationally backed industries with headquarters in France. No new aircraft has attracted more attention than the company's monstrous A380, which made its long-awaited debut in 2007. Granted, the 747 is a big jumbo, but the A380 is a superjumbo. The issue becomes whether either aircraft-development-and-production corporation will be the overall winner if it concentrates on a

single large airplane—a 747 major-upgrade model for Boeing or the A380 for Airbus.

Trying to make sense of all this is John Newhouse, an accomplished foreign-policy analyst for the *New Yorker*, a senior adviser in the Clinton administration, and a prolific author whose book *The Sporty Game* is a classic study of the aviation industry. *Boeing versus Airbus*, his latest work, provides useful insight into how these dynamic corporations perform in the arena of high-stakes airplane development and production. Part of Newhouse's extensive research consists of conducting interviews throughout the industry with individuals at all levels, representing both the present and the past. Besides the usual discussions with senior management at Boeing and Airbus, the book includes a good sampling of lower-level inside views from design engineers and factory workers, as well as from outside financial and economic analysts who focus on the airplane business.

Noteworthy is Newhouse's assessment of the strengths and weaknesses of the top-level bosses at each of the corporations. More often than not, individuals who rise to senior positions are great engineers and technicians. However, consistent decision making, calculated risk taking, and the ability to direct adjustments to changing conditions at the corporate level are not always their strongest qualities. Also surprising is the fairly rapid turnover of executives in key positions. Maybe that's business as usual in the airplane industry, but some of the resulting mismanagement, which helps contribute to various troubles—as well as a series of corporate scandals—leaves lasting impressions.

Before the reader assumes that everything is lost, recent public announcements give positive updates to the issues at hand. In 2007 the two rivals won more than 2,750 airplane orders combined—a record number. These remaining manufacturers of big and medium airplanes have the desirable position of wrestling to get new models to the airlines lining up to buy them, to include a noticeably growing demand from Asian carriers.

Boeing is developing and pushing sales for several airplanes in its 700 series that support multiple ranges, short to long. In fact, orders for the new 787 Dreamliner—the company's first new model since the 777 in 1995—give the plane one of the industry's most successful launches ever. Shortfalls among suppliers and slow progress on the assembly line have delayed the debut of the technologically advanced 787. The extended global supply chain, quality of some outsourced work, and start-up issues at the Seattle-area factory have challenged the Boeing team. Despite these problems, delivery of the first aircraft should still occur in 2010. Orders numbering 800-plus make it the best-selling new airplane in Boeing's long history. Overall, the industry shows Boeing with a backlog order exceeding 3,400 airplanes of all types, which the company projects will take over five years to fill.

Airbus is obviously relying on sales of the A380—reportedly sold out through 2011—to set the large-jet standard. It delivered 10 aircraft in 2009 after being almost two years late with the first delivery to Singapore Airlines. Airbus is also working on other airplanes in the A300 series, to include redesigning the A350 to compete with Boeing's 787 for the lucrative long-haul market and developing several smaller passenger-size airplanes in the A300 series for the short- to mid-range markets. The industry carries Airbus with a healthy order backlog. It has almost the same number of airplanes on order as Boeing—also over 3,400—and figures to take at least six years to fill them.

During the next few decades of the twenty-first century, many of the world's commercial airplanes will be upgraded or replaced in traditional and emerging markets. Observers can expect Boeing and Airbus to remain at the forefront, fighting for global business opportunities. Readers who have an interest in the aviation industry should take a look at *Boeing versus Airbus*. Despite a tendency to wander that sometimes makes it difficult for the reader to follow, the newest Newhouse effort offers a timely and informed perspective on the highly turbulent airplane business.

Dr. Frank P. Donnini
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Aircraft Carriers: A History of Carrier Aviation and Its Influence on World Events, Volume I: 1909–1945, rev. ed., by Norman Polmar in collaboration with Minoru Genda et al. Potomac Books (http://www.potomacbooksinc.com), 22841 Quicksilver Drive, Dulles, Virginia 20166, 2006, 576 pages, $34.97 (hardcover), ISBN 1574886630.

The first volume of Norman Polmar's *Aircraft Carriers* provides a detailed history of the development of these ships that professional officers, aviation enthusiasts, and historians alike can appreciate. An updated version of the first edition, published in 1969, this iteration serves as a companion to volume two, which covers 1946–2006.

Beginning with the initial concept of an "aircraft carrying ship" by French inventor Clement Ader and ending with the triumph of naval airpower at the conclusion of World War II, this extraordinarily well researched and documented text offers readers an extensive analysis of American, British, French, and Japanese carrier development and operations. Polmar collaborated with aviators such as Minoru Genda (Japanese Air Self Defense Force, formerly a captain in the Imperial Japanese Navy), Capt Eric Brown of the Royal Navy (who flew from HMS *Audacity*, the world's first escort carrier), and over 50 other professional aviators and scholars.

The study begins with the early days of carrier development, from Eugene Ely flying off the USS *Birmingham* (14 November 2010 marks the 100th anniversary of naval aviation), and moves through World War I (which saw the introduction of the first "true" carrier, HMS *Furious*) to the postwar era. During the interwar period, the aircraft carrier evolved rapidly—a period that Polmar covers very well. However, the bulk of *Aircraft Carriers* deals with World War II.

The author recounts carrier aviation's early successes (Taranto, Pearl Harbor, and Coral Sea) as well as its failures (readily addressing both the U-boat threat and the loss of HMS *Courageous* and HMS *Glorious*). He provides an extensive review of operations in the Mediterranean, highlighting the resupply of aircraft to the island outpost of Malta. The two chapters on Atlantic operations deal primarily with early British operations and support to D-day. The rest of the work is an exhaustive recounting of lightning-fast Pacific operations, from Pearl Harbor to the Japanese surrender in Tokyo Bay (an event directly supported by 1,000 carrier-based aircraft—and 429 B-29 Superfortresses).

Brilliant, rare photographs illustrate the rise of these massive vessels; they also provide insight into the development of carrier aircraft. Additionally, the book offers detailed analysis of the composition of the carrier air wing and the effect of improved technology (catapults, radar, communications, etc.) on naval operations. Detailed appendices outline carrier losses in World War II, highlighting the number of aircraft ferried to Malta.

This book is extremely relevant to Airmen insofar as it gives them another historical vista on the rise of airpower as well as a primer on carrier operations. Many of the tactics, techniques, and procedures used in carrier operations today had their origins in World War II. Any Airman with an appreciation of airpower history will want to read *Aircraft Carriers*.

