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From the Editor

Senior Leader Perspective

Features

Department of Defense (DOD) Directive 3002.01E, Personnel Recovery in the Department of Defense, *highlights personnel recovery (PR) as one of the DOD's highest priorities. As an Air Force core function, PR has experienced tremendous success, having performed 9,000 joint/multinational combat saves in the last two years and having flown a total of 15,750 sorties since 11 September 2001. Despite this admirable record, the author contends that the declining readiness of aircraft and equipment as well as chronic staffing shortages prevents Air Force rescue from meeting the requirements of combatant commanders around the globe. To halt rescue's decline, a numbered Air Force must represent this core function, thereby ensuring strong advocacy and adequate resources for this lifesaving, DOD-mandated function.*

The Air Force rescue community has expanded beyond its traditional image of rescuing downed aircrews to encompass a much larger set of capabilities and competencies that have strategic impact on US operations around the world. The author contends that "airpower advocates now have a strategic rescue capability . . . to counter our adversaries' efforts to influence our way of life. It is up to these same advocates to maximize the emerging potential of what we might term 'strategic PR.'"

Personnel Recovery in Focus

Lt Col David H. Sanchez, Deputy Chief, Professional Journals
Capt Wm. Howard, Editor

Saving the lives of your fellow Airmen is the most extraordinary kind of heroism that I know.

—Gen Curtis E. LeMay

In this issue, *Air and Space Power Journal* (*ASPJ*) focuses on the Air Force's core function of personnel recovery (PR). Since 2009 the service has emphasized PR along with 11 other core functions: nuclear deterrence operations; air superiority; space superiority; cyberspace superiority; global precision attack; rapid global mobility; special operations; global integrated intelligence, surveillance, and reconnaissance; command and control; building partnerships; and agile combat support. By elevating PR to a core function, the Air Force clearly affirms its commitment to maximize the unique advantages of airpower in support of joint and multinational rescue requirements worldwide.

Rescue Airmen are among the service's most courageous and self-sacrificing warriors. Throughout PR's history, they have risked their lives to extract wounded personnel, recover downed aircrews, and provide vital command and control for collaborative forces during a rescue event. These individuals continue to do so worldwide and across the entire range of military operations (ROMO). Today, PR encompasses much more than the familiar mission of combat search and rescue, delivering significant capability across the ROMO, including noncombatant evacuations, humanitarian assistance, relief operations, medical and casualty evacuations, and rescue command and control. PR affects every Airman and every joint and multinational partner by fostering operational confidence and offsetting battlefield risk with the asymmetric advantage provided by these rescue heroes. Since PR is an indispensible core function, Airmen in particular should understand its capabilities and deliberately incorporate rescue into every phase of operational planning and execution. We encourage you to delve into the world of PR and join the professional discourse.

This edition also includes superb articles about language and culture, tanker recapitalization, missile defense, and the base-planning process, as well as book reviews to inform your professional reading selections. In addition to reading the print journal, please review the *ASPJ* website at http://www.airpower.au.af.mil for our upcoming focus areas and enter the realm of scholarly, professional discourse via the written word. And don't forget that we are always interested in your feedback.

Finally, the *ASPJ* staff takes this opportunity to inform you of the transformation of our online publication beginning in 2012. We anticipate significant capability enhancement as we continue the advancement of intellectual debate regarding airpower and national security in the digital domain. We encourage you to request your electronic subscription today! ✪

Air Force Personnel Recovery as a Service Core Function

It's Not "Your Father's Combat Search and Rescue"

Brig Gen Kenneth E. Todorov, USAF
Col Glenn H. Hecht, USAF

After 50 collective years in and around the superb community of rescue Airmen, both authors have experienced and witnessed the boundless passion for saving lives—a passion that motivates the uniquely skilled Airmen of personnel recovery (PR) to endure great sacrifices for others during peace and war across the globe. It remains a privilege and true honor to personally know most of the selfless and amazing Airmen who share a zeal for a principle conveyed by the rescue motto "These things we do, that others may live." Stories abound of gallant heroes performing astonishing acts to save just one life, leaving an indelible mark on the hearts of those who benefit personally or operationally from the effects produced by one of our nation's moral imperatives. Legendary Airmen such as A1C William Pitsenbarger, recipient of the Medal of Honor, and SrA Jason Cunningham, recipient of the Air Force Cross, along with others who anonymously risk life and limb, put themselves in harm's way to save someone else. In light of such a legacy of sacrifice and heroism, why do so few people outside the rescue community understand the tremendous value that PR brings and will bring to America's current and future fights? The answer is simple: many individuals across the Department of Defense (DOD), Airmen included, remain unaware of "these things we do," failing to appreciate sufficiently the complexities of PR and therefore not understanding that it is most certainly not "your father's combat search and rescue (CSAR)."

Why is an understanding of "these things we do" vital to the future of Air Force PR and, in turn, Air Force rescue? First, leaders who wish to effectively employ this highly demanded military capability must recognize and leverage it in combination with other joint capabilities. This involves choosing the best means of operationally posturing fielded forces to benefit from PR should an isolating event occur, preparing potential customers who are deploying to hostile locations so they can maximize the chances of conducting a successful rescue mission, and supporting developments in PR capabilities such as integrated command and control systems, modern rescue platforms, and jointly accepted tactics, techniques, and procedures. Second, leaders and customers who fully comprehend Air Force PR are more likely to advocate our needs successfully at the highest levels, seek our expertise early in both strategic and operational planning, and effectively cooperate for expedient recovery when a teammate becomes isolated in either permissive or hostile environments.

How do we promote sufficient awareness of PR across the Air Force and the rest of the

DOD? We begin by ensuring PR's inclusion in the architecture of the service core functions and by having a core function master plan. Should this architecture exclude an essential function like PR, recovery's capabilities would decline as the other functions more productively compete for resources. Furthermore, this lack of institutional visibility would result in service, joint, and coalition partners failing to understand a particular capability, inappropriately comprehending its full value across the range of military operations (ROMO), and ineffectively advocating for resources to match requirements set by combatant commanders. Consequently, in 2009 Michael B. Donley, secretary of the Air Force, and Gen Norton A. Schwartz, Air Force chief of staff, added PR to the list of Air Force core functions.[1] In turn, Robert M. Gates, former secretary of defense, agreed with their decision by approving DOD Directive 5100.01, *Functions of the Department of Defense and Its Major Components*, the policy document that codifies Air Force core functions and those of our fellow services.[2] This designation allows senior leaders to promulgate essential PR concepts and practices to the joint community, standardizing interaction among PR experts and the customers we serve. Furthermore, the Air Force and others in the DOD can direct forces to integrate training specific to PR, thus enhancing comprehension and effective implementation of recovery across the ROMO and maximizing usage of this life-saving Air Force core function during each phase of any military operation.

However, because PR—as a service core function—systematically encapsulates "these things we do," some people at times have difficulty truly comprehending and fully understanding its expansive nature. PR spans the fundamental war-fighting requirement to prepare, plan, execute, and adapt. It encompasses survival and captivity training conducted at Lackland AFB, Texas; Fairchild AFB, Washington; and the Air Force Academy, Colorado; as well as large-force rescue exercises flown at Red Flag and Angel Thunder, together with PR education and command and control training available at Hurlburt Field, Florida, for senior commanders and the staffs of their air operations centers.[3] Although many Air Force personnel, along with those of joint and coalition partners, receive some aspects of training under PR and rely upon our capabilities in crises, most of them still do not completely grasp PR as a service core function—a fact that generates misunderstanding of PR-unique terminology, operational concepts, and practices. Ultimately, this situation jeopardizes our ability to fully integrate life-saving PR early in the mission-planning process. Conceptual misunderstandings accumulate over time, serving to limit users' knowledge of what PR can do for them. Terms such as *search and rescue*, *combat search and rescue*, *medical evacuation*, *casualty evacuation*, and *sea rescue*, to name just a few, give users the impression that PR rescues aircrews only or, worse, that we are neither available nor postured to rescue joint, coalition, or even civilian partners during an isolating event. We want our leaders and customers to understand fully what PR encompasses rather than rely on dated expressions to incorrectly characterize our specialized capabilities and unique life-saving skills.

Under PR, the ability to recover downed pilots remains the hallmark of the rescue Airman. Having such a high-end capability ensures flexibility in fulfilling the rescue mission across the ROMO. For the brave men and women who answer that call, it is a way of life like no other. An examination of that legacy from the jungles of Vietnam, and even before, confirms the fact that rescue Airmen save lives, regardless of the risk to themselves. Such commitment instills trust in others that "someone will come." It also complicates the decision cycles of our adversaries. These facts are as true today as they ever were. But saving a life is the effect—one that can occur across the ROMO, not just during major combat operations. In order to truly appreciate the full range of capability that today's rescue Airmen bring to the fight under the PR service core function, one must think far beyond the notion that Air Force PR exists only to sit alert in some austere environment, launch a rescue helicop-

ter into contested territory, and return a fellow pilot to safety. In that context, *PR* is not simply a new abbreviation for *CSAR*. Perhaps this is why rescue Airmen, past and present, were delighted when our Air Force recognized the importance of the rescue mission by including PR among the service core functions. Nevertheless, even though PR has enjoyed this designation for two years, not every Airman—as well as some rescue Airmen—understands the significance.

At this point, reviewing the meanings of the terms *service*, *core*, and *function* might prove beneficial to all Airmen. A standard English dictionary defines the noun *service* as "the occupation or function of serving, or in active service." Clearly, all of us who wear the cloth of our nation, even our civilian Airmen, share this bond. The definition of the noun/attributive *core*—"a central and often foundational part" or "a basic, essential, or enduring part"—points to our deepest rooted convictions about who we are and what we stand for, those ideas that shape our guiding principles, opinions, and beliefs. These elements comprise our "DNA." Last, the noun *function* is "the action for which a person or thing is specially fitted or used or for which a thing exists." We Airmen are "specially fitted" for the missions we perform every day—in particular, for those designated as service core functions.

The Air Force designed the list of service core functions to support its essential mission areas—those that truly reflect both the DNA of Airmen and what it means to be an air, space, and cyberspace warrior. Broadly defined, our service core functions attempt to describe and fulfill the strategic objectives found in both the national defense and national military strategies.[4] The formula for understanding what a service core function encapsulates is simple: winning effects = purpose + mission + capabilities (systems and skills) required for success. Each service core function is accompanied by a list of underlying elements intended to tie that function to specific missions and tasks carried out by Air Force units. Service core functions go well beyond what we Airmen consider important. They speak to our unique contributions to the joint cause and the need to achieve war-fighting effectiveness. Any service that seeks war-fighting independence instead of embracing interdependence serves only to reduce war-fighting effectiveness and increase the likelihood of costly redundancies and capability gaps. The last thing we need to do is turn back the clock by allowing services to develop excessively redundant capabilities, thereby rejecting the premise of joint war fighting. It is imperative that services build the right mix of people, systems, and infrastructure underlying their core competencies and functions.[5]

Armed with this understanding, one might assume that everyone knows the high-order significance of having PR listed among other Air Force core functions. However, many individuals both within and without the rescue community have lazily thrown around such terms as *PR mission*, *PR forces*, and *CSAR* when the enterprise should in fact refer to itself as the *PR service core function*. Failure to do so affects how members of other Air Force communities (e.g., fighter; bomber; special operations forces; and intelligence, surveillance, and reconnaissance [ISR]) view the value of both PR as a core function and rescue as a mission. This situation has a detrimental effect on how other core functions become interconnected and mutually supportive during all facets of preparation, planning, execution, and adaptation.

Although Airmen recognize and members of our sister services widely comprehend the functional concepts behind most of the Air Force's core functions (e.g., global precision attack, air superiority, nuclear deterrence operations, command and control, global integrated ISR, etc.), PR falls short. Yet, every Airman should have at least a baseline understanding of everything essential to our service, which now includes PR. This requirement accords with our service's solemn responsibility to organize, train, and equip our Airmen throughout the preparation-planning-execution-adaptation continuum. Doing so will meet the PR policies and de-

mands set forth by our national leaders and combatant commanders.

Recalling our formula for what a service core function encompasses (winning effects = purpose + mission + capabilities [systems and skills] required), we can now put PR to the test. First, in terms of *winning effects*, PR protects human capital and denies an adversary the operational and strategic advantages of exploitation. Second, PR exists for the *purpose* of saving lives and supporting people who must struggle to survive, evade capture, resist exploitation, and escape when necessary. Third, PR performs the rescue *mission* by finding individuals, getting them out of trouble, returning them to safety, and rendering medical care as required. Fourth, *capabilities* include the systems and skills necessary to run through the "save chain's" five critical tasks rapidly and successfully: report, locate, support, recover, and reintegrate individuals forced to survive, evade capture, resist exploitation, and escape.

The specific weapon systems currently apportioned and tasked to deliver PR effects and perform the rescue mission include the HH-60G helicopter, the HC-130N/P aircraft, and Guardian Angel (consisting of combat rescue officers, pararescuemen, and survival-evasion-resistance-escape specialists). In and of themselves, these systems do not complete the save chain, which requires additional systems typically provided under other core functions specifically designed and tasked to carry out the air-to-air mission (under the air superiority core function), the interdiction and close air support missions (under the global precision attack core function), the ISR mission (under the global integrated ISR core function), medical care support (under the agile combat support core function), command and control for air/space/cyber (under the command and control core function), and other specialized capabilities (under the special operations core function). Complementing these systems are intellectual and practiced skills characteristic of three separate yet related areas: rescue forces, commanders and their staffs, and people at risk of becoming isolated. During a rescue mission, those skills are core to an Airman's practiced ability to fly aircraft, run a hoist, deliver survival rafts while airborne, call for suppressive fire, parachute, air-refuel, maintain aircraft, employ weapons, collect and disseminate intelligence, transfer knowledge, survive, evade capture, resist exploitation, escape, and so on. All of this accurately depicts PR—they are "these things we do." Clearly then, describing PR simply as a mission or event involving a helicopter picking up a downed pilot behind enemy lines is an understatement.

In this context, every Airman plays a part within the greater PR service core function. More specifically, Airmen placed in harm's way need to prepare for becoming isolated. The Air Force's current posture statement indicates that "the United States faces diverse and complex security challenges that require a range of agile and flexible combat capabilities" as well as effects designed to win.[6] Our service is fully engaged in this effort, and PR is making a vital contribution. Given the ongoing issues confronting us worldwide, Airmen stand at the forefront of the joint arena, providing combat air, space, and cyber power in a host of dangerous environments. More than ever before, Airmen of all disciplines find themselves in situations outside safe confines and in places where circumstances might forcibly separate them from friendly control. Therefore, because Airmen may become "customers" of what the PR service core function brings to the fight, they must understand the capabilities and effects that recovery brings to bear. Additionally, as noted by the posture statement, "the increased utilization of military and civilian personnel in support of [overseas contingency operations] has significantly increased the demand for Air Force rescue forces beyond the conventional combat search and rescue mission."[7] Therefore, all Airmen, commanders included, are responsible for applying their unique capabilities (systems and skills) to support a rescue mission across the ROMO—not just during combat.

Air Force PR is indeed a core function of airpower, validated by the fact that, in to-

day's fight, Airmen trained in the true art of recovery can readily adapt and innovatively support every contingency operation, including those in the homeland. Our service's PR, which embodies an integrated and systematic approach to blending interdependent capabilities expected to save the lives of people forced to survive or evade capture, remains fully applied in Afghanistan, Iraq, and the Horn of Africa. It is also ingrained in the support that our nation offers during land and maritime search and rescue, humanitarian assistance / disaster relief, and mass-casualty evacuation operations either at home or around the globe. Surprisingly, despite such success, some individuals—especially in the joint community and higher—continue to think of Air Force PR only in terms of flying helicopters and picking up pilots shot down behind enemy lines. In actuality, the PR service core function embraces every process, system, platform, and structure necessary for the Air Force to prepare its personnel in advance, plan for the rescue mission, execute the save chain's critical tasks, and adapt our programs and methods in a way that keeps America's PR observe-orient-decide-act loop tighter than anybody else's.

So where are we missing the mark? We need look no further than our collective inability to communicate accurately and consistently the full scope of PR as a service core function. We still fail to think and talk holistically in terms of individual preparation, operational planning, joint execution, and adaptation. It is easy to speak in terms of actually executing a rescue mission, picking up an isolated person here, supporting a noncombat evacuation operation there, leading rescue operations during national disaster X, and facilitating the development of partner-nation rescue crews in country Y. However, we must become equally adept at communicating all the other aspects of preparation, planning, execution, and adaptation as described by PR's operational concept and core function master plan. As a service, we experience victory when we can easily convey our knowledge and understanding of PR to the masses, especially joint military and interagency planners who assess the recovery needs of their leadership in the field. But we do not clearly communicate beyond the rescue helicopter and, on a good day, the HC-130 and Guardian Angel weapon systems. We must become proficient in accurately portraying the Air Force's ability to quickly run through the save chain, using nontraditional systems and platforms not specifically designed or intended to perform the rescue mission. Consequently, as Air Force PR continues to fly toward the future, leaders at all levels must be mindful of how best to guide this critical and necessarily inclusive service core function. PR is war fighting. It is a key ingredient in our nation's ability to win. It is a system-of-systems approach that addresses all aspects of preparation, planning, execution, and adaptation necessary in rescuing a human being. PR is much more than war-movie images of an HC-130 refueling an HH-60 so it can lower a pararescueman on a hoist to snatch a downed pilot from near capture.

The Air Force took a significant step by recognizing PR as one of its service core functions. To enjoy true success, all Airmen, along with personnel in joint and interagency communities, must be aware of the evolved nature of warfare and of combatant commanders' escalating need for PR beyond the myopic notion of CSAR. With this demand comes a call for new and codified terminology, a vision that looks beyond historical paradigms, and a retooling of how the Air Force organizes, trains, equips, and employs its forces to give war fighters the PR they deserve. If we limit ourselves to thinking narrowly, PR's value to the nation will stagnate and eventually become irrelevant. So the next time Air Force PR comes to mind, try to move past medical evacuation, casualty evacuation, or a rescue mission with helicopters and an A-10 fighter escort, and realize that this service core function entails much more than "your father's CSAR." ✪

Notes

1. Department of the Air Force, *United States Air Force Posture Statement, 2009* (Washington, DC: Department of the Air Force, 19 May 2009), 3, http://www.au.af.mil/au/awc/awcgate/af/posture2009.pdf.

2. Department of Defense Directive 5100.01, *Functions of the Department of Defense and Its Major Components*, 21 December 2010, http://www.dtic.mil/whs/directives/corres/pdf/510001p.pdf.

3. Angel Thunder, a PR exercise sponsored by Air Combat Command that takes place at Davis-Monthan AFB, AZ, focuses on the application of recovery capabilities across the full range of military operations to support the whole-of-government response to isolated personnel.

4. Department of Defense, *National Defense Strategy* (Washington, DC: Department of Defense, June 2008), http://www.defense.gov/pubs/2008nationaldefensestrategy.pdf; and Joint Chiefs of Staff, *The National Military Strategy of the United States of America* (Washington, DC: Joint Chiefs of Staff, 2011), http://www.jcs.mil//content/files/2011-02/020811084800_2011_NMS_-_08_FEB_2011.pdf.

5. Lt Gen David A. Deptula and Harold "Buck" Adams, "Joint's True Meaning: Jointness Requires That Separate Services Focus on Core Competencies," *Armed Forces Journal* 146, no. 10 (May 2009): 38–39.

6. Department of the Air Force, *United States Air Force Posture Statement, 2011* (Washington, DC: Department of the Air Force, 17 February 2011), 1, http://www.posturestatement.af.mil/shared/media/document/AFD-110301-088.pdf.

7. Ibid., 20.

Brig Gen Kenneth E. Todorov, USAF

Brigadier General Todorov (BA, Siena College; MBA, National University; MS, Naval War College; MSS, Air War College) is the deputy director of operations at US Northern Command (USNORTHCOM), Colorado Springs, Colorado. His portfolio at USNORTHCOM includes air, land, maritime, space, and cyber operations for homeland defense, as well as ballistic missile defense; information operations; nuclear command and control; intelligence, surveillance, and reconnaissance operations; and defense support of civil authorities. Prior to his assignment at USNORTHCOM, he commanded the 23rd Wing at Moody AFB, Georgia. The wing had units at Moody, Davis-Monthan AFB, Arizona, and Nellis AFB, Nevada, including all active duty rescue assets in the continental United States. He is a command pilot with more than 3,800 flight hours in the HH-60 (multiple models), TH-55, UH-1H, CH-3E, HH-3E, HC-130, MI-8, and MI-24. General Todorov also led the initial Coalition Air Force Transition Team into Iraq to assess the capabilities and requirements for all special operations and rotary-wing assets of the Iraqi air force. The general is a graduate of Squadron Officer School, the College of Naval Command and Staff, and the Air War College.

Col Glenn H. Hecht, USAF

Colonel Hecht (BS, University of Pittsburgh; MBA, University of Phoenix) is deputy director of Analyses, Lessons Learned, and Air Force Smart Operations for the Twenty-First Century, Headquarters Air Combat Command (ACC), Langley AFB, Virginia. Previous assignments include chief of the Combat Search and Rescue Operations Division, Headquarters ACC; director for personnel recovery policy, Office of the Secretary of Defense, Washington, DC; commander of the HH-60G Combined Test Force, 53rd Wing, Nellis AFB, Nevada; and chief of the Conventional Recovery Branch, Joint Personnel Recovery Agency, Fort Belvoir, Virginia. He has deployed in support of Operations Northern Watch, Southern Watch, Allied Force, Enduring Freedom (Afghanistan and the Philippines), and Iraqi Freedom, accruing over 190 combat and 250 combat-support flight hours while performing the rescue mission. A command pilot with more than 3,500 hours in the HH-60G, HH-60A/L, UH-1N, UH-1H, and TH-55, Colonel Hecht is a graduate of Squadron Officer School, Air Command and Staff College, Joint Forces Staff College, and Air War College.

Ira C. Eaker Award Winners

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

First Place

Lt Col George H. Hock Jr.

"Closing the Irregular Warfare Air Capability Gap: The Missing Puzzle Piece: Rugged Utility Aircraft and Personnel"

(Winter 2010)

Second Place

Lt Col Kristal L. Alfonso

"Femme Fatale 2010"

(Fall 2010)

Third Place

Lt Col Timothy Franz

"The Cyber Warfare Professional: Realizations for Developing the Next Generation"

(Summer 2011)

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

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

STRATEGY AND AIRPOWER

I first read Col John Warden's book *The Air Campaign: Planning for Combat* in the summer of 1989 as a cadet at the Air Force Academy. It was, to my youthful eye, a revelation of how to think about airpower in a systematic way. Colonel Warden's five rings remained a strategic framework throughout my early career, and I think we are all indebted to him for his contributions to airpower theory. In fact, the speed and surgical nature of the first Gulf War seemingly proved the verity of his approach. Other airpower enthusiasts often cite the air wars in Bosnia and Kosovo as further supporting examples of the ability to use airpower for strategic effect.

More than two decades after originally reading his work and 10 years into our long struggle in Afghanistan and around the world against violent extremism, modern conflict has proven far more complex and intractable than to be holistically addressed by Colonel Warden's framework alone. His update of the five rings in his article "Strategy and Airpower" (Spring 2011) now "rings" hollow; it is overly simplistic and formulaic since airpower is just one "lever" among many in today's conflicts. In terms of countering ideological support for terrorism, airpower has had little positive effect, and collateral damage from even the "precise" use of airpower has been, at times, counterproductive. Thinking systematically is important, but we must be very cautious of reducing a thinking enemy to a system to be serially coerced, bribed, or destroyed solely through the use of airpower. Today our warriors, diplomats, and aid workers on the ground in Afghanistan and Iraq and around the world understand this intuitively as they engage complex, adaptive, and unpredictable foes.

Sun Tzu's admonition to "know your enemy" (his mind-set, language, history, values, heroes, hopes, fears, etc.) is the human terrain where most Airmen exhibit weakness. The technological requirements of tactically succeeding as Airmen often dominate and sometimes inhibit their intellectual development of a strategic perspective. Colonel Warden's article gives additional evidence to Carl Builder's classic characterization of Airmen "worship[ping] at the altar of technology" (*The Masks of War* [Baltimore: Johns Hopkins University Press, 1989], 19). Airpower in air, space, and cyberspace makes significant contributions to our nation's efforts in conflict, yet it is but "one tool in the tool kit" in the joint, interagency, and multinational operating environment that we use to influence the opposition's thinking.

Airpower has an important role, sometimes leading and sometimes supporting, but commanders and strategists need to understand the history, cultural context, and "human terrain" before asserting that any simplified framework will produce desired strategic effects.

Lt Col Jim Dryjanski, USAF
Garmisch-Partenkirchen, Germany

Colonel Warden's article is well written and, in places, compelling. It is also ahistorical, relies on the selective engagement of Clausewitz's *On War*, and draws conclusions that are misleading if not downright dangerous. Although Colonel Warden caveats his use of Clausewitz as tangential to his main argument, the Prussian's theories refute nearly every aspect of Warden's claims. To argue that "airpower can and should fundamentally change the very nature of war" (p. 64) ignores Clausewitz's observations that war's character changes but that its nature—centered on the uncertain interplay of violence, chance, and reason—is timeless. Airpower has continued, and must continue, to operate in environments dominated by

Clausewitz's trinity. Never in history has technology, or airpower, altered the nature of war—and Colonel Warden offers no compelling arguments to explain its doing so in the future. On the very first page of *On War*, Clausewitz tries to disabuse future practitioners of war of the possibility of "bloodless force," a notion that Warden links to some future iteration of airpower: "Kind-hearted people might of course think there was some ingenious way to disarm or defeat an enemy without too much bloodshed, and might imagine this is the true goal of the art of war. Pleasant as it sounds, it is a fallacy that must be exposed: war is such a dangerous business that the mistakes which come from kindness are the very worst" (*On War*, ed. and trans. Michael Howard and Peter Paret [Princeton, NJ: Princeton University Press, 1976], 75).

Colonel Warden joins the ranks of Douhet, Trenchard, and a host of other airpower advocates convinced that future iterations of airpower promise to change the nature of war itself. These historically unsupportable arguments damage the credibility of Airmen in the joint environment. To paraphrase the great Prussian, war is—and always will be—about using force, or threatening to do so, to compel an enemy to do our will. Airpower can deliver force or coercively threaten the use of force in novel ways that deserve emphasis in the joint environment. This simple truth—not the seductive message of well-intentioned advocates of airpower like Colonel Warden—should serve as the starting point for airpower advocates. The lack of Airmen postured to command in joint environments, particularly at the geographic combatant commander level, should serve as an indicator that it is we Airmen, not our counterparts on the ground or on the sea, that "don't get it."

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Air Force Rescue

A Multirole Force for a Complex World

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Although the Air Force rescue community boasts over 9,000 joint/multinational combat saves in the last two years and over 15,750 sorties in Operations Enduring Freedom and Iraqi Freedom since September 2001, these impressive statistics cannot overshadow debilitating, systemic problems caused by rescue's ineffective organizational structure.[1] As demand for personnel recovery (PR) continues unabated across the globe, chronic staffing shortages and aircraft mission-capable rates hovering at 60 percent paint a bleak picture of this indispensible capability. Unfilled theater PR requirements and an inability to deploy rescue forces rapidly in response to crises like the Haitian earthquake highlight dangerous operational shortfalls. Additionally, a lack of Air Force rescue participation in combatant commander exercises (despite the mandate found in Department of Defense Directive [DODD] 3002.01E, *Personnel Recovery in the Department of Defense*, to "rehearse personnel recovery as an integral part of operational planning, training, and exercise"), acquisition failures such as the cancelled combat

search and rescue replacement (CSAR-X) program, and stalled funding for replacement HH-60s and HC-130Js foretell more gaps in capability.[2] Inadequate advocacy from major commands (MAJCOM) on behalf of rescue continues to frustrate even modest improvement in this heavily tasked and operationally indispensible asset.

To reverse the decline in rescue's ability to meet worldwide requirements, the Air Force must restructure its PR core function under a numbered Air Force (NAF) in order to consistently meet mandates outlined by the chief of staff and secretary of the Air Force in PR policy and doctrine documents.[3] This article examines the statutory and operational requirements for Air Force rescue, noting how this capability fits into joint and Air Force doctrine. It then addresses how shortfalls in the current configuration prevent the rescue community from meeting the operational demand, leaving huge capability gaps in regions of the world where rescue by other means is impossible. Keeping in mind the current organizational failure to leverage essential manpower and resources, the article recommends placing Air Force rescue under Eleventh Air Force to ensure strong advocacy for the ongoing recovery of isolated personnel.

Air Force Rescue: A Department of Defense Mandate and an Operational Necessity

Joint Publication 3-50, *Personnel Recovery*, assigns each military service primary responsibility for recovery of its personnel.[4] To meet this requirement, the Air Force needs a designated force capable of interdomain operations since it is the only service that must recover personnel outside its normal domain. Unlike the Air Force, the Army and Marine Corps have ground forces that dominate the land domain where they can use a multitude of fielded maneuver elements during rescue. Locally operating units can effect an expeditious recovery of any Soldier or Marine through simple retasking: "Army ground forces conduct recovery the same way they would execute a combat patrol similar to a raid or movement to contact to execute a link up operation. They use the same organization, planning, preparation, and support."[5] Similarly, a Marine PR mission "is planned and executed as a form of tactical raid and involves thorough maneuver, fire support, and contingency planning."[6] Clearly, the tactics, techniques, and procedures for both Army and Marine PR are compatible with those of their primary mission set. Moreover, the Navy operates in the sea domain where surface or subsurface assets can be retasked to recover a Sailor isolated in open water.[7] The Air Force, however, does not deal with isolating events in its air and space domain but in either the land or sea domain. There is no existing combat air force (other than rescue) whose tactics, techniques, and procedures are compatible with interdomain operations, and these capabilities and requisite skills cannot be created ad hoc. Without a dedicated rescue community organized, trained, and equipped to operate in this environment, the Air Force would have no one to execute the service's PR core function. No other Air Force weapon system has a primary mission set that includes integrated air, land, and sea operations and that stands ready for retasking to conduct recovery. Without a standing rescue force, the Air Force could not recover its personnel, and more complex joint missions would be jeopardized because of the informal nature of its sister services' PR capability.