However, one portion might rankle Airmen: the description of Gen Billy Mitchell. Painting a distinctly partisan portrait of Mitchell, Polmar is fairly dismissive of the sinking of the *Ostfriesland*, implying—much like naval "shoes" of the day—that properly manned, the battleship would have survived. Several pages later, the author acknowledges that "General Mitchell was a great success to the development of the aircraft carrier because he forced the Navy to take serious notice of aviation and embrace its own air arm" (p. 45). Given that Navy leadership at the time held carrier aviation in low esteem and that "battleship admirals" ruled well until 7 December 1941, one might offer a different rendering of Polmar's analysis of General Mitchell: *all* Airmen, including naval aviators, can understand Billy Mitchell's drive and determination to improve the status of American aviation.

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Planetary Landers and Entry Probes by Andrew J. Ball, James R. C. Garry, Ralph D. Lorenz, and Viktor V. Kerzhanovich. Cambridge University Press (http://us.cambridge.org), 32 Avenue of the Americas, New York, New York 10013-2473, 2007, 362 pages, $138.00 (hardcover), ISBN 0521820022; $111.00 (e-book).

A quartet of exceptionally qualified engineers and scientists, two in the United Kingdom and two in the United States, has collaborated to produce an important reference for industry professionals, academic researchers, and graduate students working in the fields of planetary science, aerospace engineering, and space-mission development. Their textbook, *Planetary Landers and Entry Probes*, draws from more than 45 years of operational history—over 100 missions—to deliver between its covers a fairly concise overview of the wide range of design and flight issues spe-

cifically associated with these types of vehicles, as opposed to Earth-orbiting satellites, planetary orbiters, or flyby spacecraft. Drawing examples from over 30 different designs for landers and entry probes used in lunar and planetary missions since the early 1960s, the authors discuss engineering aspects usually ignored by traditional texts on spacecraft engineering: landing systems, parachutes, planetary protection, and entry shields. Regardless of any particular mission's success or failure, Dr. Ball and his colleagues pull examples from space programs worldwide to explain the broad range of challenges and the surprising variety of solutions chosen to meet stated requirements.

Planetary Landers and Entry Probes includes three parts, the second and third parts shorter and more narrowly focused than their predecessors but all complementing each other. While serving as a guide to basic technological principles specific to landers, penetrators, and atmospheric-entry probes, the first part also points readers toward more technical, supplementary sources of information. Avoiding minutiae, the authors provide an overview of problems and solutions for each subsystem or mission phase. The 14 chapters in this part cover mission goals and system engineering; launch, cruise, and arrival; entry and descent through an atmosphere; descent to an airless body and arrival at a surface; thermal control; power systems; communication and tracking; radiation protection; surface activities; structures; and contamination of spacecraft and planets. An especially interesting chapter deals with planetary balloons, aircraft, submarines, and cryobots. After studying part 1, readers should have a basic comprehension of the complexities surrounding the design of interplanetary probes and landers.

Part 2 offers a collection of significant information about more than 30 previously launched or planned near-term "atmosphere/surface" vehicles—from the first Soviet Venera and Mars entry probes to the upcoming Phoenix and the Mars Science Laboratory—and their missions. The authors divide these vehicles into six categories, based on the way each encounters an atmosphere or surface: destructive-impact probes; atmospheric-entry probes; pod landers, which land initially in any orientation; legged landers, which have a landing gear; payload-delivery penetrators, which decelerate in the subsurface for payload emplacement; and small-body surface missions, in which the vehicle operates in a low-gravity surface environment. Their discussion of destructive-impact probes, such as *Luna 2* in 1959 or *Deep Impact* in 2004, occupies less than two pages but enables the reader to understand how crashing a vehicle onto another world can yield an abundance of useful scientific data. A plethora of tables, drawings, charts, and key references to sources for additional information makes this section of the book more interesting to a larger audience possessing limited technical knowledge or comprehension.

In part 3, the authors drill to another level of detail by presenting seven case studies of particular spacecraft, each selected because its program team faced and overcame an unusual challenge in the vehicle's design or mission. From the Surveyor lunar soft-landing vehicles (1966–68) to *Spirit* and *Opportunity* (the Mars exploration rovers [2004–present]), spacecraft designers needed a "judicious mixture" of caution and innovation to deliver even the possibility of a successful mission (p. 312). Successful performance of the *Huygens* probe through Titan's atmosphere in 2005 depended on balancing conservatism and novelty in structural design, descent control, and scientific instrumentation. Other studies examine the *Galileo* probe, *Mars Pathfinder* and its *Sojourner* rover, the *Deep Space 2* Mars microprobes, and the Rosetta lander known as *Philae*. Investigation of why the *Deep Space 2* microprobe mission failed, aside from technical reasons, exposed programmatic deficiencies—"a rushed schedule, changing goals and inadequate testing" (p. 298). Rosetta, which aims to accomplish the first-ever controlled landing on a comet nucleus in 2014, underwent a significant reorientation of its mission in 1992 due to financial and programmatic difficulties. Collectively, these last seven chapters cover an amazing variety of static and mobile elements for missions to worlds with and without atmospheres, and worlds with low- and high-gravity environments.

At first glance, members of the Air Force community might think that *Planetary Landers and Entry Probes* deals with a realm so far beyond their Earth-orbiting focus that it could not contain useful information or insight. It would be a mistake, however, to make such a hasty judgment. This volume can expand one's conceptual understanding of spaceflight, thereby enabling Air Force space planners, engineers, and scientists to better grasp potential deficiencies in their own programs. The more extensive one's knowledge of the cultural and technical history of spaceflight, especially of the approaches and lessons learned from varied mis-

sions over five decades, the better one's comprehension of present and future challenges. Even when advances in science and engineering might seem to render decades-old accomplishments irrelevant or outdated, it remains important for spacefarers to understand in the broadest sense the foundations on which they build.

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Highest Traditions: Memories of War by Tony Lazzarini. Voyager Publishing, P. O. Box 669, Larkspur, California 94977, 2003, 151 pages, $18.95 (hardcover), ISBN 9781891555022.

"Your word, your action, your machine gun is who you are. Period" (p. 29). These simple yet powerful words set the tone for Tony Lazzarini's *Highest Traditions: Memories of War*, which recounts the author's experiences as a door gunner on an Army UH-1 Huey helicopter during the Vietnam War (1966–68). As a member of very highly decorated "A" Company, 25th Aviation Battalion ("the Little Bears"), Mr. Lazzarini took part in over 250 missions, which included routine "ash and trash" supply, medical evacuation, transport of VIP celebrities and flag officers as well as ground troops, and the somber task of transporting the dead. *Highest Traditions* is filled with exhilarating stories of claymore mines getting caught on the Huey's landing skids, inadvertently landing in a minefield, taking off in tight jungle openings, and flying clandestine "spook missions" in black, unmarked UH-1s.

Rather than relate an exacting day-by-day, mission-by-mission, blow-by-blow, gory description of his two tours, the author describes more memorable missions in more general terms, yielding a personalized description of everyday life for a helicopter door gunner. Armed with M-60 machine guns, the gunners quickly recognized the flaws of their weapons: potential jams, overheating barrels, and limited ammunition. They eliminated these problems with battlefield innovation: placing a C-ration can on the belt feed to reduce the rate of fire and replacing the ammunition-storage cans with boxes five times larger. Proudly, the author points out that, in over 250 missions, his gun never jammed.

The book reaches a high point with its descriptions of the various daily, routine activities and emotions of typical Vietnam War door gunners, who all shared a special bond and a desire not to let their brothers down. "Knowing that death could take all of us at the same instant bound us together stronger than any known metals" (p. 132). Mr. Lazzarini describes the range of emotion he experienced, from his reluctance to look at wounded soldiers so that he could remain emotionless and focused on his job, to the adrenaline rush of setting down in a hot landing zone under enemy fire. With doors open and machine guns firing, door gunners had a life expectancy of 20 seconds in these zones.

Utilizing short chapters to cover individual descriptions or missions, the book makes for a very easy and exciting read that offers an excellent introduction into a door gunner's personal view of the birth of helicopter warfare and the Vietnam War. The two photo sections complement the book's descriptions. It is also a great companion to other studies that focus on specific details of the helicopter's participation in and effect on specific battles during the war. Easily perused in one day, *Highest Traditions* is definitely worth reading.

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Ruston, Louisiana

French Strategic and Tactical Bombardment Forces of World War I by René Martel, translated by Allen Suddaby, and edited by Steven Suddaby. Scarecrow Press (http://www.scarecrowpress.com), 4501 Forbes Boulevard, Suite 200, Lanham, Maryland 20706, 2006, 504 pages, $60.00 (softcover), ISBN 081085662X.

On 3 August 1914, the German ambassador to Paris declared his nation's reason for commencing offensive military operations: simply to retaliate for the French aerial bombardment of Nürnberg. By that evening, however, the Germans had changed their tune: aerial bombing of unidentified targets in Baden had set the cataclysm into motion! Of course, neither assertion was true, but the fact that aviation was even mentioned in the realpolitik of the day perhaps foretold its impending military importance in the war to end all wars.

Originally published as *L'Aviation Francaise de Bombardement (Des Origines au 11 Novembre 1918)* on the eve of the second Great War, René Martel's classic work remains the definitive assessment

of what had been the world's largest aerial-bombardment force. A respected interwar historian, Martel had also served as an observer-bombardier in obsolete Voisin aircraft during the conflict. As such, he writes from the perspective of combat experience; he also does so with academic rigor, utilizing memory, published memoirs, and a thorough examination of official French war records.

Chapters chronologically review the development of French aerial bombardment throughout the war years 1914–18. An opening snapshot of prewar experimentation in aerial bombardment helps set the context for what follows. Martel closes with topical discussion of the specific challenges faced by the French navy's use of bombardment aviation as well as joint Anglo-French efforts along the Eastern Front and over the Dardanelles. There is no summary or conclusion. The editor has added limited but useful photographs of bomber variants flown by the French, and the translator has provided parenthetical information that clarifies or expands upon the text.

Within weeks of the near catastrophe on the Marne, Commanding Gen Joseph Joffre signed headquarters note S23 authorizing aerial bombardment, with escadrilles (squadrons) V14 and V21 becoming the first bomber units. Martel observes that throughout October 1914, on average, the French were dropping daily by airplane 50,000 antipersonnel fléchettes (steel darts)—the only suitable airborne projectiles available in large numbers. By April 1915, there were 12 dedicated bomber squadrons organized into four groups, all flying the Voisin Pusher. Although quickly outclassed, the Voisin, with various modifications and the ability to fly at night, was a "robust and solid machine" (p. 28) that remained an integral part of French bomber operations until the armistice. The author well chronicles subsequent evolutions in bomber aircraft, ordnance, organization, and operations. Not surprisingly, the rapid incorporation of aviation into the order of battle was not without human cost. Martel recalls that "nervous fatigue" (p. 41) had appeared in even the best aviators by the end of 1915 as Fokker's synchronized, forward-firing machine gun significantly changed air-war dynamics to favor the nimbler pursuer.

Martel writes from what he calls a "scientific" perspective, seeking to provide readers with only the "incontestable facts" (p. 306) of French bombardment operations. Because he regularly avoids areas where personal bias as a wartime participant might skew objectivity, Martel at times leaves readers frustrated. Although the author lauds, among others, Commandant Joseph Vuillemin's prudence, Lieutenant Dagnaux's bravery, and the indomitable spirit of Commandant Louis de Goys (the "father of French bombardment aviation"), he does not allow personal reflection on controversial topics such as the bombing of civilian targets. Perhaps because Martel's "sole pre-occupation is to study and to understand" (p. 308) French aerial bombardment in order to "sift out lessons and information" (p. 308), he sees no need to offer a conclusion at the end of the book—the facts stand on their own. Even Martel's attacks against German general Ernst von Höppner's memoir accounts of aerial operations appear based primarily on academic challenges to their authenticity rather than on issues of personality.

World War I aviation buffs know well the exploits of the fighter pilots, regardless of nationality. Although Georges Guynemer, Roland Garros, and René Fonck are regaled alongside Manfred von Richthofen, Eddie Rickenbacker, Oswald Bölcke, Albert Ball, and Billy Bishop, those who flew less glamorous but equally dangerous missions in those heady days of aviation's infancy have earned their place in the Great War pantheon of heroes. René Martel offers such recognition. Although a participant, the author does not offer a personal memoir and does not write for the casual reader. *French Strategic and Tactical Bombardment Forces of World War I* is a dense, well-written, and well-researched book that should be on the shelves of serious World War I aviation scholars. As such, the Suddabys have done a great service, long overdue, in opening Martel's classic tome to an English-speaking audience.

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Frontline Pakistan: The Struggle with Militant Islam by Zahid Hussain. Columbia University Press (http://www.columbia.edu/cu/cup), 61 West 62nd Street, New York, New York 10023, 2007, 232 pages, $24.95 (hardcover), ISBN 978-0-231-14224-3; $18.95 (softcover), ISBN 978-0-231-14225-0.

If there be an air warrior in the readership of *Air and Space Power Journal* who needs any convincing that US foreign policy in the Islamic

world is complex and dangerous, he or she can get a good view of it in *Frontline Pakistan.* It will be hard enough for readers accustomed to English to make any sense out of it because of unfamiliarity with the names of Pakistani places and persons, but the labyrinth of politics and religion in a region that hovers near anarchy will persuade just about anybody of the dilemmas facing decision makers everywhere.