If all services rely on ad hoc relationships to execute their PR responsibilities, interservice rescue in a more complex and challenging (higher-threat) environment becomes unacceptably risky. According to the (Adm James L.) Holloway Report, released in the aftermath of the failed Iranian hostage rescue attempt in April 1980,

> An existing JTF [joint task force] organization, even with a small staff and only cadre units assigned, would have provided an organizational framework of professional expertise around which a larger, tailored force organization could quickly coalesce. The important point is that the infrastructure would have

> existed. . . . The JTF Commander would have had a running start and could have devoted more hours to plans, operations, and tactics rather than to administration and logistics.[8]

This analysis remains relevant today in that a standing Air Force rescue community provides the "existing JTF organization" that Admiral Holloway referred to over 30 years ago. Disparate, ad hoc PR resources can neither represent the Air Force nor provide sufficient assistance to the joint community. A standing Air Force rescue community will add methodical organization, experience, education, and planning to the joint PR system, thus helping to avoid the costly mistakes of the past.

Current Personnel Recovery Doctrine/Policy

DODD 3002.01E, the governing document that establishes how the military executes PR, clearly defines the latter as "one of the highest priorities of the Department of Defense."[9] Additionally, it tasks service chiefs with the responsibility to

> a. Ensure personnel recovery preparation efforts keep pace with changes in the global operating environment. . . .
>
> b. Be prepared to plan and execute personnel recovery operations with other interagency partners. . . .
>
> c. Be prepared to conduct interoperable and mutually cooperative personnel recovery operations with partner and host nations, including leveraging host-nation capabilities to rescue DoD personnel unilaterally whenever possible.[10]

Based on this direction, the Air Force secretary and chief of staff developed their guidance for the service.

Air Force policy and doctrine documents further detail the service's responsibility within the PR system. Air Force Policy Directive (AFPD) 10-30, *Personnel Recovery*, acknowledges that "the Department of the Air Force has primary responsibility for recovering Air Force personnel who become isolated in uncertain or hostile environments."[11] Consequently, the secretary declared his intent to "establish a global Air Force PR capability . . . [through] well-equipped, fully-manned, and dedicated PR forces."[12] Additionally, an *Operational Concept for Personnel Recovery*, signed by the chief of staff, not only acknowledges that the sister services routinely call upon Air Force rescue to recover their personnel, but also expands PR tasks to include civil and military search and rescue, medical/casualty evacuation, noncombatant evacuation operations, disaster response, mass rescue operations, humanitarian relief operations, theater security cooperation, specialized air and ground mobility, and reintegration of recovered individuals.[13] These documents refute the depiction of Air Force rescue as a single-purpose force used only to pick up downed fighter pilots during major combat operations. Unfortunately, decisions based on such a misperception lead to significant operational shortfalls between DOD/Air Force requirements and the Air Force's actual capability.

Operational Shortfalls

Although Air Force PR boasts a proud heritage and an impressive list of recent achievements since the beginning of Enduring Freedom and Iraqi Freedom, these accomplishments should not mask significant problems that undermine the realization of leadership's vision. PR currently falls short in three specific areas mentioned earlier: (1) "a global Air Force PR capability," (2) "uncertain or hostile environments," and (3) "keep[ing] pace with changes in the global operating environment." Taken together, these deficiencies pose a risk to Air Force, DOD, and US personnel operating across the globe.

A Global Air Force Personnel Recovery Capability

Elements of Air Force rescue stationed overseas cannot respond rapidly to taskings across their assigned areas of responsibility. Rescue forces allocated to US Air Forces in Europe

(USAFE) and Pacific Air Forces (PACAF) are based at Royal Air Force Lakenheath, United Kingdom; and Kadena Air Base, Okinawa, Japan, respectively. In the United Kingdom, the 56th Rescue Squadron—the smallest in the US Air Force—has only five HH-60 helicopters and an associated Guardian Angel team; Kadena is home to 10 HH-60s assigned to the 33rd Rescue Squadron and Guardian Angel teams assigned to the 31st Rescue Squadron. These forces, which lack a fixed-wing aircraft element, have a combat radius of 195 miles without external sourcing.[14] Additionally, limitations in deployment range necessitate use of either helicopter tanker aircraft such as the HC-130 (which neither USAFE nor PACAF owns) or multiple ground-refueling stops at established airfields. To carry out strategic deployment, the air component may submit a special airlift mission request to compete with other priorities. In effect, the preponderance of the area covered by Pacific Command and European Command / Africa Command (other than Joint Task Force–Horn of Africa) remains outside the timely response of Air Force rescue forces, falling well short of the secretary's intent of maintaining a global PR capability. Unfortunately, aging aircraft exacerbate deficiencies in range and capability.

Low availability of weapon systems and low reliability rates hamper Air Force rescue's efforts to project global PR. For calendar year 2010, rescue's rotary-wing weapon system, the HH-60, recorded an availability rate of 53 percent and a reliability rate of 74 percent.[15] That is, on any given day approximately half of the helicopters are available to fly, and, of those, only three-quarters don't break before completing the mission. Rescue's fixed-wing weapon system, the HC-130, has an equally low availability rate of 51 percent.[16] Finally, the combat air force's Guardian Angel weapon system (including pararescue personnel; survival, evasion, resistance, and escape specialists; and combat rescue officers) continues to hover around 60 percent manning with no increase expected in the near term.[17] These factors, coupled with higher-than-programmed usage and major depot delays, deter commanders from appropriately employing rescue.[18] For example, the commander of US Africa Command sent a request for additional rescue assets to the Joint Staff for action, but the force provider, Air Combat Command (ACC), denied it, based on deployment rates and equipment availability. Thus, an inadequate overseas presence and concerns about fleet reliability directly lead to operational shortfalls.

Uncertain or Hostile Environments

The Air Force's rescue aircraft do not have the equipment they need to operate in adverse weather conditions. Current configurations on both the HH-60 and HC-130 lack the terrain-following radar critical to all-weather, low-level, and landing operations. Consequently, regulations limit operations to those conducted via visual low-level and visual self-contained approaches to suitable airfields and helicopter landing zones.[19] To recover personnel during bad weather, rescue forces would have to accept extremely high levels of risk or wait for better conditions—options that fall well short of the chief's intent of "rescuing anyone, anywhere, anytime."[20]

Currently, rescue cannot meet that intent without placing an undesirable burden on other forces. Improperly equipped rescue aircraft require augmentation from outside forces to lower mission risk. Special operations forces conduct high-risk operations because their equipment is designed to operate in that environment. A rescue scenario involving a penetrating mission inside defended airspace would likely task such forces because they have the electronic countermeasures equipment and defensive gear that rescue forces lack even though the latter have the requisite skills to conduct these missions. Such a situation makes special operations forces unavailable for their own primary mission.

Keeping Pace with Changes in the Global Operating Environment

National strategic documents recognize the need for proficiency in irregular warfare (IW). The new national security strategy confirms

US dedication to "more effectively advance our interests in the 21st century" through security, prosperity, values, and international order.[21] The national defense strategy extrapolates these objectives into defending the homeland, winning the long war, promoting security, deterring conflict, and winning our nation's wars.[22] These two documents share the theme of needing to develop and maintain partnerships as the cornerstone of peace and security. Nurturing partnerships and building partner capacity (BPC) through efforts designed to support, train, advise, and equip a host nation's security forces promote a strong coalition team that maintains the capacity, will, and capability to act. Although it is the premiere force for carrying out this task, Air Force rescue remains unexploited.

Rescue's untapped IW capability for BPC underlines a significant Air Force problem in keeping pace with the operating environment. The global environment has driven strategic leadership to direct investment in forces capable of building partnerships and increasing their capacity, but the Air Force has yet to task and resource its most fitting BPC asset—rescue.[23] Additionally, the lead for IW operations—Special Operations Command—calls for general-purpose forces to perform missions primarily viewed as special operations activities: "Rebalancing [general-purpose forces] to conduct IW will expand joint force operational reach. . . . The results will be improved capability to operate against adversaries . . . and an expanded ability to . . . achieve US strategic objectives."[24] IW/BPC applied to rescue enhances a partner's ability to support its military and civilian population. It reinforces national sovereignty and improves security, prosperity, and international order, as exemplified in Air Force Doctrine Document 3-22, *Foreign Internal Defense*:

> The availability of dependable CSAR and [casualty evacuation], especially at night, has dramatically improved the willingness and ability of host nation ground combatant forces to engage in operations they may otherwise be less motivated to perform. This was particularly noticeable in the Philippines during the years immediately following the September 11, 2001, tragedy. Philippine ground forces would not engage terrorists at night knowing there was no night [casualty evacuation] capability available. Ground combat teams began night operations immediately after the Philippine Air Force acquired this capability provided by Air Force [Special Operations Command] combat aviation advisor . . . trainers.[25]

With all evidence pointing to the significant strategic impact of an Air Force rescue community tasked with BPC, this capability nevertheless remains unexploited, leading one to inquire about the Air Force's view of this significant shortfall.

A report by the Air Force's IW tiger team, chartered by the chief of staff to determine IW requirements and gaps, characterizes Air Force rescue as a correctable problem in the context of successful operations in today's global environment.[26] The report contends that having more US forces perform BPC and theater security cooperation activities widens the gap between PR requirements and capability. Additional numbers of personnel operating in remote locations overseas increase the demand placed on an already strained PR, medical evacuation, and multimission fixed- and rotary-wing force. Research further reveals that the Air Force rescue community provides an organizational framework with skill sets that could be applied to fill an additional gap in air adviser capability.[27] Finally, the report advocates that expanding and resourcing that community to execute IW/BPC missions facilitate elimination of a strategic shortfall in persistent presence.[28] To fully implement the recommendations of the tiger team, the Air Force must acknowledge shortages in its current equipment inventory.

In the report, such deficits come to light when both the PACAF vice-commander and the Air Forces Africa commander discuss their desire for light, fixed-wing aircraft. PACAF's vice-commander deems PR essential in all countries (both developed and developing) but acknowledges the ineffectiveness of Air Force rescue as currently equipped: "The tyranny of distance, terrain, and island environment drive demand for light STOL [short takeoff and land-

ing] fixed-wing and light rotary-wing aircraft as forces operate in remote areas of Sri Lanka, Cambodia, Vietnam, Indonesia, Malaysia, Bangladesh, and the Oceanic island nations."[29] Similarly, the Air Forces Africa commander calls for fixed- and rotary-wing platforms that allow the Air Force and partner nations' air forces to conquer the "tyranny of distance" and lack of infrastructure. The solution, the commander contends, does not involve acquiring more strategic lift but creating regional reach with rugged, affordable light and medium fixed- and rotary-wing aircraft. Applying this air capacity to medical evacuation as well as search and rescue yields high payoffs in terms of protecting our personnel, building partnerships, and legitimizing the government.[30] The lack of "technology appropriate" equipment leaves US personnel operating in remote locations without PR support. Furthermore, it leaves our partner nations without affordable, reliable equipment to build their capacity through rescue air advisers. The shortfalls described above reflect a larger problem identified by analysis of the Air Force's PR structure.

The Root of the Problem

We can trace Air Force rescue's deficiencies to an ineffective organizational structure. Current efforts to "fix" these issues do not work because they attack symptoms rather than the problem. Unless this approach changes, the community will continue to experience the same difficulties—hence the need for a root-cause analysis that will remedy core issues.

Air Force rescue's ailments and resultant shortfalls stem from an inability to meet the responsibilities specified in AFPD 10-30. In this policy document, the secretary of the Air Force tasks ACC to

> Advocate for PR policies and strategic guidance and assist with determining PR forces requirements.
>
> Advocate for adequate programming, standards, and policies that foster both interoperability and enhanced PR capabilities.
>
> Advocate for training, standards, and requirements to maintain an effective PR command and control (C2) architecture.[31]

Although well intentioned and supportive of PR, ACC has global responsibilities that have prevented it from fulfilling those tasks. For example, 78 HC-130J and 141 CSAR-X recapitalization requirements validated by the Joint Requirements Oversight Council remain unfilled.[32] The failure to emphasize PR and advocate/prioritize at the MAJCOM level resulted in cancellation of the CSAR-X program and a reduction of the HC-130J program to 37 aircraft with as few as one aircraft delivered a year in the current program objective memorandum. Statements made by former secretary of defense Robert Gates in his budget recommendation reveal the debilitating second-order effects: "We will terminate the Air Force Combat Search and Rescue X (CSAR-X) helicopter program. This program has a troubled acquisition history and raises the fundamental question of whether this important mission can only be accomplished by yet another single-service solution with single-purpose aircraft."[33] The classification of Air Force rescue as a "single-purpose" community starkly contrasts the chief of staff's multidimensional description found in the *Operational Concept for Personnel Recovery*, mentioned previously. Unfortunately, in a system where perception is (or becomes) reality, such a viewpoint assures that programming decisions will continue to cause shortfalls in meeting combatant commanders' requirements. If the root problem persists, ACC will continue to lack the equipment necessary to meet the demands of AFPD 10-30.

Although ACC acknowledged inefficiencies with organizational structure in its memorandum announcing establishment of a PR division at command headquarters, this represents only one of the two major organizational steps required to correct the problem.[34] The fact that ACC has responsibility for five of 12 service core functions (including PR) means that a small community like rescue struggles to receive attention. Compounding the problem, the rescue mission lies outside the "mainstream" menu of ACC's capabilities and re-

quirements. The combat air force leadership's lack of familiarity with rescue results in an absence of strategic guidance as reflected in the recently published strategic plan, which describes PR as "part of our pillars but . . . not necessarily on par with the previously mentioned core functions" (e.g., air superiority, global precision attack, C2, global integrated ISR, etc.).[35] By identifying "our priorities, challenges, and the imperatives the [combat air force] must deliver in support of our Nation's security requirements," the plan also points to a major organizational deficiency.[36] Clearly, if the Air Force wishes to become a part of this strategic dialogue, it needs a rescue organization led by a senior leader. Otherwise, rescue will continue to be the "lesser pillar" directed by a staff unequipped to meet the requirements of AFPD 10-30.

A Rescue Numbered Air Force for Strong Leadership and Advocacy

The only way to implement permanent fixes to operational shortfalls is by meeting the secretary's and chief's PR mandates through a reorganization of the Air Force rescue community under a rescue NAF. At first glance, creating a new NAF seems to be at cross purposes with the former secretary of defense's statement on budget efficiencies of 6 January 2011.[37] However, Air Force actions enumerated in that statement include consolidating three NAF staffs. Although creating a NAF might prove too costly, remissioning an existing one in order to meet war-fighter needs is exactly in line with the secretary's intent. A NAF having operational control of all rescue forces will correct two critical problems caused by the current structure by providing a robust, cross-functional (rescue) staff and an experienced flag officer who reports directly to the ACC commander. These improvements will equip ACC to fulfill the advocacy demands of AFPD 10-30 and the requirements of PR's C2 architecture.

A robust, cross-functional staff can create PR policies, strategic guidance, force/programming needs, training standards, and C2 architecture that will eliminate operational shortfalls. ACC's new PR staff division (ACC/A3J stood up in December 2010) operates within the Directorate of Operations; it is neither chartered nor empowered to meet AFPD 10-30's cross-functional requirements. A rescue NAF structure, however, would mirror ACC and Headquarters Air Force staffs to ensure that personnel executing the Planning, Programming, Budgeting, and Execution (PPBE) processes have justifiable/defendable PR inputs. Additionally, the structure expedites establishment of a rescue air and space operations center (ASOC). This concept, similar to Air Force Special Operations Command's Twenty-Third Air Force/623 ASOC would simultaneously execute PPBE procedures while forming the core of PR C2 architecture. By filling the manpower, intelligence, operations, logistics, plans/requirements, communications, and analysis/assessment billets, the NAF will focus functional expertise on meeting the Air Force's PR responsibilities. The synergy gained will yield a plan that eliminates existing shortfalls, answers PR C2 architecture concerns originally raised by the Holloway Report, and provides the NAF commander with information to drive advocacy properly.

The unfiltered, direct (commander-to-commander) communication (formal and informal) between the NAF and MAJCOM command structures assures advocacy for PR prioritization in the MAJCOM and Air Force road maps, both critical to the PPBE process. Additionally, persistent general officer interaction with air component commanders yields greater understanding of the service's PR capabilities. The resultant inclusion in theater security cooperation plans, operational plans, and combatant commanders' integrated priority listings (which highlight capability gaps) will also feed the PPBE process. The NAF commander's advocacy of PR policies, strategic guidance, force/programming requirements, and training standards will assure compliance with AFPD 10-30 and position the Air Force rescue community to eliminate operational deficits.

Implementing a Rescue Numbered Air Force

A solution that acknowledges current fiscal constraints is vital to successful implementation of this plan. After the former secretary of defense tasked the services to find more than $100 billion in overhead savings over the next five years, each one proposed to eliminate no-longer-needed headquarters.[38] Proposing another headquarters on the heels of Global Strike Command, the secretary's guidance to the contrary, seems daunting. However, in accordance with that guidance, if the Air Force identifies a superfluous headquarters, it can "keep the savings . . . generate[d] to reinvest in higher priority warfighting needs."[39] In this case, if the Air Force eliminated an unnecessary NAF, it could apply the funds saved to a functional rescue NAF. The key then, becomes finding an expendable NAF.

Release of the new Unified Command Plan offers the perfect opportunity to re-mission an existing NAF. The plan realigns Alaska and associated forces (Eleventh Air Force) under the operational control of US Northern Command (NORTHCOM)/North American Aerospace Defense Command (NORAD) and the administrative control of ACC. ACC should shift "Alaska defense forces" and realign them under First Air Force, NORTHCOM/NORAD's existing air component. This action would permit separation of the Eleventh Air Force staff structure from the maneuver forces and its redesignation as a rescue NAF. The Eleventh's current approved standing strength of 477 officers, enlisted personnel, civilians, and contractors provides enough billets to meet the service's PR policy requirements, giving ACC a no-cost avenue to remedy Air Force rescue's debilitating issues. Once in place, the NAF will have to take action to eliminate existing shortfalls.

Eliminating Shortfalls

Creating Air Force rescue groups overseas that are tasked and resourced to meet both PR and BPC needs would eliminate deficiencies and standardize force presentation. Rescue operates as a "triad" of fixed-wing, rotary-wing, and Guardian Angel weapon systems, each contributing to a synergy capable of mitigating current "global PR capability" deficits. Increased speed and range of fixed-wing rescue elements, along with in-flight helicopter-refueling capability, give the air component commander a more responsive and flexible force. The associated increase in capability and resources directly results in theater coverage across greater distances and terrain. Additionally, a rescue group structure's inherent C2 capability would prove invaluable during deployment. To repeat the observation of the Holloway Report, quoted earlier, it would "[provide] an organizational framework of professional expertise around which a larger, tailored force organization could quickly coalesce . . . [giving rescue] a running start and . . . [the ability to devote] more hours to plans, operations, and tactics rather than to administration and logistics." Finally, the additional manpower associated with a rescue group brings an inherent capacity increase that can simplify compliance with the chief of staff's *Operational Concept for Personnel Recovery*. After the establishment of the rescue group structure and the attainment of global PR capability/capacity, the proper equipping of forces will rectify shortfalls associated with operating in hostile or uncertain environments while enabling rescue to keep pace with the changing global environment.

Previously acknowledged capability gaps identify inadequate equipment as the main roadblock to operating in hostile environments and remote locations, a problem corrected by adding radar and radar-jamming countermeasure suites to both the HC-130 and HH-60; additionally, incorporation of a roll-on/roll-off precision strike package for the HC-130 would provide for limited organic self-defense. Finally, conducting both PR and BPC tasks in remote locations calls for light fixed-wing rescue squadrons. Current Air Force programming includes procurement of light mobility aircraft for delivery to Air Mobility Command. If the service refocused these efforts and shifted delivery to ACC, both PACAF and Air Forces Africa would have the remote PR/BPC access they need to operate in their theaters. The key to doing away with all exist-

ing shortfalls lies in putting a mechanism in place to work within the system to guide the development of Air Force rescue.

Conclusion

The Air Force rescue community is essential to joint doctrine and operations. Commanders and their troops clearly benefit tactically from the availability of rescue, and the US government benefits operationally and strategically from its ability to deny the enemy an opportunity to exploit captured US personnel. Unfortunately, weak advocacy at the MAJCOM level for personnel and equipment leaves over 40 percent of the rescue demand unmet. Failure of programs such as CSAR-X and HC-130 recapitalization to meet validated force requirements, combined with chronic personnel shortages and declining aircraft availability rates, foretells a worldwide decline in Air Force rescue's capability and capacity for contingency operations. Unquestionably, those forces cannot meet the secretary of the Air Force's requirement for global PR without dramatic improvement in their organization, training, and equipment—which a rescue NAF would provide. By elevating the needs of Air Force rescue and its contribution to the joint and coalition communities at the Air Staff, the service can meet the growing demand for its global rescue. Renewing our commitment to the rapid recovery of isolated personnel will inspire confidence among our international partners that Air Force rescue professionals will answer the call around the world so that others may live. ✪

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35. Gen William M. Fraser III et al., *Securing the High Ground: Agile Combat Airpower; 2010 Combat Air Force Strategic Plan* (Langley AFB, VA: Headquarters ACC, 6 August 2010), 13, http://www.acc.af.mil/shared/media/document/AFD-100915-011.pdf.

36. Ibid., foreword.

37. Secretary of Defense Robert M. Gates, "Statement on Department Budget and Efficiencies" (speech, Pentagon, Washington, DC, 6 January 2011), http://www.defense.gov/speeches/speech.aspx?speechid=1527.

38. Secretary of Defense Robert M. Gates, "Efficiencies Statement as Prepared" (speech, Pentagon, Washington, DC, 9 August 2010), 2, https://dap.dau.mil/policy/Documents/Policy/Efficiencies%20Statement%20As%20Prepared.pdf.

39. Ibid.

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Strategic Rescue

Vectoring Airpower Advocates to Embrace the Real Value of Personnel Recovery

Maj Chad Sterr, USAF

Few Airmen would dispute the intrinsic importance of rescuing comrades in distress. Stories of selfless efforts to recover downed personnel are rooted in US military lore, most strikingly in Southeast Asia and Somalia. This article suggests that although airpower advocates generally identify with the tactical rescue mission, they often fail to understand its inherent strategic value as part of the broader personnel recovery (PR) function. This needs to change.

Current US policies clearly define the necessity for and strategic purpose of a concerted approach to rescuing people in physical distress, especially where America's security interests are at risk.[1] These policies identify the beneficial effects that a nation with organic rescue capability creates within the international community.[2] To fulfill this national policy, the Department of Defense (DOD) tasks the Air Force to employ dedicated rescue forces to perform global PR, which requires a holistic approach towards organizing, mobilizing, and conducting rescue responses that can systematically recover and then return all isolated personnel.[3] Although some of these expectations resulted from top-down initiatives, we should note that PR professionals effectively climbed many bureaucratic walls to nudge the US government towards placing strategic emphasis on PR. Airpower advocates now have a strategic rescue capability that joins strategic attack; global reach; persistent

intelligence, surveillance, and reconnaissance; and other airpower competencies to counter our adversaries' efforts to influence our way of life. It is up to these same advocates to maximize the emerging potential of what we might term "strategic PR."

The Rise of Strategic Personnel Recovery

The United States needs new strategic emphasis on PR due to the advent of today's overseas contingency operations and continuing emphasis on the need to conduct major combat operations, in addition to the necessity of dissuading America's adversaries while stabilizing war-torn populations. We must reduce the operational and political risks that stem from captivity and hostage situations. The US government now takes a more proactive and unified approach to mitigating these risks to individuals who conduct official business abroad, including all Airmen who serve overseas. The term *isolated personnel* reflects this strategic emphasis, as defined in joint doctrine: "Those US military, DOD civilians, and DOD contractor personnel (and others designated by the President or Secretary of Defense . . .) who are separated (as an individual or group) from their unit while participating in a US-sponsored military activity or mission and who are, or may be, in a situation where they must survive, evade, resist, or escape."[4]

Consequently, the Air Force's rescue force has evolved beyond the traditional images of recovering downed aircrews or rescuing special operations forces from behind enemy lines. A force capable of combat search and rescue, the highly complex operational capability employed to recover these personnel, facilitates the execution aspect of a broader PR function that also includes preparation, response, and adaptation. The Air Force has effectively developed the rescue force into the service's PR experts. Rescue is now a highly adaptable resource that can mitigate the operational and political costs created when an adversary exploits isolated personnel to generate propaganda, gain intelligence, or restrict their physical freedom of action or maneuver. This makes Air Force rescue forces a key component of the US government's "whole-of-government" approach to recovering isolated personnel across the range of military operations, including the concept of building partnership capacity. Despite rescue forces' high operations tempo and the DOD's impending budget cuts, the Air Force must continue to lead PR efforts by addressing a pressing need for rescue preparation, response, and adaptation before, during, and after a crisis, respectively.

On 1 February 2011, headlines in newspapers worldwide proclaimed "Dept of State Issues Worldwide Caution for U.S. Citizens Anywhere."[5] Americans have always been at risk in war zones and lawless lands, from Iraq and Afghanistan to Somalia. Has our world become a place where Americans are really threatened "anywhere," from Olympics sites to sandy beaches? The international security environment continues to change unpredictably, increasing Americans' chances of encountering terrorist action and violence throughout the world. Adversaries target venues, both official and private, ranging from embassies and sporting events to business offices and places of worship. Public transportation has a high potential for attack—buses, subways, trains, aircraft, and cruise ships have all come under terrorist scrutiny. Confronted by these shadowy dangers, Americans can either hide within the United States or refuse to give in to these threats. Those who choose the latter course may do so with greater confidence, interacting with the world as beacons of freedom, if they know that their country will support them. This is just one reason that we conduct PR. To an even greater degree than most military missions, PR arises from a complex mix of motivations ranging from realistic statecraft to moral obligation. In making a case for adopting a broader view of PR, this article illuminates some of these motivations.

Historical Reinforcement

A selective look at the long history of the United States' PR operations is revealing. Search and rescue operations during the Vietnam War were a phenomenon peculiar to American involvement: "Few other nations, faced with similar conditions of warfare, would have developed such an extensive rescue capability. Even fewer nations could have afforded it."[6] The value that the American military places on human life, even at the expense of losing rescue forces, originates in Western philosophies that stress the cohesive nature of society as reflected in American religious and social background.[7] Indeed, al-Qaeda in North Africa offers enormous sums of money to any terrorist group that turns over Westerners—as long as they are not Americans. Al-Qaeda understands America's clear commitment to recovering its people, by forcible means if necessary.[8] Furthermore, a pervasive and often stated aspect of the American warrior ethos asserts that we will never leave a comrade behind, dramatically illustrated in Col Hal Moore's book *We Were Soldiers Once . . . and Young*:

> We had been taught never to leave any wounded or dead on the battlefield. . . . We located Taft, dead. While bringing him back we saw another soldier who had been left behind. . . . Gell and I went back again and we picked up the other man. . . .
>
> . . . The more I sat there the more I realized that I couldn't in good faith get on a chopper and fly out of there and leave those guys behind. So I took the sling off my arm and went on back out. . . .
>
> . . . I was determined to keep my promise that this battalion would never leave any man behind on the field of battle, that everyone would come home.[9]

Both the Soldier's Creed and Airman's Creed reinforce this ethos, declaring that a Soldier will never leave a fallen comrade and that an Airman will never leave another Airman behind.

Dr. Earl Tilford, a noted historian of search and rescue in Vietnam, asks in the wake of the famous yet costly rescue of Bat 21, "Was one man's life worth more than the lives of two OV-10 crewmembers, five crewmen in the HH-53, and the crew of the Army Huey chopper that were lost during the rescue operation?"[10] Specifically, on 2 April 1972, the navigator of an unarmed EB-66 electronic jamming aircraft found himself on the ground in the midst of an invading North Vietnamese force of over 30,000. The other five crew members perished in the shoot-down. The survivor evaded capture for 12 days while hundreds of personnel from all services, including the Coast Guard, searched for him in what *Stars and Stripes* called the "biggest U.S. air rescue effort of the war."[11] The object of that rescue effort, Lt Col Iceal Hambleton, often asked himself if his life was worth the effort. However, given the chance to rescue one of our own, few of our personnel would not risk their lives to save a comrade's.

Both the Soldier's Creed and Airman's Creed reinforce this ethos, declaring that a Soldier will never leave a fallen comrade and that an Airman will never leave another Airman behind.

Team members feel a responsibility to the team rather than to the individual. Cit-

ing Gen S. L. A. Marshall's book *Men against Fire*, Victor Davis Hanson points out that "Americans fought simply to survive at the unit level, at most to protect and save their friends on the left and right, not for higher notions of good versus evil."[12] Veterans of the war in Southeast Asia noted that their South Vietnamese allies, on the other hand, "had to depend on their own ingenuity at evasion to get them safely back to friendly territory."[13] The South Vietnamese had neither the same philosophy about rescue nor the extensive resources available for a dedicated rescue complex.