It appears that Zahid Hussain is well qualified in attempting to give us a picture of the situation. A journalist who provides material to the *Times* of London, *Newsweek*, and the *Wall Street Journal*, he possesses a good writing style. Clearly, Hussain is an expert on the region and has had access to some difficult-to-find sources. He organizes his work in topical chapters and in a more or less chronological order. The political landscape is cluttered with military, religious, power-seeking, nuclear-smuggling, and drug interests that yielded an almost impossible problem for former president Pervez Musharraf, who was trying to survive between many mutually hostile domestic groups and the pressures of international politics.

I fear that the reader seeking a coherent picture of what Pakistan and Afghanistan are about is doomed to frustration. Both countries have long seemed ungovernable, partly due to the fact that the central governments have had very limited powers over the regional and local interests. I suppose that the main idea of the book is that there is likely trouble ahead for the United States since Pakistan has been a principal ally during the global war on terror, but that is largely a result of President Musharraf's having sided with the United States, very much against the tide in his own homeland. That cannot go on forever, according to Hussain, and I suppose that he thinks the only possible solution is to permit real democracy in Pakistan. However, given the strength of the local warlords and the growing power of radical Islam, that *would* be a miracle. In addition to that, Musharraf was faced with a tough problem of nuclear proliferation. Pakistan followed India into the elite group of nuclear states, but its control of nuclear secrets has been defective, and its people have been involved in serious underground nuclear proliferation. If that were not enough, he was also utterly dependent upon the loyalty of his military, and that is a little shaky since the latter has an affinity for some of the radical Islamic groups, who are against secular government.

Hussain does not get into the character of the "liberal" Pakistani groups advocating secular rule, but it appears that they are utterly opposed to radical Islam and to military rule. If that were not enough, there has been a perennial issue with India over Kashmir, and Musharraf was able to contain that up to a certain degree, but this situation is fully capable of boiling over into a disaster for Pakistan's leaders—and for the United States. Since our campaign in Afghanistan against the remnants of the Taliban and al-Qaeda is highly dependent upon our relationship with the Pakistani government, that means trouble.

Few Americans know much about Pakistan and its surrounding region, and this book will certainly not make one an instant expert on the subject. However, it is readable and will serve as a useful introduction to the problems of the area. I therefore recommend it for a moderately high place on the air warrior's reading list.

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Iraq and Back: Inside the War to Win the Peace by Col Kim Olson, USAF, Retired. Naval Institute Press (http://www.usni.org/naval institutepress/index.asp), 291 Wood Road, Annapolis, Maryland 21402, 2006, 256 pages, $26.95 (hardcover), ISBN 1591145279.

In Iraq our military continues the struggle against an obstinate insurgency; simultaneously, our nation fights a war of public opinion over what went wrong in 2003 and how we must overcome those early deficiencies to defeat democracy's enemies. Though an interesting and enjoyable read, *Iraq and Back*—more a memoir than a scholarly tutorial—raises more questions than answers. The author, Col Kim Olson, seems an intelligent, family-oriented, and confident patriot eager to help transform a nation from tyranny to democracy.

The book seems to stray from the subject suggested by the title, which leads one to believe that Olson provides a guide to counterinsurgency and techniques for success based upon her experience. Instead, the reader will enjoy the tale of a woman overcoming the "good ole boy" network of Air Force aviation in the early 1980s, eventually commanding an operational flying squadron, rising to the rank of colonel, working for the Joint Staff, and volunteering for the job of executive officer to Lt Gen Jay Garner, US Army, retired, director of the Office of Reconstruction

and Humanitarian Assistance in Iraq. Candidly written, full of emotion, and deeply introspective, *Iraq and Back* brings many important leadership lessons to the forefront, while barely skimming what leadership could have done better to ensure success in rebuilding the infrastructure and security of post-Saddam Iraq. It offers even less scrutiny of the current insurgency.

In Olson, readers find a leader who gets out from behind her desk and wants to meet people. Although others in the position could have hidden behind that desk, she (along with General Garner) was shaking hands with village elders and city leaders while the battle raged. She shows us the daunting task of being among the first generation of female Air Force pilots and having the tenacity and endurance to reach her potential.

The author critiques many shortcomings in the reconstruction of Iraq, such as the lack of security for key nodes in infrastructure (power plants, sewage plants, etc.) and for protecting those nodes, once repaired. But she offers little insight on *how* to do it correctly. Introducing a variety of important subjects, Olson displays resounding evidence that economic sanctions against Iraq failed completely. While the common people lacked basic necessities, Saddam continued to build marble-laden palaces (p. 91).

The most important topic introduced in this book is the tension and mistrust among the Shia, Sunni, and Kurd leaders on the Council of Seven—the initial de facto government organized by General Garner to bring discussion and reconciliation to the forefront. Although it was necessary to bring these groups together, forging alliances between groups who have despised each other for years is—and continues to be—a challenging task (p. 98).

The most touching episode in *Iraq and Back* is the story of Christian girls and Muslim boys similar to, as the author notes, "an Iraqi Romeo and Juliet." After an "informant" alerts coalition forces of a kidnapping, Olson travels with an assault force that will attempt a rescue of two "kidnapped" females. Questioning of the youth reveals that the kidnapping is in fact a clash of cultures. Actually, the Christian girls, in love with the Muslim boys, were hiding from their fathers. Both cultures had forbidden them to marry. This story demonstrates two critical points in counterinsurgency. First, it is difficult to distinguish friend from foe in a civil war or in counterinsurgency operations. Second, the United States will not change the mind-sets of people with the stroke of a pen. Instead, it will take time and a "win the people" mentality (p. 174).

Readers will quickly adjust to the fact that this book is more memoir than anything else. They will also ask what is going on in the war. While Olson offers her own account, one wonders what the 3rd Infantry Division and US Marine Corps forces were doing on the drive to Baghdad.

An interesting, emotional, and personal narrative of Colonel Olson's journey, *Iraq and Back* would be a great read for any young woman who wants to pursue a career in the military or aviation in general. It also allows the reader to see the other side of war. Though our forces are technologically and militarily superior in current conflicts, US military personnel who read this book will find that it takes more than firepower to win a war.

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Science in Flux: NASA's Nuclear Program at Plum Brook Station, 1955–2005 by Mark D. Bowles. National Aeronautics and Space Administration (http://history.nasa.gov/series95.html), Washington, DC 20546-0001, 2006, 279 pages, $25.00 (hardcover). Available free from http://history.nasa.gov/sp4317.pdf.

In the early 1940s, knowing that World War II was imminent, the US government built 77 contractor-operated ordnance facilities scattered around the country. Thirty-four of them were "works" that produced powder, explosives, and chemicals, and 43 were "plants" that fabricated and assembled materials such as tanks, guns, and small-arms ammunition. One of these facilities, the Plum Brook Ordnance Works near Sandusky, Ohio, encompassed 9,000 acres obtained by eminent domain from farmers who, for the most part, felt it their patriotic duty to accept the government's "fair" offers.

After the Japanese surrendered to the Allies on 17 August 1945, production of explosives at Plum Brook came to a halt, and roughly 900 people were suddenly out of work. The land lay fallow until 1955 when the government, convinced that the Soviet Union had an atomic airplane, allotted funds for a program known as Nuclear Energy for the Propulsion of Aircraft. The Air Force and the Atomic Energy Commission selected the National Advisory Committee

for Aeronautics' (NACA) Lewis Research Center, adjacent to Cleveland Hopkins Municipal Airport, to conduct the propulsion studies, and in September 1956 they began construction of a new and powerful nuclear test reactor (different than a nuclear power reactor) on the Plum Brook site about 50 miles northwest of Hopkins.

The NACA morphed into the National Aeronautics and Space Administration in 1958, and it took 15 years and untold millions of dollars to build and operate the reactor, with much testing also devoted to Nuclear Engines for Rocket Vehicle Application and the Space Nuclear Auxiliary Program. When it became clear that atomic power for airplanes would never be acceptably safe and that liquid and solid chemical propellants had supplanted atomic power for rockets, the government saw no reason to continue nuclear testing at Plum Brook, pulling the plug early in 1973. Despite doing so, it eventually cost more to deactivate the reactor than it had originally cost to build it. Here the author, Mark Bowles, takes the government to task, explaining that his book's title is a deliberate double entendre, not only relating to flux as a rate of flow of nuclear particles passing through space but also reflecting the constant changes in political climate that led to huge wastes in money, manpower, and time. He hopes that the future mission to Mars, which will employ atomic power, might give Plum Brook Station a new lease on life but fears that our politicians will inevitably repeat the mistakes of the past.

Bowles interviewed 38 people who worked at Plum Brook, listing them alphabetically in the appendix with their job titles (but not the years devoted to said jobs) and quoting them liberally throughout the text as he elaborates on issues of management, morale, public opinion, safety, and scientific gains—some with humor, all with insight. There are also four pages of organizational charts with the names of more people than I could count who undoubtedly will want to buy this book as a testimonial to their service there.

Also in the appendix we learn in 12 brief paragraphs that the reactor wasn't the only test site at Plum Brook Station—completed in its entirety in the 1960s for a total cost of almost $121 million. Although not specified, this amount more than likely does not include payroll. The author cites total construction costs for each of these other on-site facilities but refers to them in the past tense, seeming to imply that they are no longer operational—further proof of government extravagance and incompetence. Giving him the benefit of the doubt, I have to think this was not deliberate obfuscation since I'm sure he knows that some parts of the facility, including the world's largest thermal vacuum chamber and a hypersonic wind tunnel, are still very much in business (verifiable by visiting the Web site http://www.nasa.gov/centers/glenn/testfacilities/plumbrook.html).

Because the book is written in layman's terms, I learned a great deal about nuclear fission and how a reactor works. I recommend *Science in Flux* for inclusion in the libraries of all Air Force bases, especially those involved in missile launches and the exploration of air and space, and in every public library in Erie and adjoining counties in Ohio.

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Diplomacy and War at NATO: The Secretary General and Military Action after the Cold War by Ryan C. Hendrickson. University of Missouri Press (http://www.umsystem.edu/upress), 2910 LeMone Boulevard, Columbia, Missouri 65201, 2006, 184 pages, $34.95 (hardcover), ISBN 0826216641; $16.95 (softcover), ISBN 0826216358.

Research on the North Atlantic Treaty Organization's (NATO) post–Cold War transformation devotes little analysis to the secretary-general position and implicitly downplays the significance of NATO's post–Cold War military operations. Recognizing the notable absence of scholarly literature on NATO's secretaries-general during this period, Ryan Hendrickson investigates their evolving impact on the alliance, particularly regarding the use of force. Only those secretaries-general who led after the Cold War oversaw NATO's use of military force.

Employing an analytical framework that he credits to Michael G. Schechter, the author examines the first four of five post–Cold War secretaries-general and the roles they played in moving the alliance toward military action. Hendrickson theorizes that the NATO military instrument remains relevant and that the secretaries-general who have served since the end of the Cold War have significantly affected NATO policy, transnational unity, and the use of military force.

Upon completion of a concise yet substantive historical overview of the creation of the office

of secretary-general, the author dedicates the remaining chapters to comparative case-study analysis of the first four people who held this position after the Cold War. Although not alike (and thus making for imperfect comparisons), the cases examined are suitably relevant to meet the author's objective. Each chapter focuses on the role that each secretary-general played in contemplating the use-of-force option (e.g., Manfred Worner—Bosnia; Willy Claes—Operation Deliberate Force against Bosnian Serbs; Javier Solana—Operation Allied Force bombings of Serbia; and Lord George Robertson—post-9/11 defense measures for the protection of Turkey). Personal interviews of key diplomats and NATO policy makers, coupled with the use of professional literature, provide a sound basis for the comparative analysis.

Each of the chapters dedicated to the secretaries-general begins with the process—the behind-the-scenes geopolitical posturing and consensus building that led to their elections. Moreover, the author goes on to describe how their professional and national backgrounds shaped their approaches in leading NATO. This backdrop alone makes the book an interesting read.

One of the many intriguing insights provided in the book occurs in the chapter addressing Secretary-General Javier Solana. In light of his vocal opposition to Spain's joining NATO in 1982 and to the stationing of American military bases in Spain, this Spaniard later led NATO expansion into the former Eastern Bloc states. Finding sufficient legal basis without United Nations approval, he advocated and oversaw NATO's military response to Yugoslavian (Serbian) president Slobodan Milosevic's acts of aggression against Kosovo Albanians. Furthermore, Solana aggressively secured member states' support for the operational/targeting plan of Gen Wesley Clark, supreme allied commander, Europe (SACEUR), which ultimately led to the capitulation of Serbian forces in Kosovo.

In all cases, Hendrickson's comparative analysis supports his theory. Although the position of secretary-general has limited formal authority in the alliance, each leader utilized an assortment of diplomatic tactics and alliance tools to make an impact on major political and military decisions at NATO. The author's findings clearly demonstrate that different personalities and diplomatic styles employed by the secretaries-general seemed to work equally well in promoting consensus, depending upon the circumstances. Furthermore, his findings highlight the importance of the SACEUR's and the secretary-general's viewing the alliance from similar ideological perspectives.

Hendrickson concludes this fine work with summarized findings, offers a comparative assessment of effective diplomatic leadership in NATO, and provides policy recommendations for the improvement of transnational tensions surrounding the office of secretary-general. Of particular note, he emphasizes the tremendous political challenges faced by the office of secretary-general in promoting consensus if the US preference for "coalitions of the willing," rather than NATO-supported military operations, remains the norm.