The value placed on a single American life did not change over the two decades since Vietnam. Service members in that conflict and others speak movingly about the American attitude towards rescue. For example, CWO Michael Durant, held captive in Mogadishu, Somalia, in 1993, has the following to say about his nation's culture: "The acts described in these pages appear unique in many ways, but they have been repeated throughout our proud history in the countless displays of courage and sacrifice that are the hallmarks of the American patriot."[14] Eighteen Americans died on a fateful day in October during the "Battle for Mogadishu," during which Durant was captured. The Somalis shot down two Blackhawk helicopters attempting to rescue Americans. Two Air Force pararescuemen, Scott Fales and Tim Wilkinson, received the Air Force Cross for fast-roping to one crash site under intense fire to save the wounded; moreover, two Delta snipers, Randy Shughart and Gary Gordon, volunteered to attempt a rescue of the other downed aircrews against overwhelming odds, making the ultimate sacrifice. Recognizing that they could manipulate American values for their own ends, the Somalis did not kill Durant; they understood the strategic benefits of negotiating for his life rather than taking it.

Functional Complexity

The value placed upon human life makes PR a highly complex operation focused on a time-sensitive target that airpower must recover rather than destroy. The perceived costs of failure are high. Success and speed go hand in hand, but the complexity of the PR cycle makes it difficult for a joint force commander to reduce rescue response time across an area of operations. Not only must the recovery force be organized, trained, and equipped to respond but also the command and control element must have established an efficient PR architecture that facilitates time-critical response, thereby complementing the capability of isolated personnel to assist in their own recovery. Preparation of commanders and staffs, rescue forces, and isolated personnel then joins with extensive planning, execution of the rescue mission, and adaptation of lessons learned in order to further affect mission success. After the rescue of Bat 21, Brig Gen R. G. Cross Jr., deputy director of air operations at Military Assistance Command–Vietnam commented, "As airmen or soldiers or sailors we should expect that there are times when as one person, we must be sacrificed for the overall."[15] We turn to national policy to determine when this sacrifice is appropriate or, better yet, when it is not appropriate for national security.

National Policy

"The United States Government remains committed to the safe and rapid recovery of private Americans and United States Government personnel taken hostage or isolated overseas."[16] America has emphasized PR by developing an annex to National Security Policy Directive (NSPD) 12, which includes prevention of, preparation for, and response to isolating events. It recognizes an adversary's desire to weaken our national will and threaten international security with events that fund insurgencies, criminal groups, and terrorist organizations. The increased presence of Americans

abroad and the dynamics of irregular warfare require the United States to develop an effective PR infrastructure and a coordinated response to isolating events, thus driving national policy's above-mentioned strategic objectives for PR: prevention, preparation, and response.[17] Prevention decreases the vulnerability of US personnel abroad by leveraging education and training resources. Preparation concentrates on at-risk individuals who need an understanding of PR processes; the development of plans and procedures, including knowledge of the risk environment; education and training in surviving captivity, minimizing exploitation, and enabling recovery; and either building or leveraging the infrastructure necessary to mount an effective response. Response, which simply entails execution of the preparation for an isolating event, requires the strengthening and further integration of existing PR mechanisms, including the reintegration process that follows the incident.[18]

Most importantly, NSPD 12 offers implementation guidance that vectors the whole-of-government approach to PR. According to Amb. Charles Ray, deputy assistant secretary of defense for POW/missing personnel affairs, "The difficulties our government encounters in interagency cooperation usually stem from divergent departmental policies and different institutional cultures. . . . How can we really expect cohesion under those circumstances?"[19] The annex to NSPD 12 gives the entire US government a common policy and language, guiding every department towards three strategic PR objectives: prevention of, preparation for, and response to isolating events. It contains 68 implementation tasks, of which 29 directly involve the DOD. The annex begins with a simple renaming of the Hostage Working Group to the Hostage and Personnel Recovery Working Group, a change that ensures a broadened perspective on hostage taking with the goal of institutionalizing PR. Implementing prevention in accordance with guidance from the NSPD 12 annex includes an evaluation of current personal security, force protection, and PR education and training. Directions for implementing preparation identify the need to establish a baseline for all departments and agencies, including the prioritizing of at-risk locations for PR education/training, defining the need for this education/training, and assessing the interoperability of education/training already available within the US government. National policy expects improvements to leverage existing education/training programs.[20] This expectation ties directly to response, the third objective, insofar as policy requires the strengthening and further integration of existing PR response mechanisms with the goal of integrating capabilities into a unified national PR system. For postincident response, the DOD must assist other departments and agencies, as well as partner nations as appropriate, in developing reintegration policies and programs.[21]

Evidence of the national PR policy is apparent throughout Pres. Barack Obama's national security strategy, which addresses America's enduring interests such as the value of life; the security of US citizens, allies, and partners; respect for universal values at home and around the world; and an international order that promotes peace, security, and opportunity through cooperation to meet global challenges.[22] The universal value of saving lives lies at the heart of these interests, and employment of the military component of PR supports the effective use and integration of American power, which occurs during prevention of, preparation for, and response to isolating events as specified in defense PR policy.

Defense Policy

Former secretary of defense Robert Gates focused his national defense strategy on a unified approach to planning and implementing policy extrapolated from the broader national policy. He recognized that military success alone is not sufficient for achieving national objectives, stating that he did not

want the DOD to allow important "soft power" capabilities, often viewed as preparation for and response to isolating events, to atrophy or disappear.[23] Adm Michael Mullen's national military strategy further articulates this position, recognizing the necessity of applying military power in concert with other instruments of statecraft: "In this multi-nodal world, the military's contribution to American leadership must be about more than power—it must be about our approach to exercising power."[24] Admiral Mullen envisions a military capable of exercising power gradationally, breaking things and taking lives only when necessary. History has proven the DOD incapable of consistently meeting this intent with respect to rescue capabilities despite the thousands of lives saved by American rescue forces through the end of the Vietnam War. Indeed, the Navy disestablished its HC-7 unit in 1975 as the service's only active duty rescue organization, while the Air Force's Air Rescue and Recovery Service reached noncapable status in 1986. Operation Desert Storm then caught the US military without an effective conventional rescue capability in 1990, a situation further complicated by the lack of an overarching theater rescue command and control structure.[25] A defense policy highlighting the need for PR capabilities prevents the United States from again learning this lesson the hard way.

The DOD emphasized its PR policies in 2009 by publishing DOD Directive 3002.01E, *Personnel Recovery within the Department of Defense*, which outlines overarching guidance for the department in building PR capacity and developing capabilities to ensure that the DOD can provide the military-response component of PR identified in national policy:

> Preserving the lives and well-being of U.S. military, DoD civilians, and DoD contractor personnel authorized to accompany the U.S. Armed Forces who are in danger of becoming, or already are, beleaguered, besieged, captured, detained, interned, or otherwise missing or evading capture . . . while participating in U.S.-sponsored activities or missions, is one of the highest priorities of the Department of Defense.[26]

The DOD also acknowledges that it has an obligation to train, equip, and protect its personnel, prevent their capture and exploitation by adversaries, and reduce the potential for leveraging isolated personnel against US interests. The department expects commanders to maintain situational awareness of all personnel during military operations, linking force protection programs and PR as a means of preserving the force.[27] In line with national policy, the DOD will not support payment of ransom or grant concessions for the return of any of its personnel, with the exception of honoring compensation obligations from the use of a blood chit.[28]

A Whole-of-Government Approach

Developing PR capabilities inside the DOD is part of the US equation to account for the strategic value of PR, but we need something more—specifically, an interagency whole-of-government approach. The national security strategy highlights the fact that fostering coordination across the departments and agencies demands more effective alignment of resources and improvements in education and training.[29] Beyond this requirement, President Obama calls for the military to continue strengthening its capacity to partner with foreign states, train and assist security forces, and pursue military-to-military ties.[30] At the same time, the United States will nurture economic and financial transactions for mutual economic benefit while intelligence and law enforcement agencies cooperate with other governments to anticipate events, respond to crises, and provide safety and security.[31] PR plays a major role by linking the military and other US agencies in addressing these last few issues, ranging from defense support to civil authorities within the homeland to humanitarian assistance and disaster

relief operations abroad. The US military's PR capacity is part of the soft power that strengthens the whole-of-government approach to future conflict and crises by enabling the United States to gain what it wants through cooperation and attraction as opposed to hard power's use of coercion and payment.

PR also supports a whole-of-government approach to deterrence. A robust deterrence policy blends economic, diplomatic, and military tools to influence the behavior of potential adversaries.[32] Traditional perspectives recognize that threatening the use of force can prove just as effective as applying force in order to prevent an adversary from attaining an objective contrary to American desires.[33] We can deter an adversary by developing a closer relationship with him and thus avoid conflict. Furthermore, combining PR capability with economic and diplomatic tools in a nonthreatening manner offers another state the lifesaving opportunities it may have never considered. In this scenario, another state relies on the United States' military power for PR at the onset of preparation for disaster relief. In the event of an actual crisis, the state requests US assistance. The Japanese disaster of March 2011 illustrates the use of PR to shore up international relations. Since Japan and the United States are democracies and allies, the possibility of their going to war with each other remains low. However, friendly states still occasionally pursue conflicting objectives that cause tension which, if not defused through existing linkages, might escalate into counterproductive courses of action. When the earthquake and subsequent tsunami struck northern Japan, the United States responded with all available rescue forces at the same time the Japanese openly asked for American help. Neither of these actions would have occurred without prior effort to integrate both states' lifesaving capabilities and avoid force posturing. Once the populace recognizes that this capability exists, it will expect the same level of coverage from its own government in the future.

Humanitarian assistance has another key benefit: saving a life can make friends for life. Saving one life affects that person's family, friends, acquaintances, and even the local government, thus having an inordinately advantageous effect on the "hearts and minds" of the populace. This can happen even in unlikely places, as was the case in Iran following the devastating earthquake there in December 2003.[34] Regarding US assistance to Pakistan after the earthquake that hit Kashmir in 2005, Admiral Mullen remarked, " 'We started showing them a side of American power that wasn't perceived as frightening, monolithic, or arrogant.' That is what rescue can bring to the table on behalf of the Air Force."[35] Further, the increased confidence in and dependence on the government to protect and save lives instill mutual respect and reduce the breeding grounds for insurgency and terrorism.[36]

The DOD is a key actor in implementing the president's guidance. Secretary Gates wanted to develop and refine the department's PR capabilities with innovative means, concepts, and organizations, seeking flexibility and speed via the use of all government assets in response to isolating events. We will tailor our capabilities, concepts, and organizations to the demands of our complex international environment, which often features asymmetric challenges. The former secretary of defense therefore required an expanding understanding of jointness that seamlessly combines our agencies' civil and military capabilities. Specifically, Secretary Gates wanted to consider realigning DOD structures, as well as interagency planning and response efforts, to better address risks and meet needs.[37] As addressed in the national PR policy, we must rescue and return isolated Americans, regardless of whether we do so by means of the diplomatic, military, or civil component of PR.

Building Partnership Capacity

President Obama identifies "combating violent extremism; stopping the spread of nuclear weapons . . .; and forging cooperative solutions to the threat of climate change, armed conflict, and pandemic disease" as major national interests that cross borders.[38] A goodwill gesture such as saving lives by finding cooperative solutions with partner nations can promote lasting partnerships or future alliances: "Each life saved communicates our values instead of the enemy's values, and strengthens faith in our nation and in those states who partner with us."[39] These states will become our closest allies—countries that the United States will depend upon in addressing global and regional security crises which affect other common interests. As the national security strategy notes, "Where governments are incapable of meeting their citizens' basic needs and fulfilling their responsibilities to provide security within their borders, the consequences are often global and may directly threaten the American people."[40] Humanitarian crises offer a perfect example of events that, left unaddressed, will overwhelm a government and influence the international community. The strategy specifies the need to foster long-term recovery from these events. Leaving American agencies deployed in support of a humanitarian crisis without a reasonable expectation of their relief by the state receiving the support does not fulfill this objective. We can use PR as a theater security engagement tool to assist in this process.[41]

The national military strategy of 2011 describes a multinodal world characterized more by interest-driven coalitions based on diplomatic, military, and economic power as opposed to security competition between opposing forces. Much of this transition stems from a growing global population and the demand it places on Earth's resources: "The uncertain impact of global climate change combined with increased population centers in or near coastal environments may challenge the ability of weak or developing states to respond to natural disasters."[42] The national military strategy dedicates an entire section to strengthening international and regional security through theater security cooperation and humanitarian assistance for the purpose of developing international interoperability before crises occur, thereby maximizing collaboration before lives hang in the balance. The need to save people's lives, regardless of their nationality, can drive erstwhile adversaries to build trust and confidence during humanitarian assistance and disaster-relief activities. These efforts will gain and maintain access to an otherwise closed nation, developing a relationship to support broader national interests.[43]

The increased probability of Americans becoming isolated around the globe and the worldwide impact of natural and/or manmade disasters motivated Secretary Gates's desire to have the DOD work with allies to improve military capabilities, with emphasis on training, education, and the building of partner capacity when appropriate.[44] In the national military strategy, Admiral Mullen adds the expectation that partnerships can withstand political upheavals or even disruption.[45] The military component of PR allows us to meet these expectations. PR offers a perfect example of the US armed forces developing foreign capabilities as a critical component of global engagements with collective security benefits. A global response to saving lives requires investment in regional capabilities: "Regional organizations can be particularly effective at mobilizing and legitimating cooperation among countries closest to the problem."[46] The military component of PR can partially realize President Obama's expectation that the United States enhance regional capabilities by developing a division of labor among local, national, and global institutions. PR does not exist as a completely military function, but the military does provide a level of expertise that the nation can continue calling upon in pursuit of America's interests.

What Does Personnel Recovery Achieve?

National and defense policies do not stipulate the point at which saving a human life is not worth the cost in resources expended. However, these policies do provide for a whole-of-government and partner-nation organized approach to prevent or hinder adversaries from realizing four key objectives:

1. Gaining strategic advantage from a tactical event in order to weaken national will and increase risks to a free/open society.
2. Influencing international partners to withdraw from US-led coalitions and withhold support of US policy.
3. Degrading America's international image by increasing an adversary's strength and operational capability.
4. Affecting the availability of operational manpower due to loss of life, combat ineffectiveness from injury, removal of the will to fight, or refusal to accept tactical risk.[47]

PR can prevent our adversaries from having a significant effect on national security. The national defense strategy says that the military will work with other US departments and agencies, state and local governments, partners and allies, and international and multilateral organizations in pursuit of national objectives: "A whole-of-government approach is only possible when every government department and agency understands the core competencies, roles, missions, and capabilities of its partners and works together to achieve common goals."[48] PR serves as a common goal for the United States and its allies. For that reason, the DOD has recently paid more attention to PR by designating a lead agent.

Conclusion

PR is a DOD function primarily because America values human life and because loyalty to comrades is the bedrock of military culture. These facts will never change, nor should they. We can more easily understand the emphasis that military members place on life through the countless examples of heroism immortalized in Medal of Honor citations and military lore. Our heroes, both living and deceased, are among a large group of warriors who would have given their lives for another team member had they found themselves in the same situation. People not involved with such missions, however, have questions about a policy that may cost rescuers their lives. Beyond these noble motivations, the United States conducts PR because it has strategic value beyond the tactical level. The United States faces a threat from adversaries who weaken national will and jeopardize international security by exploiting captured Americans and allied personnel. These adversaries run the gamut from insurgents to criminal groups to terrorists. The threat has become such a security concern that the United States has established policy for the prevention of, preparation for, and response to isolating events. DOD policy recognizes PR as one of the department's highest priorities because "any one prisoner, military or civilian, can be that dreaded publicity nightmare, beheaded by hooded fanatics bereft of humanity."[49] Through whole-of-government and building-partnership-capacity approaches, the United States conducts PR to stop or mitigate an adversary's attempts to gain strategic advantage, influence international partners, degrade America's international image, and affect operational resources. Clearly, airpower advocates should embrace their strategic rescue force and the value that PR offers beyond tactical operations. ✪

Notes

1. National Security Policy Directive (NSPD) 12, 2008; and Department of Defense Directive (DODD) 3002.01E, *Personnel Recovery within the Department of Defense*, 16 April 2009.

2. DODD 2310.2, *Personnel Recovery*, 22 December 2000.

3. Air Force Doctrine Document 3-50, *Personnel Recovery Operations*, 1 June 2005.

4. Joint Publication 3-50, *Personnel Recovery*, 5 January 2007, I-1.

5. See the Emergency Email and Wireless Network, http://www.emergencyemail.org/newsemergency/anmviewer.asp?a=878.

6. Earl H. Tilford Jr., *Search and Rescue in Southeast Asia* (Washington, DC: Office of Air Force History, United States Air Force, 1980), 116.

7. George Galdorisi and Tom Phillips, *Leave No Man Behind: The Saga of Combat Search and Rescue* (Minneapolis: MBI Publishing, 2008), 431.

8. Tiemoko Diallo, "Al Qaeda Holding Europeans Taken in Mali—Military," Reuters, 29 January 2009, http://www.reuters.com/article/latestCrisis/idUSLT774538.

9. Lt Gen Harold G. Moore and Joseph L. Galloway, *We Were Soldiers Once . . . and Young* (New York: Random House, 1992), 88, 207, 213.

10. Tilford, *Search and Rescue*, 118.

11. Darrel D. Whitcomb, *The Rescue of Bat 21* (Annapolis, MD: Naval Institute Press, 1998), 2.

12. Victor Davis Hanson, *The Soul of Battle: From Ancient Times to the Present Day; How Three Great Liberators Vanquished Tyranny* (New York: Free Press, 1999), 456n87.

13. Tilford, *Search and Rescue*, 117.

14. Michael J. Durant, *In the Company of Heroes* (New York: Penguin Group, 2003), vi.

15. Tilford, *Search and Rescue*, 119.

16. NSPD 12.

17. Ibid.

18. Ibid.

19. Charles A. Ray (remarks to the 2009 SERE [survival, evasion, resistance, and escape] Specialist Graduation Ceremony, Spokane, WA, 12 June 2009).

20. NSPD 12.

21. Ibid.

22. White House, *National Security Strategy* (Washington, DC: Office of the President of the United States, May 2010), 7.

23. US Department of Defense, *National Defense Strategy* (Washington, DC: Department of Defense, June 2008), 17. The term *soft power* was coined by Joseph S. Nye Jr. of Harvard University in his book *Bound to Lead: The Changing Nature of American Power* (New York: Basic Books, 1990). He further developed the concept in *Soft Power: The Means to Success in World Politics* (New York: Public Affairs, 2004).

24. US Joint Chiefs of Staff, *The National Military Strategy of the United States of America* (Washington, DC: Joint Chiefs of Staff, 2011), 5.

25. Galdorisi and Phillips, *Leave No Man Behind*, 465–86.

26. DODD 3002.01E, *Personnel Recovery*, 2.

27. Ibid.

28. Ibid. A blood chit, a sheet of material depicting an American flag, includes statements in several languages explaining that anyone assisting the bearer of the chit will be compensated upon the return of the individual and presentation of the claim to an agent of the US government.

29. White House, *National Security Strategy*, 14.

30. Ibid., 11.

31. Ibid.

32. US Joint Chiefs of Staff, *National Military Strategy*, 8.

33. Many theorists approach deterrence with a perspective on nuclear weapons and the use of lethal force. Bernard Brodie observes that maximum deterrence is created by the ability to target enemy societies/cities while protecting our own, as supported by a decision maker's credibility (*Strategy in the Missile Age* [Princeton, NJ: Princeton University Press, 1959]). Lawrence Freedman sees deterrence as convincing an adversary not to take specific actions, based on a legitimate threat of reprisal if he does (*The Evolution of Nuclear Strategy* [London: Macmillan Press, 1981]). Thomas Schelling sees deterrence as a bargaining strategy that doesn't involve expending power because of the threat of harm (*The Strategy of Conflict* [Cambridge, MA: Harvard University Press, 1960]).

34. The 81-member United States Agency for International Development (USAID) / Disaster Assistance Response Team (DART) arrived in-country via C-17 and C-130 aircraft on 30 December, and all had departed by 14 January 2004. In Bam, the USAID/DART team conducted need and structural assessments while its field hospital treated 727 patients, 30 percent of whom had earthquake-related injuries. "Assistance for Iranian Earthquake Victims," USAID, http://www.usaid.gov/iran/.

35. Lt Col Marc C. DiPaolo et al., "A Rescue Force for the World: Adapting Airpower to the Realities of the Long War," *Air and Space Power Journal* 21, no. 3 (Fall 2007): 84.

36. The author witnessed this effect during a 2006 rotation in Afghanistan. He launched on a rescue mission responding to a call to help a young

Afghan girl injured during an engagement between the coalition and insurgents. Rescue forces evacuated both the critically injured girl and her father to an American hospital and visited them a couple of days later. Their action saved her life, and her father declared, "I love America."

37. US Department of Defense, *National Defense Strategy*, 17–18.

38. White House, *National Security Strategy*, 3.

39. Ray, remarks.

40. White House, *National Security Strategy*, 26.

41. Ibid., 41.

42. US Joint Chiefs of Staff, *National Military Strategy*, 2.

43. Ibid., 15.

44. US Department of Defense, *National Defense Strategy*, 16.

45. US Joint Chiefs of Staff, *National Military Strategy*, 6.

46. White House, *National Security Strategy*, 46.

47. Col Glen H. Hecht, USAF (comments during development of the Air Force PR Operational Concept, Langley AFB, VA, 2009). Colonel Hecht was chief of the Air Combat Command Personnel Recovery Division following assignments to the DOD POW / Missing Personnel Office and Joint Personnel Recovery Agency as well as operational and tactical assignments flying the HH-60.

48. US Department of Defense, *National Defense Strategy*, 17–18.

49. Galdorisi and Phillips, *Leave No Man Behind*, 527.

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Air Force Fixed-Wing Rescue

A Multifaceted Approach for Full-Spectrum Personnel Recovery

Capt Kyle J. Porter, USAF

The US Air Force has a rich heritage of highly effective rescue forces supporting global operations. In the past decade, the political and economic landscapes have changed significantly, requiring a retooling of both equipment and tactics for Air Force rescue. Imagine, for example, that an expeditionary rescue squadron located in the Horn of Africa (HOA) receives word that a remotely piloted aircraft carrying a sensitive payload has gone down in central Ethiopia. The Combined Joint Task Force–Horn of Africa (CJTF-HOA) commander requests recovery of the payload, but he is under political pressure to prevent any show of military presence in the area. These concerns eliminate the possibility of dispatching a Guardian Angel (GA) team via CH-53 helicopters or via HC-130 airdrop to carry out a recovery. Thankfully, the squadron commander has a solution. In 30 minutes, one pilot and two pararescuemen take off in a less-conspicuous light aircraft. Touching down on a dirt road near the incident site, it garners no special attention because the locals have become accustomed to bush pilots delivering hunters, scientists, medicine, and other services to remote areas. In a matter of minutes, the pararescuemen return to the aircraft with the sensitive equipment and depart into the African sky—mission accomplished.

This scenario is notional, but the concept is entirely plausible. Present-day personnel recovery (PR) operations involve a spectrum of use neither envisioned nor em-

braced by the current aircraft and tactical construct in Air Force rescue. To meet present and future operational demands, the service must shift its tactics and equipment to offer more flexible options to commanders during the execution of America's no-fail missions at home and abroad. Changes in the geopolitical climate, global economic state, and civil support policies demand an evolution in equipment and tactics to ensure Air Force rescue's viability in today's and tomorrow's state affairs. The HC-130 "King" has served as the Air Force's pillar fixed-wing rescue asset since its introduction late in the Vietnam War. This aircraft brings a host of advantages to its very familiar operating scenarios but leaves specific capability gaps in three areas: access, visibility, and utility. Bridging these gaps would involve introducing a small fleet of varied, light fixed-wing aircraft into existing deployed and garrison units flying HC-130s. The concept of a blended fixed-wing rescue squadron applies to major combat operations, low-intensity conflicts, influence operations, and support to civil authorities throughout the range of military operations. This article examines fixed-wing rescue from a historical perspective, identifies operational shortfalls, and presents the advantages of varied fixed-wing platforms through case-study analysis and a focus on irregular warfare (IW).

History

Currently, the Air Force inventory includes three major weapons systems (the HC-130, HH-60, and GA) having the sole mission of meeting the PR requirements of US combatant commanders.[1] The fixed-wing workhorse of this elite operational community, the HC-130 King, entered the inventory in 1967 to fill multiple roles in the recovery of downed aircrews.[2] HC-130s performed diverse missions, including recovery of ground personnel using the ingenious Skyhook system, simultaneous refueling of two rescue helicopters in flight with a wing-mounted hose-and-drogue system, airborne mission command of PR operations, delivery of specialized aerial packages, and other roles. These missions, with the exception of Skyhook, remain mostly intact today. From its inception in the late 1960s to the present, the King has provided rescue coverage for the National Aeronautics and Space Administration's manned spaceflight program, ensured the safe ocean passage of innumerable fighter aircraft, and furnished alert coverage for US operations around the globe. Wherever American military personnel go, Air Force rescue and the HC-130 have kept the ultimate promise that they will come home.

During the past decade, the United States has found itself in almost continuous conflict spanning the entire range of military actions from major combat operations to counterinsurgency and ideological warfare. The King has deployed constantly since 1993, supporting such major operations as Northern Watch, Southern Watch, Iraqi Freedom, Enduring Freedom (including engagements in both Afghanistan and the Horn of Africa), and many others. Despite these deployments, the HC-130 has also supported numerous humanitarian and disaster-relief operations, including Hurricanes Katrina, Rita, and Ike. As the Air Force's premier fixed-wing rescue asset, it has fulfilled roles on the front lines and the home front, facilitating the recovery of US and coalition forces and winning the hearts and minds of people around the globe. Present operations find Air Force HC-130s operating regularly on four continents (North America, South America, Africa, and Asia) and occasionally worldwide. In a plethora of missions, the King and its dedicated crews perform civil search and rescue, casualty evacuation, traditional combat search and rescue (CSAR), and building partner capacity (BPC) during the course of conducting military-to-military training and humanitarian assistance in Africa. Fixed-wing rescue trains in a wide variety of skills in order to provide such a sweeping range of capabilities and effects.

Operational Limitations

Despite the force-multiplying capability it supplies to combatant and task force commanders, Air Force fixed-wing rescue is not without limitations. A variant of the Lockheed Martin C-130 (L-100 series) cargo aircraft, the current production model (HC-130J) measures 132 feet wide (wingtip to wingtip), 97 feet long, and 39 feet high (empennage), with a maximum gross takeoff weight of 175,000 pounds.[3] The relatively large size of the C-130 makes it a flexible platform for the range of fixed-wing rescue missions; however, the aircraft does not lend itself well to low-visibility/low-impact operations.

For instance, when a C-130's engines go into reverse during landing, noise increases and the airport building may begin to vibrate, catching the attention of people intrigued by the presence of a large, grey military aircraft. Curious glances follow the C-130 as it taxis to park, eager to see what happens. The implications of this action can become even more complicated when the aircraft operates in countries where a US presence is unpopular or unannounced. Furthermore, HC-130s exact significant operating and support costs. Given the aircraft's complex systems and hardware, during a typical deployment the number of support personnel equals or exceeds that of aircrew members. The expense of flying an HC-130P is staggering—fuel alone can cost $4,800 per hour.[4] Therefore, having an option to tailor aircraft types and deployment footprints to match the operating environment can enhance mission effectiveness, decreasing risk from threats and realizing monetary and logistical savings.

In addition to the prohibitive size of the aircraft and the cost of operating it, the average HC-130 flying in combat is 45 years old, a fact that generates a host of maintenance issues.[5] Present fleet availability and mission capable rates of 54 percent and 68.6 percent fall well below their respective established standards of 67.8 percent and 74 percent.[6] An effort is under way to replace the HC-130P/N "legacy" fleet with new HC-130Js by the mid-2020s. This acquisition represents a significant step in the right direction for Air Force rescue, but, unfortunately, some validated combatant command requirements will remain unfulfilled. A vital link in the rescue triad, the HC-130 enables the successful recovery of personnel and equipment through its support of the GA and HH-60 and its role in autonomous mass-casualty and disaster-response operations that demand large-capacity aircraft with specially trained crews. Additionally, the CSAR method of PR and the CSAR task force (CSARTF) in particular depend upon the strengths of the King to conduct cross-forward-line-of-troops point-recovery operations. The Joint Requirements Oversight Council has validated a requirement of 78 HC-130s, but present budget and acquisition priorities have lowered that number to only 37 aircraft scheduled for procurement.[7] Similarly, rotary-wing rescue has a validated requirement for a fleet of more than 148 helicopters but is authorized an end strength of only 112.[8] Undoubtedly the inability to acquire a full fleet of aircraft will hinder near- and long-term fixed-wing rescue operations, limiting services to the United States and its interests at home and abroad.

Furthermore, it is important to analyze the monetary cost of operations in terms of beneficial effects. According to the *National Military Strategy of the United States of America* (2011), "Defense budget projections indicate that leaders must continue to plan for and make difficult choices between current and future challenges."[9] An HC-130J, which costs $3,585 per hour to operate, can provide a combination of nine hours airborne time (extended by in-flight air-to-air refueling), multipayload airdrop, and limited recovery operations via infiltration/exfiltration.[10] At an estimated unit cost of $70 million (constant fiscal year 2011 dollars), a fleet of HC-130Js can cover approximately three areas of operation for a lifetime commitment of $15.4 billion.[11] Clearly, this pillar of Air Force rescue comes at a premium price. The service should consider other cost-effective solutions to bridge capability gaps and fill the void between the number of required and authorized rescue aircraft.