This rich yet concise book is very reader-friendly. *Diplomacy and War at NATO* is most suitable for those individuals interested in American foreign policy and NATO's post–Cold War history and politics, those destined to work directly or indirectly with NATO, and scholars and students of political science / international affairs.

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Into That Silent Sea: Trailblazers of the Space Era, 1961–1965 by Francis French and Colin Burgess. University of Nebraska Press (http://www.nebraskapress.unl.edu), 1111 Lincoln Mall, Lincoln, Nebraska 68588-0630, 2007, 402 pages, $29.95 (hardcover), ISBN 0803211465.

A tediously researched yet never tedious book, *Into That Silent Sea* offers a wonderful, in-depth look at the people of the early American and Soviet space programs. Readers looking for a technical treatise full of statistics, velocities, and orbital-mechanics equations will not find them here. This is a book about people, and in the long run, people are more fascinating than machines.

The authors have done meticulous research on each of the Mercury and Vostok astronauts and cosmonauts, as one would expect. While most Americans have at least a passing familiarity with Alan Shepard and John Glenn, and probably know the name Yuri Gagarin, this book introduces us to the other great characters who were their contemporaries. Far from being state-controlled automatons, the early Soviet cosmonauts were a diverse and fascinating bunch, from the complicated yet publicity-

friendly Gagarin to the brash Gherman Titov; the poetic Pavel Popovich; the strong, decisive Alexei Leonov; and the also-media-friendly-but-not-terribly-well-qualified first woman in space, Valentina Tereshkova.

Neither were the Americans a homogeneous group. The Mercury Seven were as different from each other as the Soviets were: Shepard, the tough, intimidating type; Gus Grissom, the quiet, consummate professional; Glenn, the all-American boy; Scott Carpenter, the poet; Wally Schirra, the jokester; Deke Slayton, the autocratic boss; and Gordon Cooper, the young hotshot who proved his mettle in a near-disastrous mission.

The book really shines, however, in two major ways: introducing the reader to many of the personalities of the era who are not well known, and serving as a "myth buster" by correcting many of the misconceptions about the early space programs. In the first case, Burgess and French tell us of Dee O'Hara, a young lady who became not only the nurse to the astronauts but also their closest confidante. The men felt safe discussing anything with her, especially matters that might make a flight surgeon ground them. In return she would dispense advice and promise not to reveal anything to the doctors that wasn't clearly mission critical or life threatening. She served in that capacity from the beginning of Mercury through the early years of the space shuttle.

Another unsung hero—Jim Lewis, the helicopter pilot who tried in vain to save Grissom's *Liberty Bell 7* from sinking—would later work on the Gemini program in Houston, including Grissom's *Gemini 3* flight. He was, of course, devastated by Grissom's death in the *Apollo 1* fire, noting the irony that Gus was nearly killed by a hatch that opened too quickly and actually killed by one that didn't open quickly enough.

Also interesting is the tale of Miss Wally Funk, one of the "Mercury 13"—a group of women who were more or less misled into thinking they were being considered for the astronaut corps. By participating in a series of tests at the Lovelace Clinic in New Mexico, they believed that NASA was considering sending a woman into space, despite the fact that it was choosing only test pilots. Dr. Randy Lovelace put the women through the physical screening program for astronauts, creating the impression that they were in the running for spaceflight. However, this was nothing more than his personal research—a fact that he never bothered to mention to his subjects, lest he lose them.

Into That Silent Sea also excels at setting many records straight on issues both large and small. First, regarding the naming of the spacecraft, most textbooks tell the story that Alan Shepard named his capsule *Freedom 7* for (1) the freedom represented by America (thus taking a subtle jab at the Soviets), and (2) the seven Mercury astronauts. The first part was true, but in reality Shepard used the number in reference to his ship's being the seventh off the assembly line. However, the reported version made a good story, so no one bothered to correct it for decades. Use of the number seven as a naming convention in Mercury stuck, adding to the myth.

Second, contrary to the portrayal of Grissom as a nervous, even panicky, man in the movie *The Right Stuff*, he was perhaps the most dedicated and professional of all the astronauts. The authors thoroughly and completely debunk the insinuation that Grissom panicked and blew the hatch on his Mercury spacecraft after splashdown. In fact, it is important to remember that NASA had so much confidence in his abilities that he was selected to command the first Gemini mission, making him the first man to fly in space twice. (To be fair, he was named commander after Shepard, the original commander, was medically disqualified.) Grissom also commanded the first Apollo mission, which, of course, ended in the tragic fire on the launchpad. Years later, chief astronaut and crew-scheduling czar Deke Slayton wrote in his autobiography that had Grissom not died, very likely the first footprints on the moon would have been Gus's, not Neil Armstrong's.

Last, there's the matter of the Soviets' alleged technological advantage since they achieved so many firsts. True, they did put the first man in space, and they were first with two manned spacecraft in orbit simultaneously, first with a woman in space, first with a three-man crew, and first with a space walk; however, the Soviets did so at terrible risk to human life and for the sake of publicity. For example, Tereshkova—not exceptionally well qualified to be an astronaut—performed less than spectacularly during her flight. Spacewalker Leonov nearly died when his space suit pressurized to the point that he could not reenter the capsule, and he had to nearly completely deflate it to get back in. Further, the first three-man crew managed to perform its mission only by using an earlier capsule modi-

fied to make more room by removing the ejection seats; the crew also flew without space suits.

In summary, *Into That Silent Sea* offers an excellent profile of the people who captured the world's attention in the early 1960s. As incredible as the machines were that took these men and women into space, that's not the most interesting part of the program. After all, the story of space exploration is ultimately a human one.

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Learning to Love the Bomb: Canada's Nuclear Weapons during the Cold War by Sean M. Maloney. Potomac Books (http://www.potomacbooksinc.com), 22841 Quicksilver Drive, Dulles, Virginia 20166, 2007, 400 pages, $29.95 (hardcover), ISBN 978-1-57488-616-0.

When the Cuban missile crisis exploded, Pres. John F. Kennedy and Canadian premier John Diefenbaker, the men ultimately responsible for the defense of North America, were having a personal set-to and not speaking to one another instead of working together against the threat of Soviet nuclear missiles. The episode typifies the often difficult relationship between Canada and the United States. Canadian-US relations were delicate after World War II, particularly with the United States unwilling to trust its ally with nuclear information and Canada regarding its larger neighbor as a cultural and economic imperialist. Both militaries needed one another, however, for there was no effective defense against the Soviet threat unless they worked together.

Learning to Love the Bomb deals with the Canadian struggle to find an appropriate way of living with its need for but dislike of American nuclear weapons during the Cold War. One might feel tempted to write this book off as peripheral to contemporary Air Force concerns. After all, as everyone knows, Canada has largely enjoyed a free ride with regard to defense, and the United States has taken almost the entire burden. Or so it seems. The story is not quite that simple.

Canada provided a significant input to the British nuclear program during World War II. Canadians produced several technical firsts, particularly in designs for naval vessels that reduced the impact and degree of nuclear contamination as well as decontamination procedures. In the 1950s, Canada provided more than its share of North American defense, with a burden ranging between 20 and 25 percent of the fighter force deployed against potential Soviet attack. (Canada has a population only one-tenth that of the United States.) Further, Canada developed some of its own aircraft as well as an engine for the US-built Sabre that was superior to that used in American models. As late as 1959, Canada was developing the Arrow, an airplane capable of delivering a nuclear payload. When Canada accepted that the primary goal of North American defense was the protection of Strategic Air Command bases, the Canadians wrote off their industrial and population centers to enable that command's bombers to have time to launch a preemptive or quickly reactive strike against Soviet bombers and, later, missiles.

So there is more to the story than just Canada's tagging along as the United States developed and implemented various defenses during the Cold War arms race. This book is in part the story of a small country struggling after World War II to establish its sovereignty after many long years under Great Britain. Another aspect is wounded pride due to US economic and cultural intrusions into Canadian life. There were also budget constraints under both liberal and conservative governments, neither of which in the early 1960s had a consensus regarding nuclear weapons on Canadian soil.

Unlike the US Defense Department, the Canadian counterpart always had to be cost conscious. On the other hand, Canadian constraints meant that in practice Canadians followed where the United States led, whether for overflights of Canadian territory, storage of US missiles at Goose Bay, or technological change. More often than not, the Canadians ended up with US equipment since it was cheaper (and, on occasion, because the United States refused to provide information sufficient to allow Canada to develop compatible nuclear arms). When the Diefenbaker government decided to kill the homegrown Arrow platform in 1959 because US weapons systems were cheaper, 25,000 Canadian industrial workers lost their defense jobs, and Canadians had no Canadian-made air defense capability. Dependency on US forces dealt a blow to Canadian pride and sovereignty—always major issues in the delicate relationship between the two nations.

The work abounds in acronyms since, after all, it deals with the military. For instance, "The

Soviets had SOXMIS in the British sectors of NORTHAG, while SMLM-B was in Baden-Baden and SMLM-F was located in Frankfurt" (p. 342). English translation: the Soviets had spies in the British part of Germany. Acronym lovers can translate SACEUR, SACLANT, BOMARC, and CINCNORAD, as well as many others.

The author's attention to detail shows in his careful description of the various types of air wings and basic characteristics of the various weapons and platforms, including the differences between versions developed for Canadian, US, and other North Atlantic Treaty Organization forces. Although the necessary chapter on the developing organizational structure is a labor to get through, it shows an evolving bureaucracy that is exceedingly complex and cumbersome, with many layered and overlapping functions (both internal and external to Canada, as well as both formal and informal).

The author also makes clear his anger and frustration at the slow rolling and deception of the Diefenbaker government that, he argues, delayed implementation of the nuclear agreements between Canada and the United States for three years. Nuclear Canadian forces came only after the near disaster of the Cuban missile crisis, during which Canadian forces handled northern defense while the United States shifted planes, ships, and submarines to the blockade.

For at least 20 years, Canadians have believed that they never had a nuclear force, merely a US nuclear presence on Canadian soil. This lengthy work should put to rest that misconception. It documents the years of deliberation and negotiation in the Eisenhower and Kennedy administrations—for Canadians the St. Laurent, Diefenbaker, and Pearson governments—that finally gave American nuclear weapons to Canadian forces between 1963 and 1968. To clinch the argument, it provides a chapter on the Canadian alert procedures and weapons safeguards as well as the nuclear force structure in NATO, the Atlantic, and North America during the 1960s.

Overall, the style is clear, and the coverage good. The documentation is thorough, and the charts and other illustrations enhance the text. *Learning to Love the Bomb* may not be indispensable for an understanding of US involvement in the Cold War, but it does enhance awareness that the United States did not fight that battle alone.

Dr. John H. Barnhill
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Forgotten Continent: The Battle for Latin America's Soul by Michael Reid. Yale University Press (http://www.yale.edu/yup), P.O. Box 209040, New Haven, Connecticut 06520-9040, 2007, 400 pages, $30.00 (hardcover), ISBN 0300116160.

Michael Reid, editor of the "Americas" section of the *Economist*, has written an exceptionally timely analysis of Latin America's social and economic performance in the last decade. The fact that Yale University Press published it is a strong recommendation—and the book does not disappoint the reader. The title reflects the essential thesis: in spite of its enormous potential in terms of resources and human talent, Latin America, once the most advanced region of the developing world, has been forgotten and has fallen behind other developing regions because it failed to achieve sufficient progress in improving the conditions of its people. As the result of frustration and the fact that some 40 percent of the population lives in poverty, the political force of populism is attracting attention among the underclass in a number of countries, notably Venezuela, Argentina, Bolivia, and Ecuador. Populism, which takes many forms, both liberal and conservative, seeks to empower the powerless and redistribute wealth quickly. Antidemocratic, it concentrates political power in the executive branch, and its historical record suggests that it will once again fail. Despite this record, democracy survives and, amazingly, has sunk deeper roots in Latin America. Reid underlines this fact constantly in this fast-paced book.

Venezuela serves as an example of the allure of populism. Underwritten by vast petroleum income, *chavismo* (a form of populism named after Pres. Hugo Chávez) has reached a high level of support among Venezuelans because of the failure of predecessor governments to channel wealth to improve the conditions of the vast underclass. Though *chavismo* may have already reached its apogee, the continuing, depressing socioeconomic conditions of poverty and social exclusion threaten the legitimacy of democracy in a number of countries. Here, Reid is at his best, drawing on his impressive observations as a journalist to draw comparisons and derive conclusions across various countries, large and small. He possesses unlimited energy and an uncanny reportorial eye to find profound significance in vignettes that define the compelling human condition in cities, towns, and villages. His reporting also takes him to the higher

reaches of academic organizations, the news media, government institutions, and diplomacy.

Reid demonstrates a passion for Latin America and obviously admires the region and its people. At the same time, he appreciates the enormous impact of history, seeking constantly to connect the present with the past. He is also an effective analyst of social and economic indicators, such as investment and growth patterns, writing in a style that the nonspecialist audience can understand. He deploys his talented and lively pen to coldly analyze the sources of the problem, the nature of reform efforts, and what he calls "The Stubborn Resilience of Flawed Democracies" (the title of chap. 11). He attributes Latin America's failure to weak and ineffective state systems—that is, to the inability of government ministries to reach the people they are supposed to serve by providing security, justice, and education, and by promoting vibrant economies that productively employ the maximum number of people.