Small Airplanes, Big Impact

Adm Michael Mullen, chairman of the Joint Chiefs of Staff, notes that "our Joint Force must prepare for an increasingly dynamic and uncertain future in which a full spectrum of military capabilities and attributes will be required to prevent and win our Nation's wars."[12] More than likely, US military forces will operate in areas where their presence is unacceptable to the local population, host government, or both. For this reason, among others, Air Force Special Operations Command recently initiated a plan to include smaller, commercially acquired assets in its fleet of special operations mobility aircraft—a fleet previously monopolized by variants of the C-130.[13] Air Force rescue could benefit greatly from this Non-Standard Aviation (NSAv) program, which contains a mix of varied-capability aircraft in civil livery capable of deploying with a small footprint and operating in an expeditionary, "outside the wire" environment. NSAv low-visibility platforms can conduct a search at more efficient airspeeds, land on non-purpose-built surfaces, and reduce target highlighting. Additionally, the Air Force can leverage these strengths to lower the risk to recovery personnel/materiel, improve aircrew management, ease maintenance requirements, and employ with decreased economic impact.

Rescue for Combined Joint Task Force–Horn of Africa: Highlighting the Value of Light Aircraft

Africa represents perhaps the greatest challenge for PR professionals because of its vast distances, sparse recovery assets (presently only HC-130s, GA, and CH-53s exist on the continent—and not in a centralized location), and large number of sovereign states and autonomous tribal nations. Nevertheless, the African continent and its people are essential to US efforts against nonstate terrorist actors. The *National Military Strategy of the United States of America* emphasizes this point, observing that "the Joint Force will continue to build partner capacity in Africa, focusing on critical states where the threat of terrorism could pose a threat [*sic*] to our homeland and interests."[14] Air Force rescue has executed and supported this mission for years as part of CJTF-HOA.

Having a long-time, constant presence in the CJTF-HOA combined joint operating area, King combat rescue aircrews have a well-developed understanding of the time-and-distance problem that is Africa, and of the limited number of areas that can support an aircraft as large as the HC-130. Typically a C-130 landing zone requires a semi-prepared surface 3,000 feet long by 60 feet wide.[15] CJTF-HOA's combined joint operating area contains 1,186 charted airfields, but only about 80 of them (7 percent) are suitable for the C-130 (table 1).[16] Assuming a rescue coverage area of 11,759,420 square kilometers, each landing zone suitable for the C-130 would need to provide access to about 147,000 square kilometers. The HC-130's speed allows reasonably quick point-to-point coverage in Africa, but the absence of a nearby, usable airfield would limit organic recovery options. Conversely, light fixed-wing aircraft, such as those identified in the extralight and medium categories (see table 2), can operate out of nearly all of Africa's 1,186 charted airfields, bringing the coverage area per airfield down to about 10,000 square kilometers.[17] Well suited to land on roads and other surfaces, some light fixed-wing aircraft do not need a prepared landing zone at all, further reducing this coverage area to a walkable distance.

Unlike the previous example of a C-130 landing at a local civilian airport, NSAv aircraft attract hardly a glance when they fly. Because their visual and audible detection range is much less prominent than that of the much larger King, light fixed-wing aircraft offer a level of security on a distant continent with varying threat levels. An airplane landing on a dirt field might simply signal the arrival of hunters, a geological expedi-

Table 1. Charted airfields in CJTF-HOA's combined joint operating area (area of responsibility / area of interest)

Country[a]	*Total Airfields*	*Runways <3,000 feet*	*C-130 Suitable*[b]	*Territory (sq km)*[c]
Burundi	8	4	1	27,830
Chad	56	11	3	1,284,000
Comoros	4	0	2	2,235
Eritrea	13	2	3	117,600
Ethiopia	61	8	10	1,104,300
Democratic Republic of Congo	198	62	9	2,344,858
Djibouti	13	2	2	23,200
Kenya	191	56	9	580,367
Madagascar	84	21	3	587,041
Mauritius	5	1	1	2,040
Mozambique	106	44	7	799,380
Rwanda	9	4	1	26,338
Seychelles	14	6	1	455
Somalia	59	7	2	637,657
Sudan	140	39	5	2,505,813
Tanzania	124	34	10	947,300
Uganda	46	9	1	241,038
Yemen[d]	55	11	10	527,968
Total	1,186	321	80	11,759,420

Source: Data compiled by the author from Combined Joint Task Force–Horn of Africa, http://www.hoa.africom.mil/; *The World Factbook*, Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/index.html; and "Airfield Suitability and Restrictions Report," Air Mobility Command, https://gdss2.c2.amc.af.mil/.

[a] CJTF-HOA's combined joint operating area is defined as the 18 sovereign states listed in this table.

[b] C-130-suitable runways have a 3,000-foot-long by 60-foot-wide landing surface stressed for twin-tandem landing gear at a maximum gross weight of 175,000 pounds.

[c] Territory includes both land and maritime surface claimed under international law and as published in the *CIA World Factbook*.

[d] Though not on the African continent, Yemen is included in CJTF-HOA's area of interest.

tion, or missionaries in rural Africa.[18] Thus, the chances of adversaries singling out an NSAv rescue vehicle as a target of opportunity diminish rapidly. By the time they discover that they are looking at a US aircraft, their window of opportunity to act has already closed. (One must note that such actions are not an attempt to conduct or suggest clandestine recovery operations. This type of employment merely demonstrates the difference between advertising a presence [show of force] and selective disclosure.)

Structured Response

Fielding a fleet of mixed fixed-wing aircraft would give commanders more options when planning and initiating a rescue. A blended fixed-wing rescue squadron could contain a mix of HC-130-type aircraft to retain the flexibility and strengths of this platform, while introducing smaller single or multiengine commercially available aircraft. These blended squadrons would allow the construction of specialized deployment packages of two to three aircraft types, based on theater requirements. A deployment to Africa might contain one HC-130J, one Twin Otter (DHC-6), and one Quest Kodiak—a mix that would retain a full range of capabilities in a given theater. Aircraft providing rescue coverage could employ together or as separate elements from common or distributed forward operating bases, as necessary. For example, an HC-130 might be most advantageously colocated with rotary-

wing assets that depend upon air refueling and at locations where maritime missions are possible. NSAv aircraft would have more utility in remote areas in which small teams work in isolation, away from large airfields, and in rough terrain. The package works together when a light fixed-wing aircraft responds to an incident and meets an HC-130 at an established airfield to conduct a transload of patients or equipment.[19] Utilizing all available assets, commanders can bridge the time-and-distance gap in remote operating areas. Additionally, these recovery vehicles have the innate capability of blending in with their surroundings and intermixing with other aircraft commonly seen in the African bush, such as the Cessna 206 "Skywagon," Cessna 208 "Caravan," and LET-410 "TurboLet."[20] Much like the aircraft in table 2, these planes are well suited to remote, off-airfield operations and come properly equipped from the factory floor (or they could easily be modified).[21]

The *National Military Strategy of the United States of America* emphasizes that "forces must become more expeditionary in nature and will require a smaller logistical footprint in part by reducing large fuel . . . demands."[22] Many expeditionary locations don't have the fuel supplies, much less the

Table 2. Comparison of HC-130 and light fixed-wing aircraft

Aircraft	*Crew*	*Payload (lb.)*[a]	*En Route Speed (KTAS)*[b]	*Landing Distance (feet)*[c]	*Takeoff Distance (feet)*[d]	*Endurance (hours)*[e]	*Size (feet)*[f]
			Extra Light / Short Takeoff and Landing (STOL)				
A-1C	1	925	126	500x30	200	+6	22x35
MT-7-420	1	960	139	500x30	600	+5	23x33
			Medium / STOL				
C-208	1	3,284	186	1,700x40	2,100	+5	37x52
GA-8	1	1,764	134	1,600x30	1,700	+4	29x40
Quest Kodiak	1	3,535	172	705x30	1,001	+7	45x33
DHC-6	1	3,250	182	1,200x40	1,200	9	52x65
			Heavy / STOL				
HC-130P/N	7	34,000	290	3,000x60	6,000	+9	97x132
HC-130J[g]	5	37,000	310	3,000x60	5,000	+9[h]	97x132

Source: Data compiled by the author from "Husky A-1C," Aviat Aircraft, http://www.aviataircraft.com/hspecs.html; "Performance Specifications," Maule Air, http://www.mauleairinc.com/Literature/performance.pdf; "Cessna Caravan Specifications," Cessna Aircraft Company, http://www.cessna.com/caravan/caravan-675/caravan-675-specifications.html; "GA8 Specifications," GippsAero, http://www.gippsaero.com/ZoneID=153.htm; "Kodiak Specifications," Quest Aircraft Company, http://www.questaircraft.com/kodiak/specs/; "Twin Otter—Series 400," Viking Air, http://www.vikingair.com/content2.aspx?id=276; Technical Order (TO) 1C-130(H)H-1, *Flight Manual USAF Series HC-130P/N Aircraft*, 1 February 2004, 5-26, 5-39; and TO 1C-130(H)J-1, "Draft Flight Manual USAF Series HC-130J Aircraft," 1-1, 1-8.

[a] Payload, also known as useful load, is the weight available for cargo, passengers, and so forth, after accounting for fuel, crew, and required equipment. All numbers estimate typical or capacity fuel loads.

[b] En route speed is the published cruise airspeed (knots true airspeed [KTAS]).

[c] Data is derived from information published by the aircraft manufacturer. When possible, numbers represent landing distance to clear a 50-foot obstacle (short field). Runway width is a number estimated by the author, based on wingspan and experience.

[d] Data is derived information published by the aircraft manufacturer. When possible, numbers represent takeoff distance to clear a 50-foot obstacle (short field).

[e] These figures reflect the manufacturer's published maximum endurance rounded down to the nearest hour or calculated with a 45-minute fuel reserve, when able.

[f] Size (aircraft dimensions) is expressed in length x total wingspan rounded to the nearest foot.

[g] The HC-130J's performance data was not published as of this writing. The author offered an estimate, based on existing C-130J data and the experience of subject-matter experts.

[h] The HC-130J is capable of aerial refueling, which greatly extends endurance; thus, flight time is limited only by the crew duty day.

ramp space, to stage PR effectively from a remote airfield using the current complement of fixed-wing rescue aircraft. NSAv aircraft meet the intent of the national military strategy and the operational demand for PR in austere locations. Furthermore, they are smaller, easier to operate, and simpler to maintain than existing rescue aircraft. These advantages translate to savings because of the need for fewer crews and maintainers, especially when coupled with a reliance on the established support infrastructure for fixed-wing rescue. Use of on-demand maintenance facilities available throughout the world and of contract maintenance personnel in expeditionary environments would easily meet aircraft support requirements.[23] In most cases, such aircraft require only one or two maintenance personnel—a stark contrast to the tens of individuals needed for military aircraft.[24]

The past 50 years of airpower have been dominated by aircraft purpose-built for a small and very narrow set of military applications.[25] These expensive planes typically employ with a large (often excessively so) support network. Arguably their design and procurement have had a detrimental effect on unique missions calling for a small footprint, agility, and, frequently, a high level of operations security. Fielding a small fleet of commercially available aircraft offers the advantages of low cost; minimal time for research, development, testing/evaluation of tactics; and almost no aircraft modification from the factory floor.[26] Along with well-trained crews and proper tactics, the simple addition of an ultrahigh frequency (UHF) radio could make a civil aircraft militarily viable for rescue operations. All of the aircraft in table 2 (except the HC-130) cost less than $1.7 million—most of them are less than $500,000.[27] In line with the 2010 *Quadrennial Defense Review Report*'s recommendations, acquisition could take place in less than one year, with forces fielded and deployed in months.[28] Light aircraft could become part of existing fixed-wing rescue squadrons and share established administrative and support resources.

Infusion of NSAv aircraft into the rescue fleet could improve the overutilized and underresourced status of its helicopter assets. A deficiency of around 40 aircraft will remain after restoration of the HH-60 fleet from combat loss to its authorized number of 112 aircraft.[29] Economical NSAv aircraft can play a significant part in filling the traditional helicopter role as the recovery vehicle in permissive environments and in those allowing a short or unimproved landing. This employment strategy would let combatant commanders mass rotary-wing force on objectives that absolutely require the advantages that helicopters bring to rescue. Cost-effective NSAv aircraft, with their greater speed and endurance, can reduce the overstressing of rotary-wing assets and help make up for this substantial gap between requirements and procurement.

Additionally, a knowledge base concerning light fixed-wing aircraft and operational experience with these planes already exists within the Air Force family. The Civil Air Patrol (CAP) presently operates the GA-8 aircraft as a utility and incident-awareness-and-assessment platform rigged with the Airborne Real-Time Cueing Hyperspectral Enhanced Reconnaissance system, a surveillance technology used to gain vital information about an incident site.[30] Much like the HC-130, the GA-8 employs an operator and console on board the aircraft to control, assess, and relay information. GA-8s and other CAP aircraft have proven themselves cost-effective assets to national defense and homeland security through their use in disaster response and counterdrug operations. Any infusion of NSAv aircraft into Air Force rescue should not overlook the CAP's level of experience. Furthermore, light video surveillance systems have been tested and installed on the Quest Kodiak (see table 2) aircraft for use in monitoring operations involving domestic vehicular traffic.[31] Much of the technology and knowledge necessary to operate NSAv aircraft as rescue and IW enablers already exists in today's Air Force and American industry.

The introduction of light fixed-wing aircraft presents a unique opportunity to capitalize on personnel and talents that already exist in the fixed-wing rescue community. Air Force Special Operations Command's leadership in fielding light aircraft systems demonstrates the proven model—one that the Air Force tends to revisit each time a new asset is introduced. With a new airplane come new units and a (typically) significant increase in personnel. A tactically advantageous and more fiscally responsible approach could mean the addition of rescue NSAv aircraft without the overhead and infrastructure that accompany new squadrons and significant additional support. It may be possible to place these aircraft in existing HC-130 squadrons with minimal increase in aircrew manning. Preferably, current rescue-qualified crew members would be available to fly the NSAv aircraft, thereby retaining knowledge of the mission and operational command and control, capitalizing on and improving interoperability tactics, and developing subject-matter experts in fixed-wing rescue. Light aircraft offer this possibility due to their relatively simple systems and similar operating procedures. In this rare case, introducing an entirely new aircraft into the Air Force inventory would entail minimal investment in capital and personnel.[32]

Roles and Missions

Addressing desired force capabilities, the *National Military Strategy of the United States of America* observes that "our strategy, forged in war, is focused on fielding modular, adaptive, general purpose forces that can be employed in the full range of military operations."[33] A blended squadron of light to midsized rescue aircraft, properly deployed, could have a tremendous impact on a wide range of military operations. Besides the recovery of sensitive equipment already mentioned, the following represent just a few types of tactical operations that could benefit from employing these vehicles:

- overland/water search
- light airdrop/resupply (precision-capable)
- communication relay
- spotting/marking isolated persons
- preparation for authentication/extraction
- low-visibility insertion/extraction
- nontraditional intelligence, surveillance, and reconnaissance
- on-scene commander
- humanitarian relief (first responder)

Many of these roles, presently filled by the HC-130, could be performed by NSAv-type aircraft that blend into indigenous surroundings and that do not highlight activities in nontraditional operating areas.

Furthermore, defense support to civil authority and maritime missions could profit from the introduction of NSAv seaplane-type aircraft. A typical scenario might involve assisting a mariner with an acute medical issue, searching for a distressed vessel, or investigating a suspected aircraft incident at sea. Present equipment limitations dictate that at least one HC-130 and a pair of HH-60 helicopters respond to open-water missions when the Coast Guard requests assistance.[34] Weather and tactics permitting, this costly footprint could be reduced to one seaplane with a GA team on board that would land at the incident site outside the response envelope of Coast Guard assets. Moreover, the Air Force could employ these aircraft in remote areas that presently lack adequate coverage (notably United States Pacific Command) at minimal cost.

Irregular Warfare: The Force of Choice

The United States Government will make a sustained effort to engage civil society and citizens and facilitate increased connections among the American people and peoples around the world—through efforts ranging from public service and educational exchanges,

> *to increased commerce and private sector partnerships. In many instances, these modes of engagement have a powerful and enduring impact beyond our borders, and are a cost-effective way of projecting a positive vision of American leadership. Time and again, we have seen that the best ambassadors for American values and interests are the American people.*
>
> —*National Security Strategy*, May 2010

This statement emphasizes the importance of engagement between Americans and citizens of foreign nations. In the realm of IW, Air Force rescue—particularly fixed-wing rescue—has an important role to play in building partnerships and engagement. The report of the Air Force's Irregular Warfare Tiger Team recommends "expand[ing] and resourc[ing] the USAF Rescue community's mission to include IW and BPC aviation advising."[35] Because rescue forces by nature are nonoffensive weapons systems that react to externally triggered events, when packaged correctly they can open doors to previously denied areas and populations. Even the poorest of countries need rescue services—including those that cannot afford C-130s or an aircraft program dedicated solely to rescue. The *Quadrennial Defense Review Report* identifies the creation of "mechanisms to expedite acquisition and transfer of critical capabilities to partner forces" as a key initiative in BPC.[36] Furthermore, the report states that "we will also enhance our air forces' contributions to security force assistance operations by fielding within our broader inventory aircraft that are well-suited to training and advising partner air forces."[37]

Introduction of NSAv aircraft to the fixed-wing rescue fleet has the potential to create an IW "weapon of choice" for commanders. According to representatives of US Air Forces Africa,

> For likely operations on the African continent, the most appropriate aircraft are rugged, affordable, light- and medium-mobility and rotary-wing aircraft to reach areas where roads and other infrastructure are non-existent. MEDEVAC [medical evacuation] and SAR [search and rescue] are high payoff capabilities in legitimizing the government. To move at will on the continent in support of the engagement strategy, US personnel require MEDEVAC, SAR, and CSAR [combat search and rescue] support.[38]

The ability to provide military-to-military training, humanitarian assistance, and liaison operations while conducting organic rescue alert for US assets is exactly the kind of solution that provides low-to-no-cost effects with tailored visibility and minimal negative influence. We have heard that our partner nations do not want to fly anything that we don't fly ourselves.[39] Giving partners the opportunity to purchase aircraft that cost less than $2 million could boost our economy at home via exports as well as facilitate continued theater security cooperation and BPC activities.[40] When asked about the type of aircraft that would best support IW activities in US Africa Command, US Air Forces Africa personnel responded that "four [Cessna 208] Caravans may be better than one C-27. We should analyze what poor countries really need and what they are able to sustain."[41] Air Force rescue can supply training and support through air-adviser-type roles after the sale of aircraft. Rescue's unique, simplified command and control, as well as its inherent ability to deploy to austere locations with little to no support, make it the right choice for BPC operations and more.

Final Thoughts

The fixed-wing rescue community remains in high demand, presenting many capabilities to combatant commanders despite a capability shortfall. The infusion of fiscally responsible and capability-rich NSAv aircraft to the present fleet could fill shortfalls while creating opportunities for international partnership. Capitalizing on current industry, NSAv aircraft are an expedient and cost-effective means of bringing the fixed-wing rescue fleet to full capacity while giving commanders an effective IW

tool at no additional cost. Creative solutions can fill capability shortfalls in access, visibility, and utility while bringing the rescue inventory up to fully authorized numbers. Since these assets require little research and development, an accelerated acquisition could place them in the hands of commanders with very little delay. By assessing the history of fixed-wing rescue and operational shortfalls, and by analyzing case studies, this article has shown that a blended fixed-wing rescue squadron can provide unique, specialized effects in PR and IW. By offering a multirole solution to both rescue and IW mission sets, NSAv aircraft enable airpower at a responsible cost to taxpayers. Most importantly, a mixed aircraft inventory enhances the responsiveness of rescue forces and increases overall system capability consistent with the goal of Air Force rescue: "that others may live."[42] ✪

Notes

1. Air Force Doctrine Document (AFDD) 3-50, *Personnel Recovery Operations*, 1 June 2005, 13.

2. "HC-130P/N King" fact sheet, US Air Force, 8 January 2010, http://www.af.mil/information/factsheets/factsheet.asp?id=106.

3. "Products," Lockheed Martin, 2011, http://www.lockheedmartin.com/products/; and "C-130 Hercules" fact sheet, US Air Force, 22 October 2009, http://www.af.mil/information/factsheets/factsheet.asp?id=92.

4. Figure calculated by the author based on a fuel-burn rate of 6,000 pounds per hour and the price of Jet A fuel at Tucson International Airport on 19 April 2011 at $5.49 per gallon.

5. "HC-130P/N King" fact sheet.

6. Mr. Kenneth R. Mortensen (Headquarters Air Combat Command Requirements) to the author, e-mail, 24 June 2011; and Air Combat Command AA/MC Standards. Availability rate (AA) is a fleet measurement—the percentage of aircraft that are unit-possessed and mission capable (on the ramp and capable of flying). Mission capable rate (MC) is the number of aircraft assigned that are ready to fly (percentage of the available fleet). Definitions and research provided by Mr. Mortensen, HQ ACC/A8RT (A4YR).

7. Gen T. Michael Moseley, "Capability Development Document for HC/MC-130 Recapitalization Capability" (Washington, DC: Headquarters US Air Force, 20 November 2007), iii.

8. "Capability Development Document for Combat Search and Rescue Replacement Vehicle (CSAR-X)/Personnel Recovery Vehicle (PRV)" (Washington, DC: Headquarters US Air Force, 16 June 2005), ii.

9. Joint Chiefs of Staff, *The National Military Strategy of the United States of America* (Washington, DC: Joint Chiefs of Staff, 2011), 2, http://www.jcs.mil//content/files/2011-02/020811084800_2011_NMS_-_08_FEB_2011.pdf.

10. Mr. David C. Vanik (Headquarters Air Combat Command Requirements), to the author, e-mail, 29 June 2011. The cost per flying hour is in fiscal year 2011 constant dollars.

11. Ibid.; and Lt Col Brian Pitcher (Headquarters Air Combat Command Requirements), to the author, e-mail, 28 March 2011.

12. Joint Chiefs of Staff, *National Military Strategy*, cover letter.

13. US Special Operations Command, *Fiscal Year (FY) 2009 Budget Estimates* (MacDill AFB, FL: US Special Operations Command, February 2008), 45.

14. Joint Chiefs of Staff, *National Military Strategy*, 12.

15. Air Force Instruction 13-217, *Drop Zone and Landing Zone Operations*, 10 May 2007, 42.

16. "CJTF-HOA Factsheet," CJTF-HOA Public Affairs Office, http://www.hoa.africom.mil/About CJTF-HOA.asp. The number 80 is an estimate based on compatible airfield length and width and data found in the Air Mobility Command airfield suitability restrictions report (see also note 14).

17. Coverage area per airfield calculated based on data presented in table 1, compiled and averaged to determine an estimated amount of land area serviced by each accessible airfield.

18. CC Milne Pocock, *Bush and Mountain Flying* (South Africa: 2009), 21; and "MAF Profile," Mission Aviation Fellowship South Africa, http://www.mafsa.co.za/content/profile-maf-south-africa.php.

19. Joint Publication 3-50, *Personnel Recovery*, 5 January 2007, VI-20.

20. "Fly with MAF," Mission Aviation Fellowship South Africa, http://www.mafsa.co.za/content/fly-with-maf-south-africa.php; and Pocock, *Bush and Mountain Flying*, 26, 44.

21. Pocock, *Bush and Mountain Flying*, 24–29, 36–38.

22. Joint Chiefs of Staff, *National Military Strategy*, 18.

23. "Authorized Service Facilities," Cessna Aircraft Company, http://www.cessna.com/customer-service/aircraft-service/service-facilities.html; and

"Global Tactical Aircraft Support Solutions," DynCorp International, http://www.dyn-intl.com/tactical-aviation.aspx.

24. In accordance with Title 14, Aeronautics and Space, Code of Federal Register, pt. 43, sec. 3, "The holder of a mechanic certificate may perform maintenance, preventative maintenance, and alterations." Additionally if that mechanic is appropriately trained for the type of aircraft, it is reasonable to believe that a maintenance crew of two personnel could provide maintenance support for one or several small aircraft. This assumes fully trained and licensed airframe and power-plant mechanics with at least one having an appropriate inspection authorization.

25. Lt Col George H. Hock Jr., "Closing the Irregular Warfare Air Capability Gap," *Air and Space Power Journal* 24, no. 4 (Winter 2010): 57–68.

26. In this example, aircraft could flow to operational units either from the factory without modification or with very light modification (possibly the installation of a UHF radio, satellite communications capability, or a video downlink, as described). The cost would be low, relative to the acquisition and sustainment of a major aircraft program such as the HC-130J or F-22A (hundreds of thousands of dollars compared to billions of dollars). Analysis by the author.

27. Unit cost of light aircraft compiled from multiple sources. See notes 15 and 16 as well as the sources in table 1.

28. Department of Defense, *Quadrennial Defense Review Report* (Washington, DC: Department of Defense, February 2010), 80, http://www.defense.gov/qdr/images/QDR_as_of_12Feb10_1000.pdf.

29. "Capability Development Document for Combat Search and Rescue Replacement Vehicle," ii; and Col Jason Hanover (commander, 563rd Rescue Group), to the author, e-mail, 2 May 2011.

30. Lt Col Brian Ready (wing vice-commander, CAP Arizona), to the author, e-mail, 2 March 2011; and "Fact Sheet: Civil Air Patrol ARCHER System Technical Specifications," Civil Air Patrol National Headquarters, Operations Support Division, August 2005, http://atg.cap.gov/downloads/FINAL%20VERSION%20ARCHER%20Technical%20Fact%20Sheet.pdf.

31. Dave Hirschman, "Quest Kodiak: A Higher Calling," *AOPA* [Aircraft Owners and Pilots Association] *Pilot Magazine* 54, no. 3 (March 2011): 52, http://www.aopa.org/members/files/pilot/2011/march/feature_higher_calling.html.

32. Minimal investment when compared to major aircraft acquisition programs such as the F-22A. Analysis conducted by the author.

33. Joint Chiefs of Staff, *National Military Strategy*, 18.

34. Col Jason Hanover (commander, 563rd Rescue Group), to the author, e-mail, 25 April 2011.

35. Department of the Air Force, *US Air Force Irregular Warfare Tiger Team Observations and Recommendations* (Washington, DC: Department of the Air Force, 2009), iii.

36. Department of Defense, *Quadrennial Defense Review Report*, viii.

37. Ibid., x.

38. Department of the Air Force, *Tiger Team Observations and Recommendations*, 67.

39. Ibid., 61.

40. Aircraft listed in table 2 are all US manufactured except the GA-8 (Gippsland Aviation of Australia) and the DHC-6 (Viking Air of Canada).

41. Department of the Air Force, *Tiger Team Observations and Recommendations*, 67.

42. Present adaptation of Brig Gen Richard Kight's "Code of an Air Rescue Man."

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How to Say "National Security" in 1,001 Languages

Lt Col D. J. Western, USAF

E pluribus unum, semper fidelis. . . . Whether it's words on our currency or a motto for an entire branch of our military, Americans love dabbling with foreign expressions. In today's threat environment, however, such a superficial approach leaves the American military and, ultimately, the American people vulnerable in a hostile global neighborhood where others frequently understand more than we do.[1] It's time for our military to comprehend fully that maintaining world leadership and security requires a broader understanding of other cultures, thought processes, and, of course, languages.

At any age, the human mind has the capacity to become multilingual. If the Department of Defense (DOD) wanted to improve its language capabilities from within, it could. This article demonstrates how, with proper motivation, the department can do so. It explains the importance of why we must begin this process now, how anyone can learn a second language, why attempts of the past have failed, and what steps we must take to improve our national security through increasing the DOD's language capability.

The Need

In 2006 the Iraq Study Group clearly indicated that our military still experiences a severe shortage of qualified Arabic linguists:

> All of our efforts in Iraq, military and civilian, are handicapped by Americans' lack of language and cultural understanding. Our embassy of 1,000 has 33 Arabic speakers, just six of whom are at the level of fluency. In a conflict that demands effective and efficient communication with Iraqis, we are often at a disadvantage. There are still far too few Arab language–proficient military and civilian officers in Iraq, to the detriment of the U.S. mission.[2]

Gen David Petraeus concurs, emphasizing how even basic "survival Arabic" is a significant force multiplier for troops in the field.[3] Soldiers have to be careful because small misinterpretations can create large controversies. In one instance, as the Army attempted to coordinate an insertion of US troops into a local Iraqi tribe's area, tribal leaders strongly objected to the US presence. The Army resolved the impasse only when an interpreter discovered that the leaders' real concern was the presence of military working dogs, which Muslims consider unclean. After the Soldiers removed the dogs, the tribal leaders allowed the troops to enter the village. Thus, a perceptive interpreter proved key to mission success. Situations like these occur repeatedly on the battlefield.[4]

The effort in Afghanistan needs linguists as well: "The recurring theme [there] is, demand [for linguists] is great, competition is keen, supply is limited."[5] Gen Stanley McChrystal once noted that "[in Afghanistan] the people are the prize."[6] He knew that reaching the people demanded properly communicating with them. Along those lines, to win the Afghanis' hearts and minds, General McChrystal developed a unique approach that required at least one person from every platoon, in addition to any interpreters or linguists already working with the unit, to maintain at least a basic level of proficiency in the local language.[7] The general understood that improving relations with any group of people necessitates face-to-face interaction and understanding. Indeed, "while they may not carry rifles, explosives or other combat gear, interpreters are integral to mission success in a war in which winning the support of the Afghan people is equally important as defeating extremists in combat."[8]

Simple linguistic ability can also help save lives. According to Gerardus Wykoff, a command sergeant major and the Military Intelligence Corps senior enlisted adviser, "It is important to have basic language skills. If you have a basic understanding of what folks are saying out there, you can save lives. . . . You can listen and see if insurgent activity is going on in a town. You can save lives by having this information." His experience also taught him that "if you can understand the basic writings and scribbling on the walls, it could be more than just scribbling. It could mean anything, like an [insurgent] meeting or an IED [improvised explosive device] emplacement."[9]

Without question, our military leaders understand the need for linguists on the battlefields of Afghanistan and Iraq. But our global responsibilities are clearly much broader than the ones in these two conflicts. Every day we spend millions of dollars in equipment and training around the world, providing our allies defense support and interoperability. Here too, linguists are essential. Col Walter Kraus, former commandant of the US Army Language School, stated unequivocally that "every day, thousands of American officers and men are brought into cross-cultural situations with people around the globe and are, whether they realize it or not, our principal weapons in the struggle for the minds of men." He also identified stewardship as a major factor for improving language proficiency in the military: "If we send billions of dollars in equipment to allied countries, it is essential that we also send persons who can explain the maintenance, operation and tactical employment of that equipment."[10] Colonel Kraus wrote those words over 50 years ago, recommending improvements to our lan-

guage capabilities. The DOD has implemented some of his ideas, but, chillingly, in all the years since then, it has yet to close our language gap.

Improving a military's overall linguistic competence offers rewards. For example, Colonel Kraus told the story of a Soviet transport plane landing in Indonesia. Down to the very last man on board—a janitor—everyone spoke fluent Indonesian. Shocked, the Indonesians processed the passengers in record time. The Jakarta leadership never forgot that calculated gesture of goodwill.[11] When, if ever, has the United States performed such an incredible yet simple act of diplomacy and propaganda?

Indeed, one wonders how much of an advantage al-Qaeda has in a world in which English is already the language of trade, navigation, and international communication, yet we struggle to produce an adequate number of Arabic linguists able to interact in the terrorists' world.[12] Are they really that much smarter than US forces simply because they tend to speak multiple languages while we do not? The answer is a resounding no; however, the question does raise an important point. If anyone can learn a language, why aren't members of the DOD doing just that? Without a doubt, improving our language capability will enhance our chances of winning a modern war. Maj John Davis, a retired Army intelligence officer, points out that

> how accurately and well we analyze the indigenous people we deal with during the Global War on Terrorism might well determine the success or failure of counterinsurgency operations. Our combat training will be for nothing if our linguist does not tell us the truth or fails to recognize it because of a lack of training. A lack of foreign language skills is our Army's Achilles' heel. Timeliness and accuracy is everything in intelligence, and thus, a linguist's skills are more important than firepower. With the former, you might not need the latter.[13]

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Anyone Can Do It

"Language comes so naturally to us that it is easy to forget what a strange and miraculous gift it is." This opening statement of Steven Pinker's book *Words and Rules* serves as a primer for discussing the simplicity of language acquisition. Pinker points out some important truths:

> Though it is sometimes easy for Americans to forget, English is not the only language spoken in the world. Humans babble in some six thousand languages falling into thirty-odd families.
>
> First, no one is biologically disposed to speak a particular language. The experiments called immigration and conquest, in which children master languages unknown to their ancestors, settled that question long ago. . . .
>
> Finally, no one supposes that language evolved six thousand times. We find different languages because people move apart and lose touch, or split into factions that hate each other's guts.[14]

Although the existence of 6,000 languages seems incomprehensible, the fact that all of them are somehow related means that, given the right circumstances, most people can learn at least one additional language.[15] The problem is not that language is inherently difficult to acquire but that after we become comfortable conversing in one language, we may not see the need to learn others. We ourselves, then, oftentimes represent the biggest obstacle to second-language acquisition—by switching on what one linguist calls the "affective filter."

The Affective Filter

Prof. Stephen Krashen, a noted linguist, theorized that adults have difficulty learning a second language because they turn on an affective filter that allows their motivation, attitude, self-confidence, and anxiety to inhibit that process. Take away the filter and anyone can learn a second language.[16] For example, despite the deplorable conditions endured by Warren Fellows—a Western journalist imprisoned in Thailand—upon his release, he left with one new skill set: fluency in a new language.[17] Naturally, we would hope that our Soldiers do not learn languages by becoming prisoners, but how much more effective would they be if they learned a language before interacting with people from other countries? We should give them that skill now—by removing the affective filter.

Professor Krashen linked a variety of affective variables relating directly to the success with which an individual can learn to speak a foreign language, ranking motivation as the principal factor.[18] It follows then, that, lacking motivation, service members will likely never even attempt to learn another language.

The US Army's special forces exemplify an organization whose members have fully embraced language proficiency. To become a special forces Soldier, each individual must demonstrate proficiency in a foreign language. In his book *Chosen Soldier*, Dick Couch, former Navy SEAL and noted author, provides a keen view of the grueling process involved in turning Army Soldiers into Green Berets—one that includes language training. Each time he introduces either Soldiers in special forces training or their instructors, he points out their language proficiency. One young Green Beret whom he met in western Iraq could speak Spanish, Portuguese, Italian, Korean, and Tagalog—not to mention his growing fluency in Arabic. The young man's response to Couch's question about how it felt to have such a knack for languages embodies just the type of motivation needed to learn a foreign language: "'It's not a knack,' he informed me evenly. 'It's commitment. Anyone can learn a foreign language if they [*sic*] want to. It takes a genuine desire to learn and the discipline to practice. And you have to go out of your way to find and practice with native speakers. The second language is easier than the first, and they get easier each time, but you have to make a personal commitment to learn the language.'"[19]

Throughout *Chosen Soldier*, Couch emphasizes the commitment necessary to enter the special forces, with language acquisition just one of the many demands. Failure to complete the language requirement negates all of the other hours of intense training. Special forces focus on a number of areas extremely important to our missions overseas, which include training and assistance with foreign military defense. Clearly, their specialized work demands fluency to enable them to communicate with the forces they train. But all service members, regardless of their location, might very well find themselves in a situation calling for communication with non-English-speaking allies, enemy prisoners, or other civilian strangers—a situation that could determine the success of the joint mission. We cannot simply rely on our special operations forces to do all the work for us. Each service member needs to be ready to engage in a foreign environment if necessary. Language engagement, even on a rudimentary level, can contribute significantly to the overall mission.

Since the beginning of the conflicts in Afghanistan and Iraq, we have repeatedly found that simply learning a few words and phrases can "break the ice" in any social context. Saying hello to someone in his or her native tongue demonstrates not only respect for that person's culture but also a sincere attempt to reach across barriers to form friendships and alliances. Along those lines, if Soldiers learned to speak only 10 words and phrases in the language of the country where they are deployed, the possible benefits, even of such a simple engagement, are immeasurable. Indeed, nothing is more personal than one's native language. But consider the value of learning additional terms. Specifically, conversing on an introductory level would require proficiency in only 100 words—and the more terms, the greater the fluency.[20]

Notwithstanding English's extensive lexicon, mastery of only 1,000 key words would enable someone to understand roughly 72 percent of practically any standard written text. A vocabulary of close to 2,000 words brings understanding to around 79 percent of most written texts. Clearly, at least from a lexical standpoint, it is not difficult to develop basic understanding of a language. Going beyond 1,000–2,000 words is just linguistic icing on the cake. A thorough understanding of most English texts requires knowledge of roughly 16,000 terms.[21] Granted, after 1,000 words, the process slows considerably, but the point is that one can bolster comprehension by learning a relatively small number of terms.

Mastering those 1,000 words demands basic motivation—something we would expect of hardworking service members. Unfortunately, they have no incentive to do so. Instead, they put up their affective filters and make excuses for not learning a new tongue. In that case, the military should accept no excuses.

The Effect of Aging and Brain Function

Service members who have decided not to learn a foreign language offer many common excuses. Some linguists and other skeptics point to age as the ultimate predictor of proficiency, declaring that Soldiers who did not learn a language in their youth will never master one in adulthood. But this "younger is better" argument is not entirely accurate.

Professor Krashen concludes that because older children learn faster, can better regulate quality and quantity of their speech, and can persuade native speakers to modify their speech (by saying, for example, "Please slow down; I don't understand you"), they have greater "conversational competence."[22] Such children and adults may also find it easier to follow instructions, search dictionaries, and understand the intricacies of grammar. Unfortunately, though, as Krashen points out, the affective filter "hardens" after puberty.[23] These individuals can still learn a foreign language, but their affective filters grow stronger, becoming artificial mental barriers to learning new languages. Removal of those barriers (by education or necessity) allows adults to learn to speak a new language more easily.

Science shows that an adult probably cannot learn to speak a language as fluently as a child who has learned it from birth.[24] Indeed, young children seem better at the nuances of acquiring proper phonetics and phonology.[25] This does not mean, however, that adults cannot become proficient in a second language.

Regarding age and its effects on linguistic fluency, Prof. Lydia White, a linguistics professor at McGill University, cited strong research indicating that acquisition of languages does not decline with age but that the possibility of becoming a near-native speaker of a second language decreases after reaching a "critical or sensitive [period]" of brain development, which ranges from six to 15 years of age.[26] For these reasons, older immigrants may not speak with a perfect accent but can still learn the dominant language of their new environment.

Fortunately, in the context of military readiness, functional communication doesn't

depend upon phonetic perfection. Learning a new language later in life will certainly leave the speaker with an accent, but local citizens rarely care about that. Rather, they will appreciate the Soldier's attempt to speak their language. Only extremely atypical and inconsiderate foreigners would refuse to converse with a nonnative speaker because of his or her strong accent.

Accents and native-like language precision aside, few would doubt that learning a first language is an inherent human characteristic. Indeed, Noam Chomsky (considered the father of modern linguistics) first arrived at the idea of a "universal grammar" because he believed that children could not so easily learn to speak a language if it were not for an "innate language faculty to guide them."[27] Although not completely accepted, universal grammar does offer one strong theory to describe how people learn to communicate and explains second language acquisition. Regardless, developing at least rudimentary skill in one additional language is a function not only of motivation but also of our minds' predisposition to learn new languages, even into adulthood.

Past Attempts

In 1957, after the Soviet Union launched Sputnik, the United States felt threatened by the possibility of losing the space-and-technology race. In response to our new second-place position behind the Soviets, a wave of legislation and patriotic fervor spread across the country, leading within a year to initiatives in many areas that needed improvement. Among these was the National Defense Education Act, which "suddenly poured millions of dollars into support for foreign language learning and teaching."[28] Not much has changed during the more than 50 years since passage of the act. In fact it seems that every time the military becomes aware of a language shortage, it throws millions of dollars at the problem, hoping to overcome the deficiency. One such investment involves finding linguists who have the desired proficiency.

Recruiting Natives

After the terrorist attacks of 11 September 2001 (9/11), the military realized it faced an acute shortage of Middle Eastern linguists. Because training individuals from scratch could not meet the immediate need, the military resorted to contracting with linguists willing to fly to Afghanistan and Iraq. Unfortunately, this strategy was not always very effective. One report noted that some contracted translators in Afghanistan were in their 60s and 70s "and in poor physical condition—and some [didn't] even speak the right language"; in fact, the military immediately sent some of them back to the United States because of their physical problems.[29]

Realizing that contracting translators is not an ideal long-term solution but also recognizing that native speakers are an extremely useful resource, the DOD has promulgated new programs to recruit and enlist them. In 2008 the Army initiated the 09L military occupational specialty (recruits are referred to as "09 Limas"): "This new military occupation employs heritage speakers as interpreters and translators, representing a new phase in the service's reinvigorated approach to foreign language."[30] During the 09L program's pilot stage, the *Defense Language Transformation Roadmap* of 2005 directed that all services study the program for possible DOD-wide implementation.[31] Such initiatives are effective if they identify the very best civilian linguists, but finding them can prove quite difficult. For example, according to a 2000 census, only 7,700 Pashto speakers live in the United States.[32]

Other programs championed by the DOD call for funding more travel abroad for service academy cadets and midshipmen during their studies. Reserve Officer Training Corps programs have also allowed cadets to learn more about foreign lands.[33] Some innovative schemes currently encourage development of language capabilities from

elementary school through high school. For instance, the National Language Flagship Program seeks to nurture students of the future in strategic languages such as Arabic, Hindi, and Urdu.[34] Unquestionably, we need strategies like these to seed our nation with future talent, but what about current efforts within the DOD to improve the language capabilities of those who already wear the uniform?

The Defense Language Institute

Offering exceptional instruction, the Defense Language Institute (DLI) leads the charge for language training in the military. Students will not progress in their linguist career field without successfully passing a particular language course at the institute, which sets its students up for success. Despite the difficulty of finding qualified instructors, the DLI is fulfilling its training mandate.

The institute has also enjoyed great success in its predeployment basic language instruction. For example, from 2005 until 2008 the Army's Language Familiarization and Cultural Awareness training saw a 78 percent growth in outreach. As of 2008 the training had reached over 66,572 service members.[35]

Today's environment demands that predeployers receive the DLI's training in key strategic languages at the survival skill level. However, the military should also encourage troops not yet deployed to take advantage of language instruction, which, for the most part, is entirely voluntary. Fortunately, the military has tools to help those who so choose.

Rosetta Stone and Other Self-Help Programs

Self-help computer programs like Rosetta Stone, popular in the military for several years, are nothing new and have produced mixed results. In 2006 the Air Force chief of staff directed Air University to begin language instruction in the Air War College, Air Command and Staff College, and Senior Non-Commissioned Officer Academy.[36] Face-to-face instruction seemed to work well at the Air War College, whose students enjoyed it. Unfortunately, the mandatory usage of language software proved less successful. Air Command and Staff College students (required to use Rosetta Stone) became frustrated with the software and lost their motivation to learn. In fact, many of them began to concentrate on "beating" the software rather than learning from it.[37]

Similarly, students enrolled in distance learning programs had a less than satisfying experience. According to one observer, "Although this voluntary program initially generated enthusiasm, as evidenced by a rather lengthy waiting list for license use, completion rates for software modules were abysmal. Over a 15-month period, a total of 2,667 SOC [Squadron Officer College] students signed up for licenses, but only 67 of them (2.5 percent) completed 50 or more hours."[38]

Self-help language software can provide very successful instruction. The key factor, however, as noted previously, is the motivation of the learner. Those who lose either their focus or motivation will not learn. Currently, other than certain professional military education programs, few areas demand that military members use language learning software. Even those areas lack incentives for students to learn a language, other than completing the particular course. Clearly, service members need additional motivation to help inspire them to learn a language. Simply providing access to self-help software is not enough.

Other Language Training Programs

For over 40 years, the Army has had a very robust foreign area officer program that allowed officers to specialize in the language and culture of certain regions. The Air Force attempted to copy this model with a part-time program wherein members could also obtain a secondary specialty as a foreign area officer. Realizing that this effort did not meet the needs of our increased op-

erating tempo following 9/11, the Air Force went back to the drawing board and devised a new regional affairs strategist program.

The Air Force selects officers for this program at about the seven-to-10-year point in their careers, giving them 24–33 months of additional training that usually results in a master's degree in the area of their language and cultural specialty.[39] The service then assigns them to areas in which they can best utilize their new talents.

The Air Force has also recently implemented the Language Enabled Airmen Program, which identifies junior officers motivated to learn or improve their language capability and begins their training with a language-intensive training event. As of October 2010, 25 of the service's newest second lieutenants had completed the first of these classes.[40] The program seeks to identify and train officers at an early stage in their careers and then, throughout their stay in the Air Force, give them training and assignments that will strengthen their language skills and put them to use where needed worldwide.

Both the Regional Affairs Strategist Program and the Language Enabled Airmen Program likely will help produce an effective cadre of language and cultural specialists within the Air Force. These programs accommodate individuals who wish to become language and cultural specialists; furthermore, they serve as a valuable mechanism to address the service's shortage in this field. Such efforts help the Air Force develop personnel comparable to the Army's foreign area officers. None of these programs, however, can ever fully meet the military's need for expertise in language and culture. In addition to grooming individual specialists, the Air Force should also encourage and motivate its other members to value the importance of language and culture. Allowing them to continue in the mind-set of "English only / our culture is best" will only harm our ability to master the art of global engagement.

William Lederer and Eugene Burdick's novel *The Ugly American* presents an account of the American experience in Southeast Asia.[41] Despite its setting during the Vietnam War, the book's lessons remain valid today. In order to win the hearts and minds of any people, *all* of our troops must first understand what is within those hearts and minds. Sheer brute force or bulk gifts of rice are not enough. As previously mentioned, Congress enacted the National Defense Education Act a year before publication of *The Ugly American*. Since that time, our military's efforts to bridge the linguistic gap appear to have been Sisyphean. The continual focus on pouring money into training select groups of linguists will help but not solve our problem. There is only one way to do that—by changing the way we motivate our military members to learn foreign languages.

Way of the Future

To increase the number of its members who can speak a foreign language, the military must remove its institutional affective filter. Even language experts allow themselves a certain amount of filtering. Consider, for example, this statement by Lt Col Jay Warwick, USAF, retired, of the Air Force Culture and Language Center:

> Attendees of the AU [Air University] language summit agreed that it was impractical and undesirable for all Airmen to be language specialists. Depending upon the language, an individual could take longer than a year in an immersion-style course to become minimally functional. . . . Additionally, experience has identified motivation and capability as the key factors in language learning. Not all Airmen possess the motivation to learn a foreign language or maintain proficiency; neither are all of them predisposed to language learning.[42]

It is indeed impractical for all Airmen to become language specialists, but nearly every member can develop some proficiency in a foreign language. Claiming that some people are not "predisposed" to learning a new language is just the affective filter speaking. Even apes learning sign language

build a vocabulary of 500–600 words.[43] Given the right motivation, most humans *are* predisposed to language learning.

Perhaps Warwick's most accurate statement is that "not all Airmen possess the motivation to learn a foreign language." Herein lies the true problem as well as the solution to our shortage of proficient speakers. Motivate the troops, and the problem solves itself.

Promotion

The *Defense Language Transformation Roadmap* mandates that mastery of a foreign language be phased in as a "criterion for general officer / flag officer advancement."[44] This requirement is a good start, but we could expand it to become a huge motivator for all military personnel to pursue language proficiency. Why not direct that an officer's eligibility for promotion to lieutenant colonel (O-5) depend upon attainment of a Defense Language Proficiency Test level of two in any second language?[45] Such a score is reasonable on this test, which measures proficiency in reading, listening, and speaking, and whose results range from zero (lowest) to five (highest), in addition to plus signs used as midlevel range markers. These levels correspond to the system devised by the Interagency Language Roundtable: "Put another way, an individual with 1/1/1 scores in Arabic possesses 'survival skills,' while one with 4/4/4 could debate the US Middle East policy on al-Jazeera television."[46] Requiring officers to attain a two level of proficiency would not entail asking them to learn a new language perfectly but merely to attain limited working proficiency.

If this policy were implemented today, junior officers would have at least six to 10 years to study a new language before becoming eligible for promotion to O-5 rank. On 5 January 2011, the Air Force announced that officer selection briefs would include a section that captures an officer's language certification levels (for reading and listening). Recognizing that "officers who have foreign language skills and cultural experience relevant to world operations play a key role in supporting joint combatant commanders," the service decided to include a foreign language section to help identify these in-demand officers to promotion boards.[47] Certainly this is admirable, but the Air Force can do more. If officers realized that promotion to O-5 depended upon language certification, they would obtain it.

"Not all Airmen possess the motivation to learn a foreign language." Herein lies the true problem as well as the solution to our shortage of proficient speakers. Motivate the troops, and the problem solves itself.

The service can assist in this matter by doing away with its anachronistic emphasis on earning a master's degree as a criterion for advancement into the senior ranks. As outlined by Col Dennis Drew, USAF, retired, most of the subject areas that our officers pursue for master's degrees are "largely irrelevant to [the Air Force's] raison d'être. The Air Force seems unable or unwilling to distinguish the value of a graduate degree in business from the value of a graduate degree

in national security studies or military history."[48] Or, for that matter, foreign languages.

By replacing the institutional emphasis upon these degrees with one on foreign language advancement, the Air Force could provide funding for language training in much the same way it offers tuition assistance for graduate-level education. Currently the service assists with tuition for language courses if they are tied to obtaining college credit. Unfortunately, though, this is not true of many specialized language courses, so the Air Force should underwrite any such credible course, whether associated with a degree program or not. Junior officers could then concentrate on obtaining skills they could use in an operational setting rather than on certifying skills best practiced in the civilian world.

The service could also channel the language-development process of its junior officers by offering training at its larger installations. By contracting with local universities to conduct special training on less commonly taught languages (LCTL), the Air Force could create opportunities for officers and enlisted troops to seek proficiency in languages of most benefit to the service. Given the difficulty of learning many of these LCTLs and the time necessary to do so, the Air Force could permit (or direct) members to study them during duty hours.[49]

Furthermore, the service could designate officers proficient in "high-need" LCTL languages with a special identifier on their officer selection brief.[50] Needs change with regard to languages, so, to be fair, once a language was identified as high-need, that identifier on the brief would stay with the officer who earned it, but new languages could always be added or subtracted from a master list.

The military could phase in these policies over time, minimizing disruption of the current officer promotion process within each service. Additionally, the new policy would motivate all Reserve Officer Training Corps cadets entering the military to study languages as a means of enhancing their careers. Maj William Downs, a special operations pilot, commented that "officers should set the example by learning at least one language fluently."[51] Linking language skill to promotion will make the process natural and eliminate the affective filter.

Similarly, if a noncommissioned officer with LCTL proficiency could earn an additional five points toward promotion to senior rank, he or she would find a way to remove the affective filter.[52] Some might argue that attaching language acquisition to promotion would benefit only linguists, foreign nationals entering our services, and those raised in bilingual families. The services could address this potential problem in a simple manner. First, since the additional points for senior promotion become a benefit only after the member has invested many years in the service, language capability would not disproportionately skew promotions in early career stages when development of vocational and leadership skill is of primary importance. Foreign language speakers in the lower grades would still be eligible for proficiency pay. Second, the new standard could be based on a language someone did not learn as a child—a second language for most people, perhaps a third or fourth for a select few. The point is that failure to give our Airmen a mechanism to disengage the affective filter will produce a military full of foreign language mottoes and clever catchphrases but no reservoir of language capability for engaging our allies and defeating our enemies. We may have a cadre of elite linguists ready to lead the charge, but we will never have enough of them to go around.

Professional Military Education

We need not wait until our officers enroll in midlevel and senior-level professional military education to give them exposure to a foreign language. Instead, we could require that officers who aspire to matriculate in-residence demonstrate a level of proficiency beforehand. For officers attending basic developmental education, the military could require a score of at least "0+" or a "1" on a

Defense Language Proficiency Test, a "1+" or "2" for in-residence intermediate developmental education, and a "2+" or "3" for in-residence senior developmental education.

Combining promotion with selection for developmental education (as the Air Force does) makes this process even more streamlined. An individual's officer selection briefs could list the level of language ability attained, and promotion boards could then use this information accordingly.

Initiating this approach would not impose any significant cost on the DOD. The DLI already offers a number of free programs for those who seek language proficiency. Self-help software can also lend sufficient support to motivated individuals who wish to achieve lower-level proficiency. Finally, if the Air Force shifts gears to emphasize language acquisition rather than superfluous master's degrees, this new mandate will become smoothly incorporated into our troops' already busy work/life schedule.

Cultural Change

For many years, the DOD has used various financial incentives such as foreign language proficiency pay to attract language speakers and encourage service members to learn or retain their capabilities.[53] At certain times, this pay applied to a wide variety of languages—at others, only for certain languages in short supply. Nevertheless, foreign language proficiency pay has served as just about the only mechanism to motivate service members. Certainly it is a good program that we should continue, but it cannot be the only method that the DOD uses to encourage its members to learn a language.

Because of individual and institutional affective filters, the DOD has not actively undertaken a serious language-proficiency campaign. Thus, each year a new study discusses the importance of languages in the military and the fact that the department faces a critical shortage of skilled linguists. The DOD then decides to throw money at the problem. Now is the time, however, to demonstrate a stronger commitment to solving it. Promotion and individual recognition are hallmarks of membership in the service. If the DOD required linguistic skills of its future leaders, then they would step out of their comfort zones and acquire those skills.

Interestingly, of all the medals and ribbons offered by the DOD, none are awarded for language proficiency. If the department does nothing else, it should at least offer recognition in the form of a badge or ribbon to those who have demonstrated linguistic capability. True, fully trained foreign area officers have functional badges, but what about those troops who are not full-time linguists? Surely they deserve recognition for their efforts.[54] Herein lies the key to a shift in the DOD's culture with regard to language proficiency. If the military ever wishes to motivate people to learn a new language, the DOD needs to prove that it values the service of those who do so.

Conclusion

In 2002 a legend and true American hero passed away. Gen Vernon Walters never went to college but worked his way up through the ranks in the Army to become a two-star general. He served with honor during World War II and later became one of America's greatest diplomats. This man learned 16 languages, speaking eight fluently—including Chinese and Russian.[55] He even translated for President Harry Truman and President Richard Nixon. At one point in his life, "his simultaneous translation of a speech by Nixon in France prompted President Charles de Gaulle to say to the US President, 'Nixon, you gave a magnificent speech, but your interpreter was eloquent.'"[56]

Today, instead of looking up to men like General Walters, many of our young troops do not even know who he is. During deployments, they waste countless hours playing video games and watching movies. Imagine the impact these service members could have if they applied the same drive and motivation to learning more about for-

eign languages and cultures. Tieing their career advancement to linguistic capability would help. Changing our culture to reflect that importance would help even more.

The Army's special forces have already incorporated this culture into their training. Even the legendary Robin Sage training exercise now makes use of languages like Arabic.[57] Special forces do indeed understand that "while developing the language and cross-cultural skills is more difficult and more time consuming than purely tactical, behind-the-gun skills, it's what really sets the special operator apart from his conventional counterpart."[58] Perhaps if the DOD demonstrated its commitment to language growth and learned from its special operations forces, all levels of the military could reap the linguistic rewards. The impact on our overseas operations would be truly extraordinary. ✪

Notes

1. I use the number "1,001" in the title of this article in the same sense as it appears in the classic book *The Thousand and One Nights*. In that collection of stories, the Persians did not use "1,001" literally but simply to mean "a lot." Indeed, original transcripts do not contain that number.

2. Iraq Study Group, *The Iraq Study Group Report* (New York: Vintage Books, 2006), 92, http://permanent.access.gpo.gov/lps76748/iraq_study_group_report.pdf.

3. Lt Gen David H. Petraeus, "Learning Counterinsurgency: Observations from Soldiering in Iraq," *Military Review*, October 2006 (supplement), 45–56.

4. "US Scrambles to Find Linguists for Afghan Surge," VOANews.com, 29 May 2009, http://www.voanews.com/english/news/a-13-2009-05-29-voa32-68643567.html.

5. Ibid.

6. Kate Brannen, "Petraeus' COIN Guidance 'Prematurely Released,'" *DefenseNews*, 30 July 2010, http://www.defensenews.com/story.php?i=4729883.

7. Gen Stanley McChrystal, Headquarters US Forces Afghanistan/International Security Assistance Force, memorandum, subject: COMISAF/USFOR-A Counterinsurgency Training Guidance, 10 November 2009.

8. Sgt Kevin Stabinsky, "Afghan Linguists Key to Success," American Forces Press Service, 2 November 2006, http://www.defense.gov/news/NewsArticle.aspx?ID=1998.

9. Quoted in Brian Lamar, "3rd Inf. Div. Prepares to Deploy to Iraq with Language and Culture Training in Mind," 27 August 2009, accessed 2 February 2011, http://www.army.mil/-news/2009/08/27/26598-3rd-inf-div-prepares-to-deploy-to-iraq-with-language-and-culture-training-in-mind/.

10. Walter E. Kraus, "Bridging the Linguistic Gap (50 Years Ago in ARMY)," *Army*, 1 July 2008, http://findarticles.com/p/articles/mi_qa3723/is_200807/ai_n27995742/?tag=mantle_skin;content.

11. Ibid.

12. See Arnaud de Borchgrave, "Extremists Pander for Mission and Money: Terrorists Deploy News Rags to Hold Adherents' Attention," *Washington Times*, 20 January 2011, http://www.washingtontimes.com/news/2011/jan/20/extremists-pander-for-mission-and-money/. Al-Qaeda even has its own online English language magazine titled *Inspire*.

13. Maj John W. Davis, "Our Achilles' Heel: Language Skills," *Military Review* 86, no. 2 (March/April 2006): 110.

14. Steven Pinker, *Words and Rules: The Ingredients of Language* (New York: HarperCollins, 1999), 1, 211.

15. Ibid., 211.

16. Stephen D. Krashen, *Principles and Practice in Second Language Acquisition* (New York: Pergamon Institute of English, 1982), 31.

17. Warren Fellows, *The Damage Done: Twelve Years of Hell in a Bangkok Prison* (Sydney, NSW Australia: Pan Macmillan, 1997). Fellows, who spent 12 years imprisoned, discusses how he acquired proficiency in Thai and its value to him. How did he do it? He had no choice.

18. Krashen, *Principles and Practice*, 31.

19. Dick Couch, *Chosen Soldier: The Making of a Special Forces Warrior* (New York: Crown Publishers, 2007), 382.

20. Tony Buzan, *Use Your Memory* (London: Guild Publishing, 1986), 129.

21. Paul Nation and Robert Waring, "Vocabulary Size, Text Coverage and Word Lists," WordHacker, 2007, http://www.wordhacker.com/en/article/vocabularysizewordlists.htm. See "Table 1: Vocabulary size and text coverage in the Brown corpus."