But state weakness is only one part of the story, according to Reid. National leaders of the last generation embarked on a series of neoliberal reforms espoused by the "Washington Consensus" (p. 6) (pushed by research centers and multinational lending institutions) to remove tariff barriers to trade and investment and get the state out of running enterprises. But progress could not be sustained because the governments did not conduct additional reforms and protections of the most vulnerable, which would unlock their creativity and wealth. Accordingly, an anti-neoliberalism backlash is now generating tensions between the proponents of free-market economies and those who advocate that the central government provide greater direction to the economy, as well as redistribution of wealth schemes. Add to this the awesome insecurity in the streets. Indeed, criminal violence subtracts nearly 25 percent of gross domestic product annually.

This reviewer is sympathetic to this kind of writing. Reid writes well, with an engaging style that captures the reader. To be sure, some simplifications challenge credibility. Note, for example, the statement that "the Catholic Church—which had blessed injustice in Latin America since the moment a Dominican friar had taken a full part in the capture and murder of Atahualpa, the Inca—had an attack of conscience" in the twentieth century (pp. 97–98). But Reid has captured the essence of the Latin American social, economic, and political dilemma. The only disappointment with the book is that he doesn't offer some policy alternatives. Nonetheless, *Forgotten Continent* is a worthy addition to a growing collection of writings on what went wrong and what should be done in Lain America.

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SECDEF: The Nearly Impossible Job of Secretary of Defense by Charles A. Stevenson. Potomac Books (http://www.potomacbooks inc.com), 22841 Quicksilver Drive, Dulles, Virginia 20166, 2006, 224 pages, $19.96 (hardcover), ISBN 978-1-57488-794-5; $13.56 (softcover), ISBN 978-1-57488-795-2.

Drawing on his experience on four senatorial staffs, the Policy Planning Staff of the Department of State, and faculties of the National War College and Nitze School of Advanced International Studies at Johns Hopkins University, Charles Stevenson has written a clear, concise, and readable history of the Office of the Secretary of Defense (OSD) and the men who have occupied it. This inexpensive volume nicely fills a gap in the literature. It is a perfectly suited primer for officers and civilian professionals who need or desire to understand the OSD, including those pursuing professional military education or a degree in security studies.

Stevenson divides his work into three sections. In the first, he deftly discusses the origins of the OSD, its first secretaries, and its evolution through the Eisenhower administration. He recounts the origins of the secretary of defense in Pres. Harry S. Truman's desire to increase interservice cooperation, the compromise that was the National Security Act of 1947, and Truman's revenge in appointing Navy secretary—and vociferous opponent of the act—James Forrestal as the first secretary of defense. The first occupants of the office struggled to assert the secretary's authority over budgets (Louis Johnson, Charles Wilson, and Neil McElroy) and over the services (Forrestal, George Marshall, and Thomas Gates). The secretaries who focused on budgetary matters at best restrained spending in peacetime but failed to systemically alter the spoils system used by the services in the wake of the intense budget battle between the Navy and the Air Force in 1948. Marshall and Gates succeeded admirably: Marshall strengthened civilian authority by backing President Truman's decision to fire Gen

Douglas MacArthur, while Gates shepherded the Defense Reorganization Act of 1958, which strengthened his statutory authority, and issued a directive requiring a joint, combined, allied, or OSD tour as a prerequisite for promotion to general officer. (Regrettably, that requirement was not written into law until the next major Defense Reorganization Act in 1986.) Much of this history has been forgotten, but officers and policy makers should be keenly interested in these developments as the US government looks to enhance interagency cooperation today.

In the second section, Stevenson discusses individual secretaries of defense, focusing on their background; relations with the president, Congress, and the military; their operating style; and the way they fulfilled their roles as Pentagon manager, war planner, diplomat, and National Security Council advisor. He divides them into three categories, characterizing Robert McNamara, James Schlesinger, and Caspar Weinberger as revolutionaries; Melvin Laird, Les Aspin, and William Cohen as firefighters; and Harold Brown, Richard Cheney, William Perry, and Donald Rumsfeld as team players. Finally, he omits from the analysis three secretaries who were primarily caretakers: Clark Clifford, Elliot Richardson, and Frank Carlucci.

Stevenson provides lucid and evenhanded evaluations of these men and their tenure. For instance, he recounts the "McNamara Revolution" and Rumsfeld's "Transformation" analytically, refraining from the invective common in other accounts, and focuses instead on the manner in which these men strengthened the office they held, the policies they pursued, and their relations with the president, the military, and Congress. He makes clear that the office suggests certain behaviors whose acceptance is more a reflection of the secretary's operating style than an affirmation of their inherent legitimacy. Virtually all secretaries since McNamara have required the service chiefs to clear their congressional and public statements with the OSD before their delivery, but McNamara and Rumsfeld drew vitriolic ire for this practice. Like Rumsfeld, Cheney personally interviewed all candidates for three- and four-star billets and interested himself in the career paths of promising one- and two-star officers—yet drew little resentment for "meddling" in personnel matters (p. 139). Like McNamara, Brown picked apart programs with systems analysis, yet was admired despite having canceled cherished programs such as the B-1 bomber and another nuclear-powered aircraft carrier. The lesson to be learned is that at this level, a collegial leadership style is more effective over the long term than one that focuses on asserting unilateral control.

Stevenson evaluates each man's performance, judging McNamara, Weinberger, Laird, Cohen, Brown, Cheney, and Perry successes, and Forrestal, Johnson, Schlesinger, and Aspin failures. He does not explicitly judge Rumsfeld—perhaps reserving judgment since Rumsfeld was still in office when the book was written—but groups him with the successful secretaries in his conclusion, noting that he maintained "a close relationship with the president, adequate relations with key officials in Congress, and . . . excellent relations with the military leadership" (p. 215). His account of the secretary's tenure seems to contradict most of this assessment, however.

In the final section, Stevenson pivots his analysis and discusses the various roles the secretary must perform (manager of the Pentagon, war planner, diplomat, and National Security Council advisor) and evaluates how well they were filled by each man. These chapters are notable for their clear discussions of the secretary's statutory power, the Department of Defense's budgetary and planning processes, the influence of the secretary and the military on American foreign policy, and their privileged position in national-security decision making, given their advantages in personnel, resources, disciplined processes, and the clarity they appear to bring to key issues in national security. As Stevenson argues, the secretary and the military can effectively veto military action by offering professional advice against it or only untenable options such as "250,000 troops, six months, and $10 billion" (p. 197).

In all, the secretary of defense controls the largest agency in the government, more resources than most countries, and the ultimate means of settling international disputes. That this office has not been subjected to more systematic attention is unconscionable, and Stevenson's volume is an excellent introduction. This first-rate book should find its way onto syllabi in professional military education and security studies courses, the shelves of officers and Department of Defense civilians aspiring to develop themselves professionally, and the desks of congressional staff members who oversee this powerful institution.

Dr. Gary Schaub Jr.
Maxwell AFB, Alabama

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