22. Krashen, *Principles and Practice*, 43.

23. Ibid., 44.

24. William H. Thorpe, "The Learning of Song Patterns by Birds, with Especial Reference to the Song of the Chaffinch Fringilla Coelebs," *Ibis* 100, no. 4 (October 1958): 535–70. Consider the biological evidence. Thorpe did an extensive study on the chaffinch and its unique song, finding that if a young bird is not introduced to the adult male's song during a critical period after hatching, it will never sing properly. Like the chaffinch, children seem to have the same need for exposure to linguistic nuances, such as nonnative phonemes, at an early stage; if not, such sounds will prove more difficult to pronounce and/or replicate later on. For example, in 1799 Jean-Marc-Gaspard Itard discovered a boy 11 or 12 years of age whom he named Victor, known as the "Wild Boy of Aveyron" because he had apparently been raised by wolves. Victor never really developed significant ability to communicate beyond a few words. More recent examples also confirm the chaffinch phenomenon. In 1940 scientists were intrigued by "Isabelle," who had been hidden away by her parents since early infancy. Discovered at age six, she had cognitive skills below those of a two-year-old. Although she learned to speak, her linguistic skills were comparable to those of a child immigrant learning a second language. See Ray Jackendoff, *Patterns in the Mind: Language and Human Nature* (New York: BasicBooks, 1994), 116–20.

25. Jackendoff, *Patterns in the Mind*, 117.

26. Lydia White, *Second Language Acquisition and Universal Grammar* (New York: Cambridge University Press, 2003), 245.

27. Rosamond Mitchell and Florence Myles, *Second Language Learning Theories* (London: Hodder Education, 2004), 55.

28. Tom Scovel, *Learning New Languages: A Guide to Second Language Acquisition* (Scarborough, Ontario: Heinle and Heinle, 2001), 37.

29. Jason Straziuso, "Lost in Translation: Linguists Hired under Contract Struggle to Keep Up with Troops," *Sun Sentinel*, 26 July 2009, 15A.

30. A "heritage speaker" generally refers to an individual raised in a home in which the dominant language of a country (e.g., English in the United States) either is not spoken or is not the primary language. Heritage speakers generally have native proficiency in the language spoken in their home and acquire the dominant language (of the country in which they live) either simultaneously with the acquisition of their home language or later in life. John J. Kruzel, "Defense Department Navigates Language Roadmap," American Forces Press Service, 25 November 2008, http://www.defense.gov/news/newsarticle.aspx?id=52090.

31. Department of Defense, *Defense Language Transformation Roadmap* (Washington, DC: Department of Defense, January 2005), 9, par. 2.E, accessed 14 December 2010, http://www.defense.gov/news/Mar2005/d20050330roadmap.pdf.

32. Straziuso, "Lost in Translation," 15A.

33. Kruzel, "Defense Department Navigates."

34. Ibid.

35. House, *Language and Cultural Awareness Capabilities in the Military, Statement of Gary Patton, Senior Language Authority, Office of the Chairman, Joint Chiefs of Staff / J-1, House Armed Services Subcommittee on Oversights and Investigations*, 110th Cong., 2nd sess., 10 September 2008.

36. Lt Col Jay J. Warwick, "The Dilemmas of Providing Language Instruction for the US Air Force," *Air and Space Power Journal* 23, no. 1 (Spring 2009): 47.

37. Ibid., 49.

38. Ibid.

39. Secretary of the Air Force for International Affairs, "Regional Affairs Strategist Factsheet," accessed 15 December 2010, http://www.safia.hq.af.mil/factsheets/factsheet.asp?id=12756.

40. Air Force Personnel Center, "Lieutenants Complete Inaugural Language Training," 1 October 2010, accessed 15 December 2010, http://afpc.randolph.af.mil/news/story.asp?id=123224700.

41. William J. Lederer and Eugene Burdick, *The Ugly American* (New York: W. W. Norton and Company, 1958).

42. Warwick, "Providing Language Instruction," 50.

43. Jackendoff, *Patterns in the Mind*, 139.

44. Department of Defense, *Defense Language Transformation Roadmap*, 8, par. 1.S.

45. "Attaining the grade of lieutenant colonel is often considered to be the hallmark of a successful career." Department of the Army Pamphlet 600-3, *Commissioned Officer Professional Development and Career Management*, 1 February 2010, 18, par. 3-7, http://www.apd.army.mil/pdffiles/p600_3.pdf. This Army pamphlet is but one confirmation of the notion that attaining the rank of lieutenant colonel is a "hallmark" of success. As such, this author recommends making fluency in at least one foreign language a requirement for promotion to this important rank.

46. Col John L. Conway III, USAF, Retired, "The View from the Tower of Babel: Air Force Foreign Language Posture for Global Engagement," *Air and Space Power Journal* 19, no. 2 (Summer 2005): 60. The International Language Roundtable levels of proficiency roughly equate to the following: "0" = "no proficiency," "0+" = "memorized proficiency," "1" = "elementary proficiency," "1+" = "elementary proficiency, plus," "2" = "limited working proficiency,"

"2+" = "limited working proficiency, plus," "3" = "general professional proficiency," "3+" = "general professional proficiency, plus," "4" = "advanced professional proficiency," "4+" = "advanced professional proficiency, plus," and "5" = "functional native proficiency." See "Interagency Language Roundtable Language Skill Level Descriptions—Speaking," Interagency Language Roundtable, accessed 20 January 2011, http://www.govtilr.org/Skills/ILRscale2.htm.

47. Daniel P. Elkins, "Air Force Officials Approve Changes to Officer Selection Brief," 5 January 2011, accessed 20 January 2011, http://www.af.mil/news/story.asp?id=123236950.

48. Col Dennis M. Drew, USAF, Retired, "Educating Air Force Officers: Observations after 20 Years at Air University," *Airpower Journal* 11, no. 2 (Summer 1997): 40.

49. John Conway provides an excellent table outlining the number of study hours necessary to attain proficiency in various categories of languages. Col John Conway, USAF, Retired, "Civilian Language Education in America: How the Air Force and Academia Can Thrive Together," *Air and Space Power Journal* 24, no. 3 (Fall 2010): 77.

50. These languages are spelled out in the DOD and Air Force strategic language lists. They change as do the needs of the Air Force / DOD.

51. Maj William Brian Downs, "Unconventional Airpower," *Air and Space Power Journal* 19, no. 1 (Spring 2005): 22. Unfortunately, Major Downs died near Baghdad while training Iraqi pilots.

52. Col John Conway recommends awarding one Weighted Airman Promotion System point to enlisted personnel for obtaining a 3/3/3 level of proficiency. Conway, "Tower of Babel," 65. Although a good idea, it does not offer enough incentive to prompt enlisted troops to obtain such a high level of proficiency. A more substantial incentive (i.e., more points) would basically guarantee promotion for troops who mastered a language. Furthermore, mandating only a 2/2/2 level of proficiency makes the goal easier to reach. Finally, the fact that five points is roughly equivalent to a Bronze Star demonstrates the value the Air Force puts upon foreign language proficiency.

53. See Air Force Instruction 36-2605, *Air Force Military Personnel Testing System*, 24 September 2008, 82–83, par. A14.4, http://www.e-publishing.af.mil/shared/media/epubs/AFI36-2605.pdf. The Air Force has authorized various forms of proficiency pay over the years; this instruction details the most current version.

54. Colonel Conway recommends granting linguists an oak leaf cluster on their Air Force training ribbons. Conway, "Tower of Babel," 65. However, this author believes that they deserve a separate ribbon or badge of distinction.

55. Henry L. Applebaum, "Vernon Walters—Renaissance Man," Central Intelligence Agency, 27 June 2008, https://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/csi-studies/studies/vol46no1/article01.html.

56. Ibid.

57. The final hurdle that a recruit must negotiate, Robin Sage is arguably one of the most strenuous, realistic exercises in all of the DOD, extending over a vast terrain and incorporating all facets of special forces training. To make it even more realistic, foreign language is now becoming part of this exercise. Couch, *Chosen Soldier*, 365.

58. Ibid., 392.

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Fiscally Sound Options for a Flawed Tanker Recapitalization Strategy

Lt Col Michael W. Grismer Jr., USAF

The United States remains the only nation able to project and sustain large-scale military operations over extended distances. We maintain superior capabilities to deter and defeat adaptive enemies and to ensure the credibility of security partnerships that are fundamental to regional and global security. In this way, our military continues to underpin our national security and global leadership, and when we use it appropriately, our security and leadership is reinforced.

—President Barack Obama
National Security Strategy, May 2010

The current US economic crisis brings a national impetus to reduce government deficit spending, an undertaking of great importance; indeed, both the legislative and executive branches have taken immediate action in fiscal year (FY) 2011. This fixation on fiscal responsibility will surely include the previously sacrosanct defense budget, which set record highs and nearly doubled with wartime supplemental defense spending since the terrorist attacks of 11 September 2011.[1] With the Department of Defense's (DOD) fixed costs at an all-time high and recapitalization requirements in every direction, the challenge to win two wars and reset for the next contingency in a fiscally constrained environment demands innovative leadership at every level.

The top recapitalization priority for the US Air Force is replacing the 50-year-old KC-135 tanker fleet, a force multiplier critical to US military power projection. Aerial refueling represents a single point of failure for any rapid global mission, a capability critical to the DOD's joint force. The latter depends on the tanker to enable global reach and rapid global response, essential tenets of the US national security strategy. Unfortunately, the existing road map for recapitalizing the aging KC-135 fleet is untenable, and senior leaders have estimated that the last aircraft will not be replaced until it is more than 100 years old. From a pure time perspective, this would be analogous to flying the Wright Flyer in combat today! Given the pressures from budget constraints and the national deficit reduction, the DOD must seek alternatives for expediting recapitalization.

The Tanker Recapitalization Challenge

Simply put, America's National Security Strategy, built on the imperative of world-wide engagement, demands nothing less than the best global transportation system the world has ever known, one capable of projecting U.S. strength and resolve—anywhere, anytime.

—Gen Charles T. Robertson Jr.
Former Commander
Air Mobility Command and
US Transportation Command

An important linchpin to US military hegemony, the tanker enables joint and coalition forces by facilitating power projection over long distances, guaranteeing access to any location in the world. According to Gen Raymond Johns Jr., commander of Air Mobility Command, without the tanker, America could not execute the Air Force's core competencies of global vigilance, reach, and power.[2] For example, during FY 2010, the KC-135 fleet enabled combat power in Iraq and Afghanistan by air-delivering 255 million gallons of jet fuel to a host of Air Force, Navy, Marine, and coalition aircraft.[3] During congressional testimony, Gen Duncan McNabb, commander of US Transportation Command, reiterated the importance of air refueling: "My number one recapitalization priority is replacing the fleet of 415 Eisenhower-era KC-135s with a new platform to preserve a unique asymmetric advantage for our nation."[4]

Regrettably, KC-135 recapitalization (commonly referred to as KC-X acquisition) has been one of the most controversial, political, and ineffective acquisition programs in Air Force history. It had unconventional beginnings as an unsolicited lease proposal from Boeing in 2001, receiving congressional approval before the Air Force had validated or budgeted the requirement.[5] Following significant congressional oversight, KC-X acquisition underwent a competitive bidding process in 2008, won by Northrop Grumman / European Aeronautic Defence and Space Company (EADS); a protest in 2008 cancelled the award, which underwent competitive bidding again in 2009.[6] The failed awards in 2001 and 2008 were nullified by indictments for corruption and errors made during bid evaluations, respectively, events that highlighted serious flaws

in the Air Force acquisition process. In the latest gaffe (2010), procurement officials mistakenly returned confidential data to rival bidders, resulting in further delay.[7] Finally, after nearly 10 years of recapitalization efforts, the Air Force successfully awarded a $31.5 billion contract to Boeing in February 2011 to build 179 KC-X aircraft.[8]

However, this acquisition falls 236 aircraft short of recapitalizing the entire KC-135 fleet. From a capability standpoint, the Boeing replacement, dubbed the KC-46A (Boeing 767), is a modern, cost-efficient, and versatile aircraft, capable of multipoint refueling of joint and coalition aircraft, cargo and passenger airlift, and aeromedical evacuation missions.[9] The KC-46A has significantly more airlift capability than the KC-135 and meets current DOD joint doctrine requirements for refueling platforms to augment the airlift fleet. Most importantly, it delivers 1.14 to 1.38 times the air-refueling capacity of the KC-135.[10] Additionally, Boeing's KC-46A carries 190 passengers and 19 bulk cargo pallets; the KC-45 (Airbus A330-200), the aircraft of losing competitor EADS North America, carries 226 passengers and 32 pallets.[11]

Former secretary of defense Robert Gates affirmed that US strategic strength is linked to the fiscal health of the nation and that "the Department of Defense's track record as a steward of taxpayer dollars leaves much to be desired."[12] Since the DOD budget accounts for more than half of federal discretionary spending, Congress has begun to scrutinize defense spending more closely to find savings for debt reduction.[13] Secretary Gates also emphasized the fact that future DOD budget growth will stop. Zero growth, together with the increasing cost of energy, operations, and sustainment, will disproportionately affect future procurement accounts. Significantly, the DOD budget crisis has no end in sight, a menacing hurdle for future acquisition programs. These programs include timely recapitalization of the remaining KC-135 fleet, which continues to operate at great expense and risk.

Lengthy KC-135 Recapitalization Timeline

The KC-X acquisition strategy does not recapitalize the KC-135 fast enough, adding risk to an aging fleet. In 2007 Gen Arthur Lichte, commander of Air Mobility Command at that time, said, "If the [KC-X] program runs into any problems and slips by just three years, and Air Force officials are unable to procure 15 aircraft a year, the last KC-135 will retire in the year 2082, when it is more than 120 years old."[14] The KC-X award did in fact slip nearly three years since the general's statement, so the Air Force faces the prospect of flying a 50-year-old tanker another 70 years.

To the DOD, gaining initial operational capability of the KC-46A offers the most pragmatic solution for beginning KC-135 recapitalization. Regrettably, current budget constraints limit recapitalization funding to $3.5 billion annually, allowing for a maximum procurement rate of 12 to 18 aircraft per year.[15] Even if the Air Force took delivery of the KC-X tomorrow, the last KC-135 would be flying for over a century, a strategy full of risk and expense. Some KC-X advocates would like to see the KC-135 in a museum, not on the front lines of combat for the next 35 to 70 years. Many members of Congress and DOD personnel are well aware of this reality, but attempts to shorten the timeline have not been productive.

To recapitalize the fleet more quickly, the DOD investigated split-buy acquisition options to contract KC-X aircraft from both Boeing and EADS. The budget-limited strategy of 12–18 aircraft annually is also a minimum economic order of quantity (EOQ), which allows bidders to size production and validate cost to produce aircraft on time and within budget. A DOD budget allowing a higher purchase rate would lower the unit price of aircraft, and recapitalization would proceed more quickly. Although a split buy with minimum EOQs does not represent a best-case scenario for the Air Force, it would prove beneficial for the competitors, each of which has a considerable

stake in the defense industrial base, since both would build KC-X aircraft. Boeing will employ 44,000 US workers from 300 US suppliers, and EADS estimates that aircraft production would create 48,000 direct and indirect jobs from 230 suppliers in 49 states.[16] Michael Wynne, former secretary of the Air Force, noted that the cost of a split purchase "would be prohibitive, unless there was sufficient funding to essentially buy between 24 and 30 [annually]."[17] The DOD lacks not only up-front funding for a split purchase but also the sustainment budget for dual maintenance, training, and logistics support systems.

Costly Recapitalization Strategy

Under current Air Force maintenance practices, sustaining fleet reliability standards as the KC-135 ages will be exorbitantly expensive. Projections indicate maintenance costs will increase to $6 billion yearly over the next decade, well over the annual $3.5 billion budgeted for KC-X procurement.[18] Even congressional appropriation language acknowledges it is "in the best interest of the taxpayer to pursue recapitalization at a rate of 36 aircraft per year . . . [to avoid] a large sustainment and modernization cost of the legacy KC-135 fleet."[19] The Air Force maintains fleet availability at a mission capable rate of 81 percent but not without significant cost.[20] Considering the fact that the average age of the US commercial airline fleet is 12 years, with reliability rates in the high 90s, maintaining a 50-year-old KC-135 at this rate is a remarkable feat.[21] Maintenance expenses continue to grow, largely as a result of costly corrosion damage. During FY 2010, nearly 20 percent of the KC-135 fleet (81 aircraft), spent an average of 227 days in depot-level maintenance.[22] However, the growing amount of depot time spent repairing corrosion and landing-gear problems represents only half the story. The time devoted to flight-line repairs (non depot maintenance) increased over the last several years to 12.5 maintenance man-hours per flying hour in FY 2010.[23] With such personnel at a premium in the Air Force, maintaining a KC-135 necessitates more than double the manpower per flying hour than the larger but more modern C-17.[24]

Along with burgeoning maintenance costs looms significant risk of the unknown regarding the length of time that metals used in production of the KC-135 fleet will endure. In 2006 the RAND Corporation completed an analysis of alternatives for KC-135 recapitalization, concluding that insufficient data existed for projecting the KC-135's technical condition over the next several decades with high confidence.[25] Similarly, the Defense Science Board concluded "that corrosion [did not pose] an imminent catastrophic threat to the KC-135 fleet. . . . However, because the KC-135s are true first generation turbojet aircraft . . . concerns regarding the ability to continue operating these aircraft indefinitely are intuitively well founded."[26] Following a KC-135 crash in 1999, which killed the crew and destroyed the airplane, the Air Force grounded 40 percent of the fleet for six months while it inspected and repaired faulty stab actuators, which caused the flight-control malfunction.[27] A similar grounding of the KC-135 fleet today would severely jeopardize the capabilities of DOD joint and coalition forces, particularly for landlocked operations in the Middle East.

The lengthy KC-X acquisition timeline will also cost the Air Force more in future maintenance expenses for both KC-X aircraft, which represent a first-generation wide-body, twin-engine design from Boeing and EADS. The Boeing 767, first produced in 1978, is approaching the end of its commercial life because customers find modern, fuel-efficient aircraft more attractive.[28] The Defense Science Board concluded that "obtaining an aircraft nearing the end of its production run, coupled with very low procurement rates and an expected service life of several decades, there is a good possibility that repair parts and infrastructure will become scarce and exceedingly expensive."[29] This is another area that the DOD

and defense industrial base must resolve by employing industry best practices.

Untapped Industry Best Practices

Former secretary of defense Gates called for tighter scrutiny of all defense spending, seeking $100 billion in savings over the next five years. The focus areas for saving emphasize efficiency in the contracting of goods and services, which account for $400 billion of the DOD's annual budget of $700 billion.[30] His original plan allowed the services to keep their savings and apply them to critical areas such as force structure and procurement.[31] The secretary changed this guidance, directing the services to apply a portion of the savings to pay for increased operation and maintenance (O&M), leaving less for acquisition programs.[32] As requirements continue to exceed funding, the DOD must leverage acquisition strategies that work. Dr. Ashton Carter, the Pentagon's chief acquisition official, summarized the problem: "The department must achieve what economists call productivity growth: Learning to do more without more."[33] Affordable acquisition strategies built on valid requirements that deliver capability on time and within budget must be the rule, not the exception.

The future success of US military forces will depend upon a military industrial complex capable of meeting DOD requirements and delivering capability on time and within budget. The quid pro quo relationship between the DOD and the US defense industrial base is becoming more strained, and the deficit reduction climate presents more challenges. Maintaining America's military dominance demands that the defense industrial base retain a skilled workforce and sustain its investment in military platforms.[34] KC-135 recapitalization offers an opportunity to strengthen the industrial base while the DOD benefits from commercial competition. More importantly, KC-X aircraft will become more cost-effective because of their link to a commercial production line. Building military capability from an existing commercial platform offers a sound strategy for a defense industrial base replete with a record of cost overruns and schedule delays. To illustrate, over the last decade, the Air Force managed a preponderance of the DOD's 74 major acquisition programs, which exceeded cost-growth limitations and triggered Nunn-McCurdy congressional reporting, a mechanism for informing Congress of cost overruns in major acquisiton programs.[35] We must reverse this trend, beginning with improving trust and accountability between DOD acquisition officials and industry. The reality of fewer resources and more requirements means that, to recapitalize the KC-135 fleet, we must partner with industry to take advantage of the best commercial acquisition and maintenance practices.

The KC-135 recapitalization plan primarily emphasizes bringing the KC-46A online but does not address problems associated with keeping the legacy fleet flying for another 30 years or more. Because the KC-135 will remain the backbone of air-refueling service well into the future and because nearly 20 percent of the fleet is in depot-level maintenance every year, the Air Force must leverage commercial maintenance methods to increase aircraft availability and decrease cost, thereby preserving mission capability. Industry experts have experience maintaining the older Boeing 707 platform (the commercial sibling of the KC-135) through commercial programs that match the quality of the Air Force's organic and contract depots—but at a fraction of the cost and fewer days in depot.[36] Furthermore, the DOD would do well to investigate another existing commercial program—civilian contract air refueling, otherwise known as fee-for-service air refueling.

Faced with an aging tanker fleet of 19 aircraft, more tanking requirements than capacity, and limited money to recapitalize, the United Kingdom finds itself in a situation similar to that of the United States. The United Kingdom looked to the commercial aviation industry by contracting for the Future Strategic Tanker Aircraft program, a

privately financed initiative with the consortium group AirTanker Limited, to provide a new fleet of 12 Airbus A330-200 multimission tankers/airlifters.[37] The United Kingdom pays a fee for service—specifically, AirTanker's provision of air-refueling and airlift capacity for 27 years and its payment of all capital costs, including infrastructure modifications to the host UK airfield.[38] The United Kingdom will retain permanent access to nine aircraft and will make the other three available for commercial use by AirTanker, which may offer them to other governments. The Future Strategic Tanker Aircraft business model may serve as a productive baseline for a DOD fee-for-service option, especially since that program's aircraft is the same basic platform as EADS's KC-X candidate.[39]

The Failure of Recapitalization Strategy to Meet the Required Force Structure

The DOD does not have adequate air-refueling capability to meet today's requirements, and the KC-X acquisition plan does not ameliorate the problem. The DOD's *Mobility Capabilities and Requirements Study* of 2010 (MCRS-16) examined three representative scenarios that employ mobility assets, finding the DOD tanker fleet 93 aircraft short of meeting requirements in the two most constrained cases.[40] In addition, a recent Government Accountability Office (GAO) review of the MCRS-16 concluded that planned recapitalization rates would not correct the tanker shortfall for the analysis period (2010–16).[41] The delay of KC-135 recapitalization for nearly 10 years further exacerbates the problem by driving up lost opportunity cost in dollars and risk.

Unfortunately, the Air Force cannot depend on maintaining current reliability rates as the KC-135 fleet ages; moreover, no quantitative analysis assesses the risk of operating a 50-year-old fleet into the future. The GAO report also found (and the DOD confirmed) that no tanker risk assessment was performed for the air-refueling portion of the MCRS-16 (a requisite of the study objectives).[42] While the future reliability of US air refueling clearly remains at risk, our closest near-peer competitor (China) is building a force of stealth fighters having an operational date of 2017.[43] Most disconcerting is China's nascent tanker fleet, which will soon give that country's stealth fighters unlimited range.[44] The DOD's tanker force structure also seems uncertain, specifically in terms of determining the gap between tanker requirements and capabilities. Although the MCRS-16 quantifies a tanker shortfall, which DOD officials confirmed in testimony before Congress, the GAO review of MCRS-16 notes that "DOD officials responsible for the [MCRS-16] report told us that a tanker shortfall *does not* exist despite the language and data in the report" (emphasis added).[45]

The Air Force cannot afford to procure KC-X aircraft fast enough to replace aging KC-135s one-for-one. Solving the tanker shortfall involves more than dispatching a more capable airborne gas station—we must also put enough gas stations in the air. In FY 2008, the Air Force proposed to Congress a money-saving case to retire the oldest and most costly KC-135E aircraft. To keep the E models flying would cost approximately $45 million each to reengine, a hefty sum compared to the $120–$150 million procurement cost of a new tanker.[46] To save money, the Air Force accepted risk by dropping below the required force structure, retiring the entire KC-135E fleet.

Recommendations

Granted, the Air Force has a valid need to recapitalize an aging KC-135 fleet, but abject events—including the delayed KC-X acquisition, a limited budget, and shrinking defense spending—must drive a new look at the tanker fleet structure as well as a holistic review of the recapitalization strategy. The service's leaders must investigate options that leverage innovation, efficiency, and capital budgeting of the commercial aviation industry. Two such options entail a

force structure shift from a completely organic tanker fleet to a mix of civilian contract tankers and military aircraft, with the bulk capacity remaining in the Air Force's organic fleet. Both options capture aviation industry's strengths and bring more capability at lower cost. The service could award a fee-for-service competitive bid contract for either alternative. Most importantly, either choice expedites KC-135 recapitalization, augments the DOD's organic fleet, and provides savings in manpower and equipment. An absolute prerequisite for the success of either option calls for proceeding with rapid acquisition of 179 KC-46A aircraft. A final general recommendation that applies to future recapitalization efforts involves partnering with industry to innovate and build accountability.

KC-X Commercial Option: A Functional Split Buy

One option involves a contractor purchasing KC-X aircraft, assured of a guaranteed number of DOD flight hours annually on a fee-for-service basis. This plan enables a cathartic split-buy opportunity sure to gain approval from Congress and interest from the defense industrial base. Even as the losing KC-X bidder, EADS would win by selling fee-for-service refueling to the Air Force. Additionally, Boeing could sell KC-46As to a commercial contractor, ramping up production to more cost-efficient quantities beyond the minimum EOQ it will build for the Air Force.

In 1998 US Transportation Command investigated a civilian contract air-refueling option but rejected it as "meet[ing] no significant wartime requirement and provid[ing] no cost benefit to the services."[47] Today, a commercial KC-X variant represents a tremendous *fiscal benefit* for three reasons. First, a fee-for-service option will be cheaper than new organic capability because a contractor amortizes capital costs over time, employs economical commercial maintenance practices, and has lower operating costs than the Air Force. Additionally, the service will realize manpower savings because the contractor will bear all O&M and sustainment costs. Second, a KC-X commercial derivative brings additional capability faster, allowing the Air Force to retire KC-135s sooner, saving O&M costs, and reducing the risk associated with operating an aging fleet. Third, the defense industrial base gets a boost during a recession by generating another customer.

From a political, economic, and national security perspective, a split buy with a fee-for-service contractor is a credible scenario. Many key congressional leaders have advocated such a strategy but were deterred because the DOD considered it fiscally irresponsible. However, because the fee-for-service contractor would pay for long-term aircraft costs associated with a dual acquisition strategy (for training, maintenance, and logistics), a dual fleet presents less of a challenge for the Air Force. Furthermore, a split buy that involves a civilian contractor procuring aircraft from competing manufacturers promotes price competition and puts more Americans to work.

Finally, a KC-X commercial option does not presuppose a split-buy solution. Certainly Boeing could add aircraft beyond the EOQ to its KC-46A production line and offer a cost-efficient option to a commercial contractor. Moreover, this strategy would give Air Force Reserve and Air National Guard operators of the KC-46A opportunities as civilians to fly and maintain a commercial version for a contractor. This scenario appears especially practical in terms of operations, cost, and risk.

KC-135 Commercial Option

Retired KC-135Es could add commercial capability to the Air Force. In 2009 the Air Force retired the last KC-135E after 51 years of service, relegating it to the "boneyard," where the aircraft sits with 73 other E models, ready for reactivation if necessary.[48] Establishing a competitive-bid fee-for-service contract for industry to upgrade retired KC-135s and sell air-refueling service to the

DOD saves up-front capital cost, manpower, and maintenance—not to mention the fact that it quickly adds capability.

Omega Air Refueling (a commercial contractor) has already proved the business case for using a civilian tanker to fulfill military requirements. Omega provides worldwide fee-for-service probe-and-drogue air refueling to a host of customers, including the US Navy, US Marine Corps, Germany, Canada, Australia, and the Royal Air Force.[49] Paid through the Navy's flying-hour program, the contractor offers capability on par with the KC-135 and KC-10 at a rate of $7,890 per flying hour for its (KC-135 equivalent) KC-707 and $12,500 for its (KC-10 equivalent) KDC-10.[50] Omega's fee-for-service rates are nearly the same as the cost of similar probe-and-drogue air refueling conducted by the Air Force, but the contractor has supported the Navy when the Air Force could not.[51] Also at the cutting edge of commercial-practice maintenance schedules on older Boeing 707 airframes, Omega employs an inspection and depot schedule that significantly reduces down time and cost, compared to the practices of the Air Force's KC-135 depot.[52] Perhaps most importantly, Omega serves as a model for safety and the successful integration of standardized operations between military and commercial aircraft.

The Air Force needs to take advantage of commercial aviation's best practices for wide-body aircraft technology, maintenance, and operations. One of many commercial contractors with extensive experience using older aircraft innovatively and efficiently, Omega currently has the capital, equipment, and technology to offer fee-for-service air refueling to the DOD at a lower cost per flying hour than the Air Force's organic fleet.[53] Additionally, it has paid for the Federal Aviation Administration's supplemental type certification to alter the KC-135E and owns proprietary rights to a new commercial maintenance program for modernizing engines and avionics on that aircraft.[54] Furthermore, Omega will supply boom service on worldwide operational or training missions, just as it currently does for the Navy.

Several industry experts determined that businesses can make a favorable case for spending commercial capital to upgrade legacy KC-135E components and then recouping costs by charging a fee-for-service rate competitive with the Air Force's hourly flying costs.[55] However, the service has been reluctant to establish a commercial fee-for-service air-refueling capability. In previous discussions with industry, the Air Force identified several areas in need of attention prior to development of an air-refueling pilot program—key among them obtaining congressional funding approval for an eight-year contract and certification of a commercial boom.[56] Congress recently showed its willingness to support such a concept, directing the DOD in the FY 2008 National Defense Authorization Act to investigate fee-for-service options for air refueling.[57] Though not considered, the option to transfer or sell a KC-135 to a contractor now appears to offer an economical and pragmatic opportunity to save money in developing and certifying a commercial boom. Despite the Air Force's past concerns, it now has a chance to embrace aviation industry contractors eager to suggest innovative, cost-effective commercial options for air refueling.

In light of the new multirole tanker/transport aircraft available on the commercial market today, US Transportation Command should investigate alternatives for a commercial air-refueling capability similar to that established for airlift in the Civil Reserve Air Fleet. Adding tanker capability to that fleet is not a revolutionary concept. In 1997 Transportation Command formed a Contract Aerial Refueling Working Group to explore commercial air-refueling options.[58] Without an established requirement, however, the group did not pursue the fee-for-service model. Since then, requirements and technology have undergone significant change while the KC-135 fleet has aged 14 more years. A KC-X would easily be the

most capable aircraft in the Civil Reserve Air Fleet, perhaps worthy of a premium.

Partnering with Industry for Innovation and Accountability

The Air Force must leverage commercial aviation's best practices throughout the aircraft life cycle, from initial cost estimating to maintenance procedures. Additionally, and perhaps most importantly, the service should build mutual trust and accountability with industry partners—a difficult but attainable goal in an environment which encourages innovation and creativity. Such a strengthening of relationships begins with bringing the purchase of 179 KC-46As on-line, on time, and within budget. However, the initial KC-X buy represents recapitalization of only one-third of the fleet, leaving the Air Force more opportunity to partner with industry to create more capability at a lower price. Industry, the DOD, and Congress continue to work through many acquisition challenges in which cutting-edge research, development, and testing of new technologies still result in more requirements and higher costs, accentuated by delayed delivery. For example, the $382 billion F-35 acquisition is behind schedule, and expenses have nearly doubled—from $50 million per aircraft to $92 million.[59] Compared to the F-35 program, KC-X acquisition remains relatively low risk, especially considering that versions of both KC-X tankers are in operation today using probe-and-drogue technology. Japan and Italy operate Boeing KC-767s while Australia, Britain, Saudi Arabia, and the United Arab Emirates purchased EADS's KC-45s.[60] Successful acquisition of the KC-46A is critical to follow-on KC-135 recapitalization plans, which replace the remaining two-thirds of an aging KC-135 fleet at an estimated cost of over $100 billion.[61] Adopting industry best practices and holding contractors accountable throughout the entire research, design, testing, and production process should not be limited to new acquisitions. Since the KC-135 will remain the backbone of the air-refueling fleet well into the future, the Air Force also needs to adopt proven commercial maintenance and depot practices to gain efficiencies and reduce maintenance costs. Partnering with the aviation industry to leverage commercial best practices takes innovation and leadership, but opportunity abounds.

Air refueling is a critical joint force capability. In terms of enabling global operations, it is as important as the air we breathe.

Conclusion

Air refueling is a critical joint force capability. In terms of enabling global operations, it is as important as the air we breathe. Without it, the joint war fighter cannot execute the US national security strategy. To maintain viability, the Air Force needs to make tough choices with respect to tanker force structure and future recapital-

ization of the KC-135. The service should investigate a commercial KC-X air-refueling option that leverages industry's capital budgeting and meets requirements at a fraction of the cost of a fully recapitalized KC-135 fleet. A commercial option represents the only way to facilitate a split buy with two capable multirole tanker/transport commercial platforms available. The Air Force and US Transportation Command should revisit the economics for a tanker Civil Reserve Air Fleet or similar fee-for-service options. Finally, given the fierce competition for shrinking DOD budgets, the proposed options would free scarce resources to recapitalize the KC-135 more quickly and would provide economical, reliable capability. Former secretary of defense Gates said it best: "My hope and expectation is that . . . what had been a culture of endless money where cost is rarely a consideration will become a culture of savings and restraint."[62] If America wishes to attain *physical* security, it must have *fiscal* security. Facing long-term deficit-reduction challenges, the DOD must lead the way by thoroughly validating joint requirements and exacting fiduciary responsibility for future acquisitions, measured against the same yardstick as the rest of government spending. Doing so demands innovative and accountable leadership at every level. ✪

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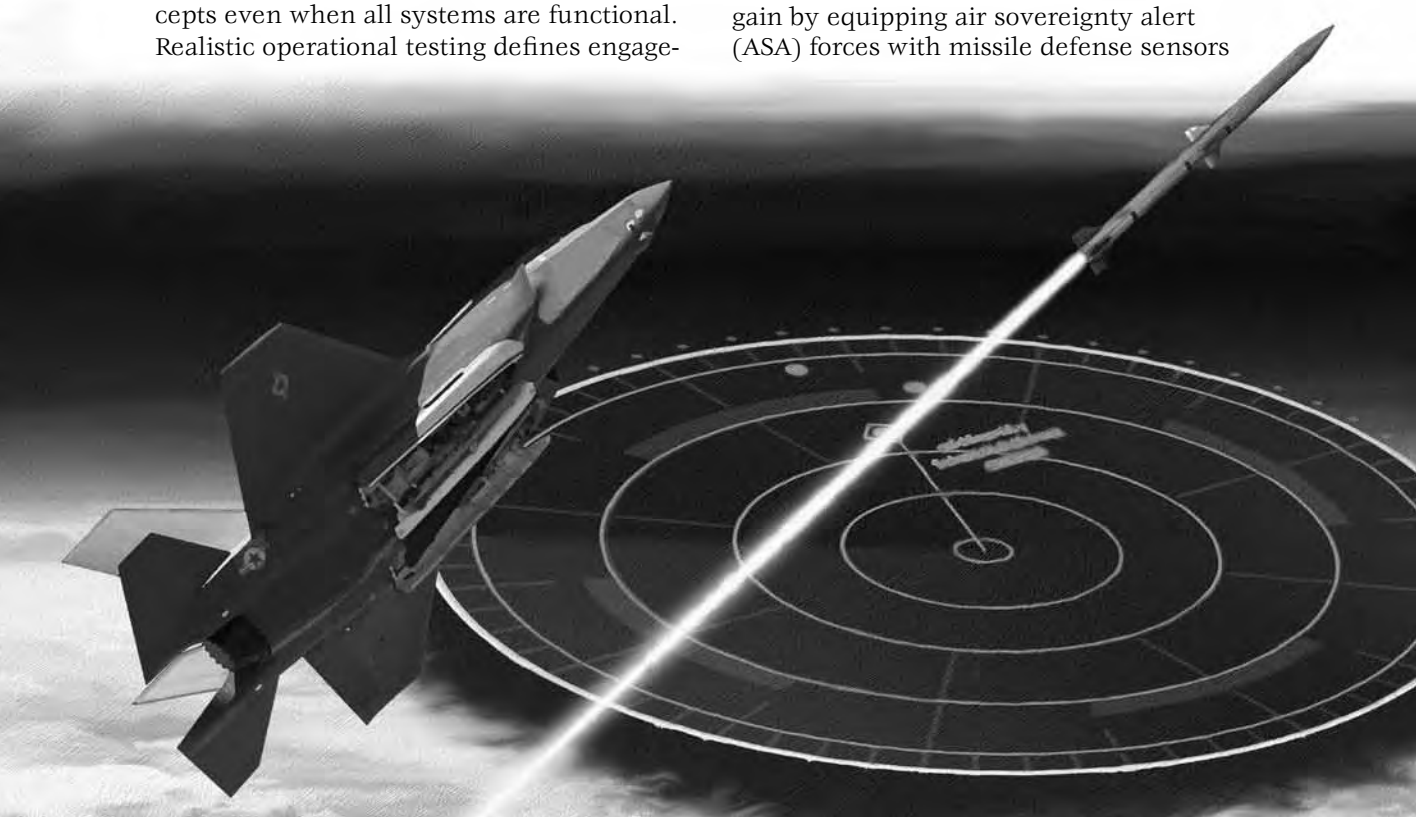
The United States Should Develop a Missile Defense System That Builds Confidence

Col Mike Corbett, USAF, Retired
Paul Zarchan

System performance is an essential factor in determining military utility; it is even more critical with respect to deterrent effects. Test failures, unless refuted by a string of successful tests, can erode our confidence and the system's value for deterring our adversaries. In addition to component failures, defensive systems must also cope with unknown target characteristics and maneuvers that can yield missed intercepts even when all systems are functional. Realistic operational testing defines engagement envelopes where we expect success if everything works, but it takes *many* tests.

The ground-based midcourse defense (GMD) missile defense system has not performed to expectations in recent tests, and some individuals even question the feasibility of midcourse intercepts themselves under realistic combat conditions. However, GMD's greatest challenge may not be identifying and correcting the causes of recent test failures but testing enough to regain military confidence and define its operational envelope.

This article examines an alternative concept and the defensive capabilities we could gain by equipping air sovereignty alert (ASA) forces with missile defense sensors



and small, air-launched interceptors currently under evaluation by the Missile Defense Agency (MDA) and the Air Force as the Airborne Weapons Layer. It depicts this concept's predicted capabilities under two scenarios: (1) a short-range ballistic missile launched from a ship offshore, and (2) an intercontinental ballistic missile (ICBM) launched from Iran without warning. Finally, the article discusses an operational testing concept focused on building confidence in the proposed defensive system.

Criticisms of Our Missile Defense System

The November/December 2010 issue of the *Bulletin of the Atomic Scientists* includes an article entitled "How US Strategic Antimissile Defense Could Be Made to Work" by two leading critics of the US missile defense system.[1] Authors George Lewis and Ted Postol have a long history of criticizing that system, and many people close to the program consider them opposed to the missile defense mission in general. However, in this article they do not declare missile defense unnecessary or impossible but argue that the MDA chose an inadequate approach.

In 2003 Senator Carl Levin "expressed grave concern" about the Bush administration's plans to field a missile defense capability in 2004, stating that "the missile defense system the administration plans to field . . . will not be fully tested or proven to work under realistic conditions" and that it "won't contribute to the defense or security of our country."[2] He reiterated these concerns six years later during his address to a missile defense conference.[3]

Lewis, Postol, and Levin are not against the missile defense mission; in fact Lewis and Postol adamantly maintain that a dire ballistic missile threat exists.[4] For Senator Levin, the issue concerned a decision to deploy a defensive system without sufficient, realistic testing. For these men, the MDA's failure to provide a convincing technical explanation of how the system will identify and hit incoming enemy warheads under expected combat conditions, or demonstrate such capabilities in realistic testing, had undermined their confidence in the ballistic missile defense system (BMDS). After the GMD test failure in December 2010, even optimistic supporters expressed concern over the system's performance.[5]

The mission is obvious—defeat the threat that current and future ballistic missile systems pose to our homeland, deployed forces, and allies.[6] The question is *how* to perform that mission, but it is not simply a matter of physics. The details of detecting, tracking, intercepting, and destroying a ballistic missile or warhead are fairly well defined. *However, defeating these missile threats in a cost-effective manner with neither advanced warning nor carefully controlled test preparations poses a challenge*. If we do it right, we assure our allies and deter our adversaries. If we do it wrong, we waste precious defense resources and delude ourselves with false confidence during crises. If we do it very well, we may be able to build ties with prior adversaries and dissuade future ones from pursuing ballistic missile weapons.

In the decade following the decision in 2001 to deploy GMD, the MDA investigated several alternative concepts but always concentrated development activities on large, surface-based interceptors. These decisions, made without the usual participation of the military services in requirements development, have resulted in very large interceptors simply too expensive to test frequently enough to inspire statistical confidence in their operational performance. For example, to date we have spent over $35 billion on the GMD system to provide a system with an alert force of 30 interceptors, with 16 additional ones for spares and testing.[7] Costs for the most recent test involving a single target and one interceptor likely exceeded $300 million.[8] The same large interceptor size that drives high unit costs also severely limits mobility and prompts deployment decisions not subject to quick alterations, thus increasing the system's vulnerability to unexpected adversary actions. In contrast, a

concept of operations (CONOPS) emphasizing an air-launched interceptor would enable much smaller, less expensive interceptors that we could deploy quickly, opening options for boost- and terminal-phase intercepts not possible with a surface-based CONOPS.

To better understand today's missile defense systems, we need to consider the impact of the 1972 Anti-Ballistic Missile (ABM) Treaty.[9] Carefully written by US and Soviet negotiators who feared that effective ballistic missile defenses would lead to an arms race and even greater deployment of nuclear weapons, the ABM Treaty constrained the capabilities of any system that could alter the strategic balance. The treaty limited defenses against ICBMs to a single ground site, restricted the number and capability of defensive sensors, and precluded theater missile defense systems capable of engaging long-range ballistic missiles.[10] When Pres. George W. Bush withdrew the United States from the treaty, he removed those restrictions, but the concept and design underlying the current GMD system had already been set, and the initial system acquisition was already under contract. The United States had committed to deploying a defensive system compliant with the ABM Treaty yet capable of defending the entire country against missiles launched from North Korea. However, developers needed to solve the problem of midcourse discrimination between warheads and decoys—an impossible task, according to Lewis and Postol.[11]

Alternatively, they suggest intercepting missiles during their boost phase (fig. 1), using a relatively small interceptor carried by a low-observable, remotely piloted aircraft. In fact, their proposed interceptor is very similar to the air-launched hit-to-kill (ALHK) upper-tier interceptor previously studied by a joint Air Force–MDA team.[12] The ALHK concept builds upon previous concepts of air-launched interceptors explored under the Raptor-Talon program and, most notably, by the work of Dean Wilkening in 2004.[13]

Today's Missile Defense Systems

Today's BMDS works in both the midcourse phase (GMD, Aegis SM-3, and theater high-altitude area defense) and the terminal phase (theater high-altitude area defense, Patriot advanced capability three, and Aegis SM-2 Block 4) (see fig. 1). The airborne laser was intended to destroy ballistic missiles in the boost phase, but the acquisition program was cancelled in 2009.[14] Despite the lure of engaging targets at the speed of light, concerns about high unit cost, countermeasures, and operational limitations led the secretary of defense to focus BMDS developmental efforts on maturing directed-energy technology prior to resuming acquisition of the airborne laser system. Also intended to provide a boost-phase capability, the kinetic energy interceptor, despite its large size (40 feet long, 40 inches in diameter, and 25,000 pounds), fast acceleration, and high speed, still needed to be located relatively close to launch areas to catch ballistic missiles during that phase.[15] Earlier manage-

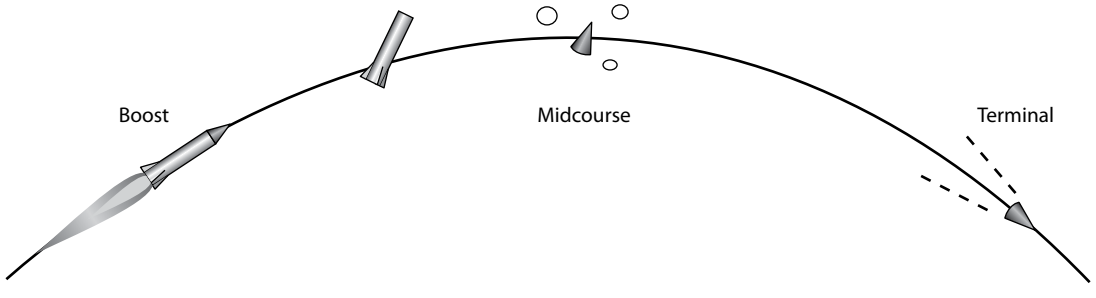


Figure 1. Phases of a ballistic missile's flight

ment decisions had focused this interceptor solely on booster development, but further cutbacks terminated the program in 2009.[16]

All missile defense systems depend on sensors to track their targets precisely, and in most cases (except the kinetic energy interceptor, which planned to rely on existing missile warning satellites and the airborne laser, which carried an Infrared Search and Track System [IRSTS]) these sensors are large, surface-based radars.[17] Such radars offer a persistent and highly accurate tracking capability, but they are either fixed on the ground or floating at sea; furthermore, the transportable ones require significant airlift capacity. These sensors are also vulnerable to adversary attack, and any loss can disable a large number of associated interceptors. In the case of GMD, data from the radars must be sent to the fire-control computers located in either Alaska or Colorado, and in-flight updates go out to the kinetic kill vehicle. Data transfer alone makes use of multiple, potentially vulnerable communication links.[18]

The Missile Defense Agency's Development Plans

In 2009 the MDA made significant changes in its advanced technology efforts, terminating ALHK as well as other technology explorations and concentrating developmental efforts on larger, higher-velocity, and longer-range derivatives of the Aegis SM-3.[19] In addition, the agency adjusted the objectives of its long-enduring, space-based sensor development, seeking a smaller constellation of satellites in equatorial orbits.[20] Airborne infrared tracking sensors carried on remotely piloted aircraft systems were added to support earlier intercepts and take advantage of the planned longer-range SM-3 interceptors.[21]

Plans for a European GMD deployment were scrapped in favor of a land-based deployment of SM-3 interceptors, emphasizing wide-area defense of Europe but having midcourse-only capability. This new plan, the Phased Adaptive Approach, starts with a deployment of Aegis ships carrying SM-3 interceptors, followed by augmentation with forward-deployed radars, and ends with a ground-based SM-3 currently under development. Later, the longer-range SM-3 Block 2A, currently planned as a 21-inch-diameter "full caliber" missile, would upgrade deployments, as would a liquid-fueled upper stage in the SM-3 Block 2B.[22]

Deployment of the SM-3 Block 2B would regain the midcourse intercept capability against Iranian ICBMs that we lost with cancellation of the European GMD detachment, but many challenges remain.[23] The Navy does not intend to put liquid-fueled interceptors on board ships, and the Army has no interest in a land-based variant of the SM-3.[24] Additionally, what, if anything, Europe would contribute to this defense concept has yet to be resolved. Finally, Russia remains highly skeptical of plans that could threaten its nuclear deterrent capability in the future or that would deploy US forces along its borders.[25]

The Air-Launched Hit-to-Kill Alternative

In late 2009, the US Air Force and the MDA completed a joint study on the viability of ALHK against regional ballistic missile threats, declaring the concept technically feasible and operationally viable. Initial war game analysis showed the usefulness of ALHK, including desirable effects on secondary metrics such as sortie-generation rates of theater aircraft, even though many details remain unverified. The initial study emphasized both classes of interceptors (upper and lower tier), supported by an IRSTS carried by the launching aircraft.[26] A follow-on joint Airborne Weapons Layer study is in progress, but the MDA has committed no resources or even restored those previously cancelled. The Air Force, in contrast, has expressed significant interest in the program and is continuing limited follow-on studies at Eglin AFB, Florida.

The ALHK components briefly described here include a lower-tier interceptor modeled with a 1.75 kilometer per second (km/sec) burnout velocity that primarily uses aerodynamic maneuvering, possibly supplemented with divert thrusters. It can generate 10 g's of lateral acceleration at a 20 km altitude, but its agility decreases rapidly above that altitude. Roughly the size of an AIM-120 advanced medium-range air-to-air missile, it is carried in the same manner.[27] The upper-tier interceptor, modeled with a 3.5 km/sec burnout velocity, uses divert thrusters for all maneuvers following booster burnout. Capable of 10 g's of lateral acceleration, it can engage only above 50 km altitude due to seeker heating limitations.[28] Roughly four times the weight of the advanced medium-range air-to-air missile but not much longer, the upper-tier interceptor fits within the F-35's internal weapons bay. Moreover, fourth-generation fighters could carry it externally.[29]

The supporting IRSTS pod could resemble the Sniper or Litening, with 20 centimeter optics carried externally, or an integral internal system such as the F-35's Distributed Aperture System—or both. It lends itself to integration with the aircraft radar, or it can work in pairs via triangulation, depending upon the weapon (upper tier or lower tier) supported, the phase of intercept (boost, ascent, or terminal), and the engagement range.[30]

The Distributed Aperture System is of particular interest due to its complete coverage in every direction around an F-35 and because it will be standard equipment on each F-35 produced. On 4 June 2010, a test aircraft equipped with this system detected and tracked the entire boost phase of a Falcon 9 space launch vehicle from well in excess of the maximum kinematic range of an upper-tier interceptor.[31] The system's small aperture will limit its range when tracking in the postboost or terminal phases, but it may support uncued terminal intercepts at a short range with a lower-tier interceptor. If so, it would enable a relatively "stock" F-35 to provide autonomous terminal defense when equipped with a lower-tier interceptor. Future tests will reveal the system's actual capabilities.

Existing, demonstrated technologies support these systems although they are not yet integrated into a weapon system. Raytheon's Net-Centric Airborne Defense Element showed how a modified AIM-9X seeker head could track a boosting missile and discern its body in the presence of the rocket plume. It performed a successful boost-phase intercept in 2007 (the MDA's first) in just under three years and for a cost of roughly $25 million.[32] Significant development work lies ahead for the upper-tier interceptor in particular, but the fundamental, well-defined technology has been demonstrated in a relevant environment.

Air Sovereignty Alert

Interceptors, sensors, and aircraft are only part of the larger system. We propose incorporating these components with ASA aircraft on duty continuously around the United States. Although the number and locations of actual ASA sites undergo occasional adjustment, the basic distribution has remained fairly constant over the past five years.

The 16 alert sites within the continental United States and one each in Alaska and Hawaii (fig. 2) typically maintain two primary alert aircraft and a spare on "immediate" status. However, 14 of the 18 ASA sites are colocated with active duty or Air National Guard squadrons capable of rapid augmentation in the event of heightened tensions. Currently, we have a mix of F-15, F-16, and F-22 fighters on alert, but F-35s will begin to replace the older F-15s and F-16s in coming years.[33] The command and control system for ASA, a principal part of North American Aerospace Defense Command's (NORAD) Integrated Threat Warning and Attack Assessment system, features secure and redundant communications continuously linking missile warning sensors, air surveillance sensors, the national civil-

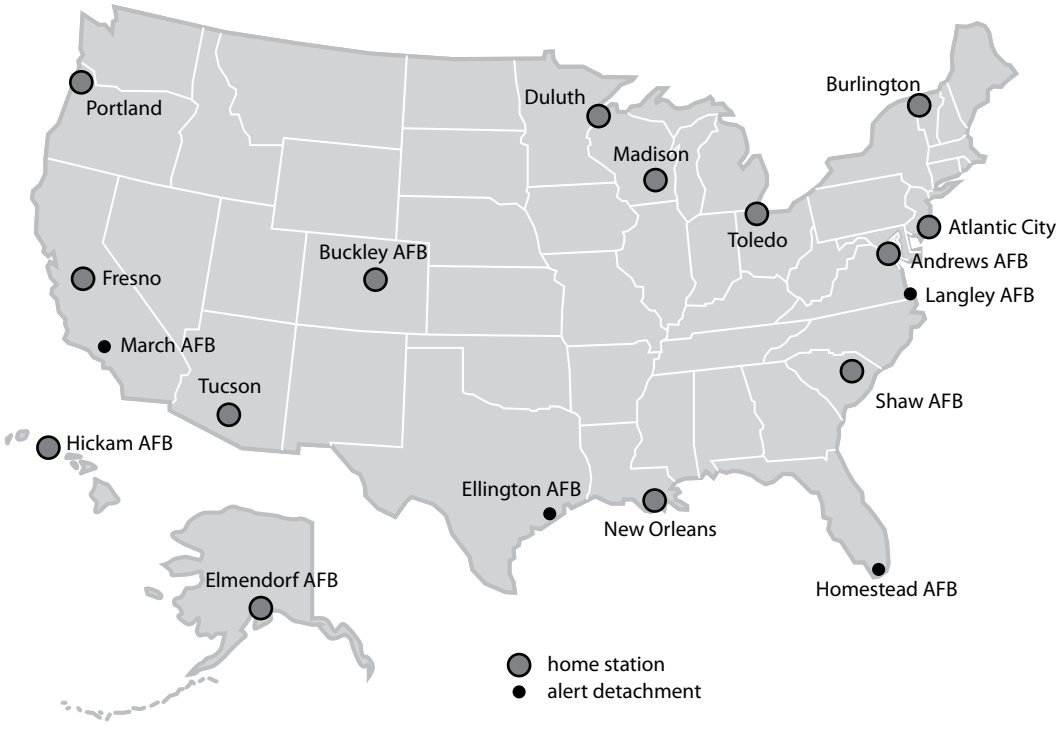


Figure 2. Steady-state air sovereignty alert sites (2008). (Adapted from Government Accountability Office, *Homeland Defense: Actions Needed to Improve Management of Air Sovereignty Alert Operations to Protect U.S. Airspace*, Report to Congressional Requesters, GAO-09-184 [Washington, DC: Government Accountability Office, January 2009], 13, fig. 3, http://www.gao.gov/new.items/d09184.pdf.)

ian air and space control system, and national decision makers.

Figure 2 depicts both home stations—sites colocated with their associated squadron—and detachments located at another base or airfield separate from the squadron. Originally planned following the terrorist attacks of 11 September 2001, these sites enable fighter aircraft to respond to the vicinity of most major metropolitan areas within 20 minutes.[34] This planning, driven by the threat of hijacked aircraft, also enables ASA aircraft to position themselves optimally during an ICBM's time of flight (30-40 minutes) to launch both upper- and lower-tier interceptors as terminal-phase defense of US territory. In the case of an ICBM launched on a minimum-energy profile from Iran against Washington, DC, the total flight time is slightly less than 33 minutes.[35]

The infrastructure at each ASA site includes aircraft shelters for at least four aircraft, security, living quarters for the pilots and maintenance personnel, and secure, redundant communications. These communication links include ties to the Eastern and/or Western Air Defense Sectors, which monitor the airspace, as well as the local airfield control tower and air route traffic control centers. The 601st Air and Space Operations Center at Tyndall AFB, Florida, plans and monitors all operations within the Continental NORAD Region, maintaining direct communication with NORAD/Northern Command headquarters.[36] Alaska supplies similar capabilities through the

Alaskan NORAD Region, as does Hawaii through Pacific Command.

The time required for the fighters to become airborne following a scramble order varies but usually takes on the order of six to seven minutes.[37] Given an unrestricted climb, fighters configured with two external fuel tanks, two upper- and two lower-tier interceptors, and an infrared tracking pod would typically need another five minutes to climb to an altitude of 15 km (approximately 48,000 feet) and accelerate to supersonic speed. Twelve minutes after a scramble order, the fighters would be 75 km away from their ASA launch base, moving in excess of 20 km per minute—a speed they could sustain for roughly 20 minutes before their fuel supply became a concern. Without performing a supersonic dash, fighters in this configuration could cruise for two hours or more before refueling.[38]

Homeland Defense Scenarios

Two scenarios illustrate potential real-world applications of the proposed ALHK system.

Scenario One

Intelligence analysts receive indications that an adversary plans to launch a ballistic missile from a ship, resulting in a high-altitude detonation of a nuclear weapon over the US east coast. The enemy anticipates that the resulting electromagnetic pulse will disrupt communication and power transmission in major metropolitan areas. He might wish to demonstrate a nascent nuclear capability to deter US involvement in a pending theater conflict or disrupt US force deployments without actual killing or destruction.[39]

Given the threat as described, we would use all of the nation's technical capabilities to find the ship. However, even if we locate it, the vessel could still launch a ballistic missile. For example, transporting a US boarding party to the vicinity may require days. In the interim, the ship could launch a missile once it enters the ellipse depicted in figure 3. After US forces find the ship, they could always sink it with an air strike, but without boarding and inspecting it, we cannot know the intentions of the ship with certainty. Since the scenario postulates a high-altitude electromagnetic pulse attack, terminal defenses would not help even if we knew a specific target and could deploy our defenses in time.

Figure 3. Scenario one: sea-launched ballistic missile threat

Simulating engagement of the threat with an upper-tier interceptor shows that the maximum employment range depends upon the time interval between the threat launch and interceptor launch. The high-altitude electromagnetic pulse scenario constrains the planning to require an intercept no later than 100 seconds after the threat launch.[40] Using existing weather conditions to predict infrared detection (i.e., a cloud-free line of sight between the threat and the fighter) and sufficient tracking time to determine a threat-state estimate (roughly five seconds) prior to launching the interceptor, planners calculate maximum engagement ranges and determine engagement zones for the expected threat region.[41]

Planners use these engagement zones to develop a combat air patrol (CAP) plan that covers the potential threat-launch area. The center of each ellipse in figure 4 roughly represents a CAP point for a single fighter.

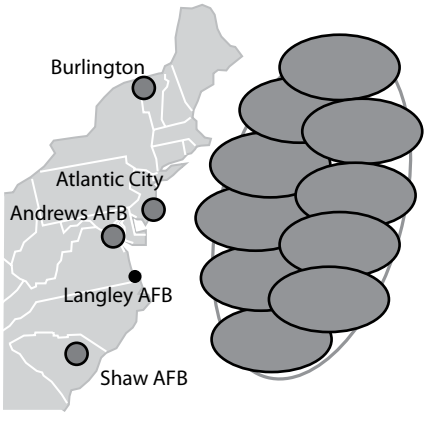


Figure 4. Defense plan for scenario one

Fighters launch from the ASA sites indicated on the map and proceed to the CAP points.

Simultaneously, the Air National Guard squadrons at Burlington, Vermont; Toledo, Ohio; Andrews AFB, Maryland; and Atlantic City, New Jersey, mobilize and, along with the active duty squadron at Shaw AFB, South Carolina, begin preparing additional aircraft for launch. Tanker aircraft on one-hour alert are launched to refuel the alert fighters at the CAP points. After roughly six hours, new fighters launch to replace those on station. This operation could continue for a week or longer if necessary to find and neutralize the threat ship or to determine whether or not it is in the predicted launch area.

Scenario Two

Fighters are on normal ground alert at each indicated ASA site when an ICBM launch from Iran occurs without warning. Initial detection by infrared missile-warning satellites prompts a "quick alert" warning before the missile completes its boost phase. Although tracking accuracy is not yet sufficient to estimate the ICBM's actual target, it does indicate a missile type capable of reaching the United States and an initial azimuth toward the US east coast. At that point, fighters at their bases (fig. 5) receive a scramble order. As the ICBM finishes its boost phase, it also rises above the horizon, as viewed from the Fylingdales space surveillance radar located in the United Kingdom, and a radar track begins. At this point, when it becomes clear the missile is headed toward Washington, DC, a state estimate of the ICBM along with its probable impact point passes through the NORAD system to the scrambling ASA aircraft.

The fighters take off roughly 10 minutes after the ICBM launches and receive the latest ICBM tracking update by data link at roughly the same time. Onboard systems for each of the fighters then calculate an optimal launch point for upper-tier interceptors, and the planes from Toledo and Shaw AFB proceed in a supersonic dash toward their interceptor launch points (fig. 5). Fighters from Langley AFB, Virginia; Andrews AFB; Burlington; and Atlantic City climb and then loiter near their planned launch points. If the threat enters the field of view of the space-surveillance radar sites at Thule, Greenland, and Cape Cod, Massachusetts, updated ICBM tracking information passes to the fighters, again by data link, to refine the interceptor aircrafts' targeting solutions.

Simulations with the upper-tier interceptor show an acceptable interceptor launch area of about 1,000 km cross range and 1,500 km up range from the intended target, an area that 10 of the 12 fighters have reached 15 minutes after their takeoff. Operating at 15 km altitude, well above any clouds, the fighters focus their IRSTS on a search pattern around the predicted position of the threat. At the optimum time, each fighter launches two upper-tier interceptors about 10 seconds apart toward predicted intercept points as the aircrew continues to scan with the IRSTS. As the threat warhead, upper rocket body, and decoys reenter the atmosphere, they begin to heat up, and the IRSTS rapidly detects them. Using intensity patterns and, possibly, spectral signatures observed by the IRSTS to identify potential reentering warheads, the fighters uplink the target designation to the upper-tier interceptors.

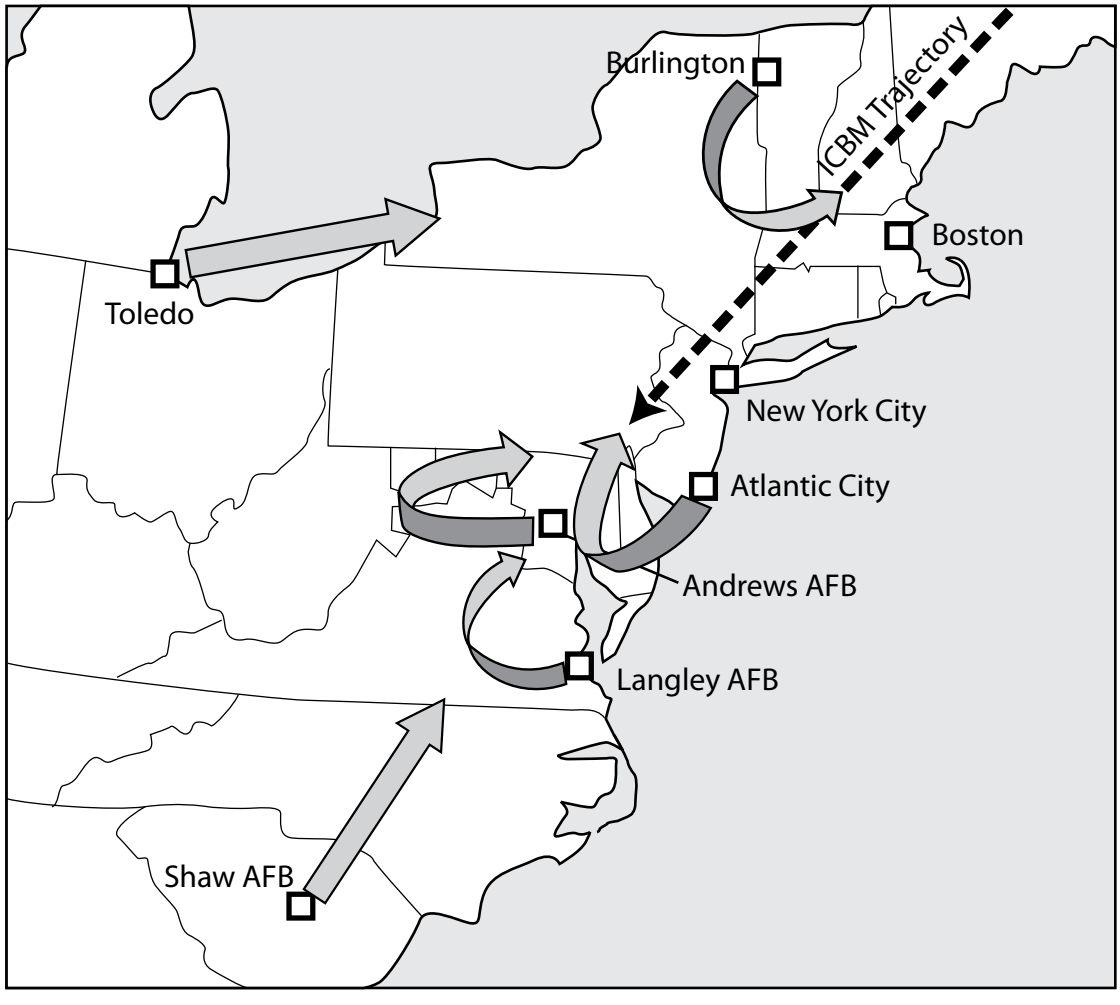


Figure 5. Initial ASA response to Iranian ICBM launch (scenario two)

The geographic areas plotted in the upper part of figure 6 represent the allowable interceptor launch points for an upper-tier interceptor intended to intercept at 100 km altitude (left) and 50 km altitude (right). The region between these altitudes represents the desired intercept zone, characterized by optimal atmospheric interaction for identifying the warhead; moreover, in this area, seeker heating does not require significant cooling measures, and one can avoid atmospheric jet interaction, which complicates maneuvering.[42] This is the "heart of the envelope" for the upper-tier interceptor in a terminal intercept.

The area depicted at the bottom of figure 6 shows allowable interceptor launch points for an exoatmospheric (i.e., midcourse) intercept using only BMDS sensor data. All simulations were limited to ascending interceptor flight paths, but this zone would still have a lower probability of success for the upper-tier interceptor.

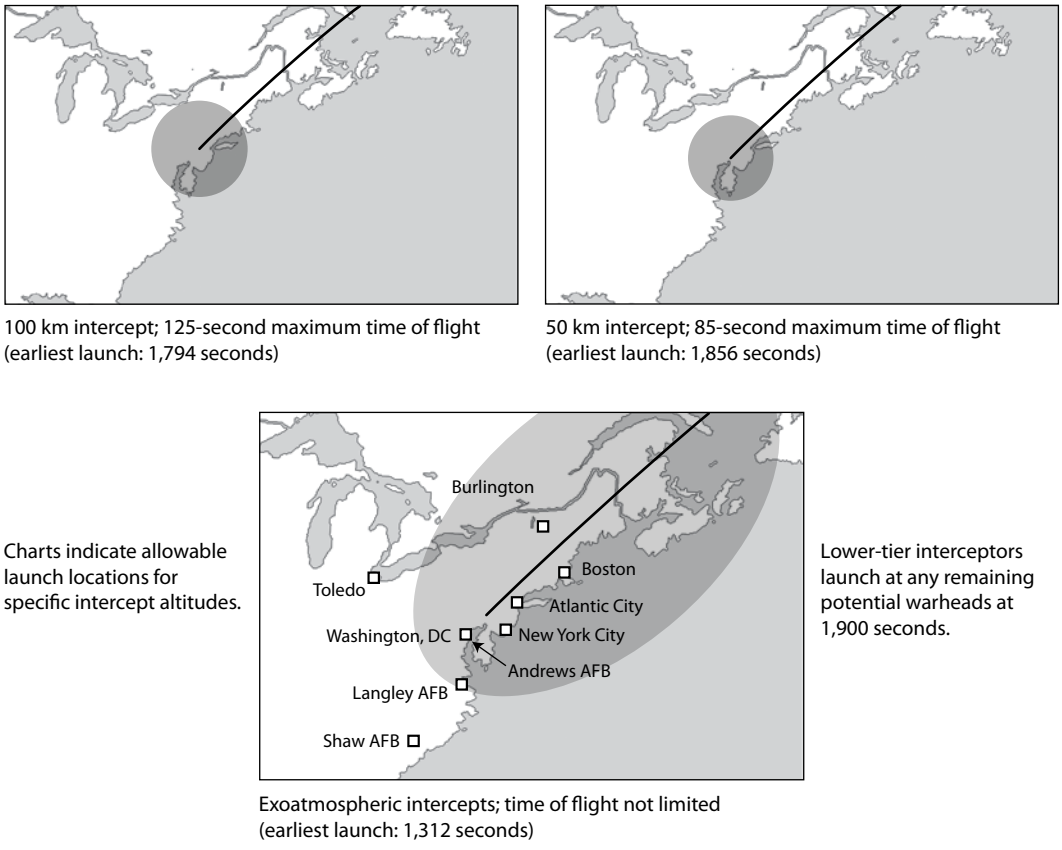


Figure 6. Simulation results for scenario two with upper-tier interceptor. "Earliest launch" measures the time since the ICBM's launch. For example, the lower graphic shows that aircrews may not launch upper-tier interceptors for an exoatmospheric intercept sooner than 1,312 seconds into the ICBM's flight.

Although the differential response to atmospheric heating of individual elements associated with the reentering ICBM provides the principal discriminant for upper-tier engagements, deceleration of reentering objects due to atmospheric drag becomes another discriminating factor for a lower-tier engagement yet also increases the difficulty of performing hit-to-kill intercepts. The midcourse phase of an ICBM's flight diminishes the chances of distinguishing lightweight decoys from the real warhead. Conversely, the terminal phase makes it difficult for those decoys to display the same deceleration profile and thermal response to atmospheric friction as the actual warhead. In essence, finding the right target becomes easier during the terminal phase, but intercepting it becomes harder.

Intercepting an ICBM during the terminal phase can prove challenging because of the missile's tremendous deceleration (more than 50 g's). This deceleration can appear as an evasive target maneuver to the pursuing interceptor. However, on near-inverse trajectories between the interceptor and target, the pursuing interceptor does not see this apparent maneuver, thus making interception possible. Therefore, the challenge in terminal intercepts of ICBMs lies in get-

ting the interceptor on these near-inverse trajectories—which only an air-launched interceptor can do consistently.

A typical ICBM warhead encounters 20 g's of deceleration at 20 km altitude, growing to over 50 g's at 10 km (fig. 7). With a high aspect angle, very little acceleration occurs perpendicular to the interceptor's flight path, enabling even the relatively low lateral acceleration of lower–tier interceptors to engage an ICBM warhead successfully at 20 km altitude.[43] In fact, the authors' simulations show that using only proportional navigation, without requiring ranging to the warhead, allowed lower-tier interceptors to engage successfully at a 20 km intercept altitude if launched within 70 km of the warhead's target—and at a 10 km intercept altitude if launched within 30 km.[44]

During the scenario, fighters from Langley AFB, Andrews AFB, and Atlantic City position themselves within 70 km of the ICBM's intended target (Washington, DC) during the time between their scramble order and the time when they should launch lower-tier interceptors at any incoming warhead that survives the upper-tier engagement.

Figure 8 is a quantitative depiction of the engagement opportunities. Twelve aircraft have scrambled from six separate locations, each plane carrying two upper-tier and two lower-tier interceptors. Ten fighters launch both their upper-tier interceptors, eight of those intercepting the ICBM between 50 and 100 km altitude. Six of these fighters follow by firing two lower-tier interceptors each, yielding a total of 32 possible intercept opportunities. The fighters from Shaw AFB do not reach an acceptable launch point in the time available.

The actual number of interceptors launched in such a scenario depends on

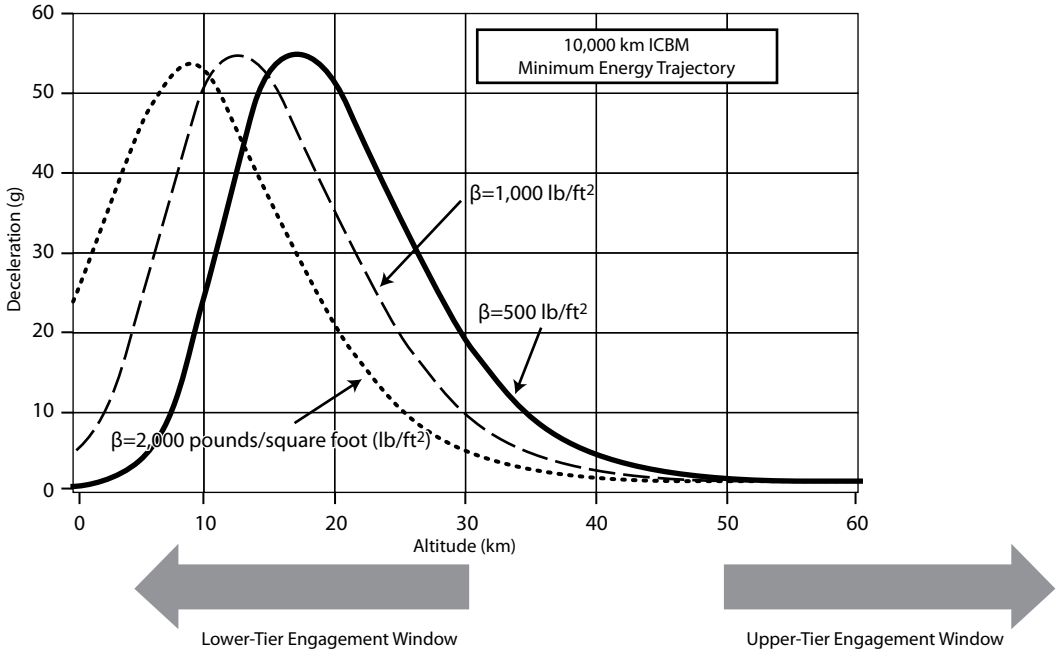


Figure 7. ICBM deceleration profile. Beta (β) refers to a characteristic used to estimate deceleration due to aerodynamic drag. Large β numbers indicate objects that have greater density, less drag, or both. Warheads have a high β number while decoys like balloons or chaff have a very low number.

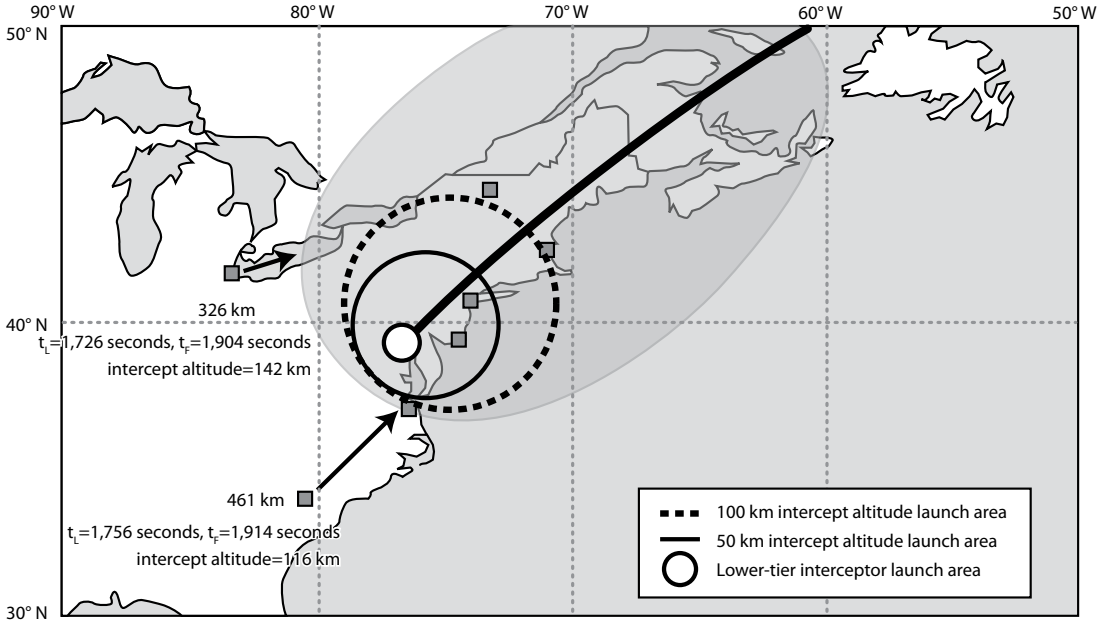


Figure 8. Simulation summary of scenario two. Notations at Toledo and Shaw AFB represent distances to the nearest launch point, elapsed time from the ICBM launch for the planes to arrive and launch upper-tier interceptors (t_L), time from the ICBM launch to the intercepts (t_F), and intercept altitudes.

many factors, including whether we anticipate another ICBM attack and whether the flight of one interceptor might conflict with that of another. However, given the scenario described, all interceptors would probably launch unless we firmly believed that all possible warheads were destroyed prior to the last launch opportunity. In light of preliminary estimates for both upper- and lower-tier interceptors, the total cost of all 32 interceptors would be less than the cost of two of today's GMD interceptors.[45]

What Does All of This Mean?

Distinct probabilities are associated with an aircraft scrambling with all required systems functioning and continuing to function throughout the intercept, the interceptor launching with all systems functioning, and so forth. We can estimate these probabilities analytically but can *determine* them definitively only through realistic operational testing. The Air Force continuously evaluates its planes, pilots, and air-to-air missile systems though a realistic weapon system evaluation program known as Combat Archer, which tests roughly 300 missiles per year and tracks these probabilities for each weapon system.[46] In contrast, the MDA conducted just seven flight tests of hit-to-kill ballistic missile intercepts between October 2008 and April 2010; of those, only two were GMD and only one GMD interceptor hit the target during that period.[47]

ASA aircraft equipped with ALHK would build on the existing US air defense infrastructure and enable homeland defense that we could deploy in minutes if necessary. Compatible with our current fourth- and fifth-generation fighters, this system would provide a terminal-phase layered approach to complement GMD. It would inte-

grate well with the mission and capabilities of the Air National Guard, providing a baseline alert response for surprise threat launches that we can augment by mobilization for heightened homeland defenses or expeditionary deployment.

Because of the interceptor missiles' small size, they cost much less than GMD, perhaps on the order of 5 percent of the unit cost per interceptor.[48] This cost advantage enables higher production rates, which in turn lowers unit expenses even further, which allows more frequent testing, which increases confidence in the system's operational performance.

Imagine our combining the periodic Minuteman "Glory Trip" reliability tests with ALHK operational tests and deploying fighters to Kwajalein or Guam for quarterly employment tests.[49] Imagine the confidence that would build—and for very little additional cost.

System development, like system confidence, must begin with consensus on the CONOPS, with key decisions belonging to the combatant commanders. In most weapon acquisitions, the Joint Capabilities Integration and Development System (JCIDS) establishes the CONOPS and key performance requirements, and the Joint Requirements Oversight Council closely oversees the derived requirements.[50] The MDA, however, has operated with a waiver from the JCIDS process, which allows it to make system acquisition decisions involving cost, schedule, and performance independently of the military services, with oversight by the Missile Defense Executive Board.[51] The *Ballistic Missile Defense Review Report* of 2010 found no benefit in bringing the MDA into the JCIDS or into the full Department of Defense 5000 acquisition reporting process at this time.[52] However, that review also concluded (perhaps prematurely) that the United States currently enjoys protection against limited ICBM attacks.[53]

ALHK could contribute capabilities to other missions beyond missile defense that this article does not address, including very-long-range counterair, electronic countermeasures, very-long-range visual identification, suppression of enemy air defenses, and even space control in low Earth orbit. We need to make decisions regarding trade-offs in these areas from a broader perspective than solely that of missile defense. The *Ballistic Missile Defense Review Report* noted the benefit of further innovation in managing the missile defense program and the fact that the Department of Defense is pursuing the creation of additional hybrid MDA/service program offices.[54] Such a concept could work well with a potential ALHK acquisition, provided the services have a bigger voice in missile defense acquisition programs. To do so and to improve the program's results, the MDA should relinquish its JCIDS waiver and follow the full DOD 5000 acquisition reporting process.

Conclusion

The ability to respond quickly and flexibly to a wide variety of potential adversary developments is critical to preventing any defensive CONOPS from becoming the twenty-first-century equivalent of the Maginot Line. Despite the persistence of fixed defensive establishments, a variety of forces can target them or, as in the case of the Maginot Line, simply avoid them. From the military perspective, enduring value depends upon the ability of any ballistic missile defensive system to respond with little notice and provide capability in a variety of scenarios. As shown in an earlier article by the authors, the ALHK concept would also work against theater missile threats.[55] Allies could participate with their own aircraft, allowing them to make their own investments—in affordable increments—for their own defense.

We gain confidence in a system's effectiveness through reaching consensus on the underlying principles in the CONOPS and through conducting rigorous operational testing in which the operator has no control over the test environment. It is not fiscally possible to obtain statistical confidence in

an operational environment when a single test costs over $200 million, but frequent testing with a much less expensive small air-launched interceptor would generate a high degree of confidence.[56]

Building a missile defense system that inspires confidence starts with a CONOPS grounded in accepted physical principles, demonstrated technology, and war-fighter needs. It progresses with needs optimized from the combatant commander's perspective, balanced against realistic estimates of the cost of development. It then requires competitive prototypes that have undergone sufficient developmental testing to verify the contractor's approach and a commitment to full developmental funding. Finally, it demands competitive source selection and initial production rates sufficient to demonstrate operational performance. Following initial operational capability, it requires an ongoing commitment to incremental improvements and continued operational testing to ensure that confidence remains as systems age and adversaries adapt.

We should reexamine not only the MDA's decision to focus all development funding on midcourse interceptors but also *the decision process itself*. ALHK may not be the best answer, but it represents a path to a system that could build confidence, thus warranting continued development. ✪

Notes

1. George N. Lewis and Theodore A. Postol, "How US Strategic Antimissile Defense Could Be Made to Work," *Bulletin of the Atomic Scientists* 66, no. 6 (November/December 2010): 8–24, http://bos.sagepub.com/content/66/6/8.full.pdf+html.

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September 2001. Although the open literature refers to an immediate readiness posture of 15 minutes, alert fighters typically do much better. On 11 September 2001, fighters from Otis Air National Guard Base, MA, were airborne in seven minutes, and those from Langley AFB, VA, in six minutes.

38. See performance data referenced to Technical Order 1F-15C-1 and TO 1F-16C-1 (dash one) performance tables for representative drag indices and nominal atmospheric temperatures.

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42. "Atmospheric jet interaction" refers to the complex forces resulting from divert thrusters firing into high-speed atmospheric flow around the interceptor, at times creating adverse accelerations.

43. "Aspect angle" refers to the angle between the warhead's flight path and the interceptor's flight path. High aspect angles approach 180 degrees, indicating a head-on engagement.

44. Proportional navigation is a form of interceptor guidance that requires only the relative bearing from the interceptor to the target for determining guidance commands. In essence, the interceptor seeker observes a change in the line of sight between it and its target and maneuvers a "proportional" amount in the direction of that observed movement. When the relative movement in line of sight ceases, the interceptor is on a collision course with its target.

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49. The "Glory Trip" program entails the Air Force's removing operational ballistic missiles from their silos, removing their warheads, and shipping the missiles to Vandenberg AFB, CA, for a test launch. The Air Force does this about once per quarter to demonstrate ICBM system reliability.

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We Were Deans Once . . . and Young

Veteran PME Educators Look Back

Dr. James W. Forsyth Jr.*
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The publication of a book chapter titled "Professors in the Colonels' World" by Daniel J. Hughes, a retired Air War College professor, began a debate regarding the quality and future of professional military education (PME) in the US Air Force.[1] The chapter sparked a lively exchange on journalist Tom Ricks's widely read *Foreign Policy* blog *The Best Defense*.[2] Among his most serious charges, Hughes claims that Air Force PME is hamstrung because its major educational institutions, particularly Air War College (AWC), are led by senior leaders with little or no academic background. He further claims that the military faculty members at these schools are at best ill prepared for their educational tasks and at worst openly hostile to academic enterprise. Finally, Hughes argues that academic standards and scholarly rigor are noticeably absent from PME. The culprit? Something one might call the "clash of cultures" that exists between civilian and military faculty. Certainly, serious differences exist between these two groups of people, but are those differences so stark as to make life intolerable? Are they insurmountable? Perhaps, but we think not.

This article represents an attempt to distill some of the observations and lessons we have gleaned through many years teaching within the Air Force, educating the officer corps.[3] Most of our examples come from our time at Air Command and Staff College (ACSC) at Maxwell AFB, Alabama, a school that sits a few hundred yards from AWC. Although every school has its own unique culture, most of the points Hughes raises apply to both ACSC and AWC—indeed, to any military college. We state up front that Hughes is onto something, but his conclusions are a bit overdone. This is an attempt to address some of his concerns.[4] It is not an attempt to refute Hughes's charges point by point but simply to offer a different perspective. We suspect that these observations might resonate with colleagues at other PME schools, anyone interested in Air Force education, and even those in civilian academe.

Most of us who decide to make a career in Air Force education realize that we are not producing academic specialists. Historians in a civilian history department strive to educate and train graduate students to become professional historians and members of the academic guild. A historian who accepts a job at a PME school will teach students who are already credentialed members of a different guild—the profession of arms. These students may not realize it, but they can benefit from exposure to a his-

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torical or theoretical perspective that can give them insight into their profession and inform their decision making. Both are rewarding undertakings, but they are different. And let's be clear: staff and war colleges are hybrid organizations, following many academic conventions but unmistakably military in orientation. If one accepts these conditioning factors, the challenge of educating air, space, and cyberspace professionals seems less daunting.

Schools Only as Good as Their Faculty

Like the international environment, PME has undergone a series of dramatic changes during the past two decades. It no longer focuses on teaching just the mechanics of officership, narrowly defined in terms of leadership or staff skills, as well as the fundamentals of airpower doctrine and application. The men and women attending today's service colleges are steeped in history and international relations, together with joint, interagency, and multinational operations. Studies on peacekeeping, human rights, and military intervention have shored up obvious security concerns such as terrorism, failed states, and interstate war. Officer education has made strides in becoming more theoretically and practically sound, but as Hughes makes clear, serious issues and challenges face students and faculty, the most important of which is the quality of faculty.

What makes for a great school? It's the amalgam of teachers and students. As Hughes notes, in PME we are fortunate to have students at the top of their year group. They are professionals with years of accomplishments behind them and bright futures ahead. Most will go on to serve as colonels, and some attain flag rank.[5] Yet their assignments to Maxwell can be a difficult task for them: "Put down your weapons, spool down the jet, and return to school." They have much to learn and sometimes even more to teach, yet we suspect, like Hughes, that many would prefer to be elsewhere. These warrior-students are exceptional people, but while they are here with us, they are students first and foremost. This distinction is worth emphasizing. Students are here to learn; networking and recharging batteries can be part of the process, but they are not why we have a university. This is important to remember, especially when answering the popular philosophical question "What am I supposed to get out of this?" The answer is, whatever you can. Truth be told, some students will get more from their year here than others. This is the inevitable result of nature or choice, but the central point remains that the integration of knowledge is the students' responsibility. The faculty owes them a sound and coherent curriculum.

Without top-quality faculty, little else matters—technology, infrastructure, and even money pale by comparison. When it comes to educating students, a quality faculty is the alpha and omega—and PME is no different. Along these lines, PME has made some strides. Few people are aware of the fact that in 1990 only two faculty members at ACSC had PhDs. By the 2002–3 academic year, the number of individuals holding advanced degrees (including those who had completed all requirements except the dissertation) had grown to 40, representing 38 percent of the faculty.[6] How did that happen? It resulted from years of work, keeping one thing in mind: faculty first.

This became evident at a staff meeting one day nearly 15 years ago when we were discussing student assignments with our new commandant. Listening carefully as the dean of students outlined the process for managing student assignments, he then asked, "What are we doing for the faculty?" His point was well taken. "AFPC [Air Force Personnel Center] will take care of student assignments. Starting today—I'm in charge of faculty assignments." During his tenure, faculty assignments were his priority, with a colonel working them personally. He knew that word would spread and that volunteers would emerge. He wasn't wrong.

From 1998 to 2003 or so, ACSC had an uncommonly high promotion rate to lieutenant colonel—for three or four years it hovered around 100 percent in the promotion zone.[7] What's more, the commandant had devised several attractive assignment options, one of them designed to entice future AWC attendees to spend two years on the faculty at ACSC before attending AWC. The lesson is simple, the implications enormous: to attract a quality faculty, you need to take care of them. Word spread, and quality became a self-fulfilling prophecy. Incidentally, this episode serves as a tonic to Hughes's contention that commandants without formal academic training cannot possess good educational instincts.

In 2000 the desired minimum requirements for faculty duty consisted of resident PME and a master's degree in an appropriate field of study. Though many nonresident graduates enjoyed highly successful faculty tours at ACSC, all things being equal, having experienced a resident program as a student gives a new faculty member a leg up.[8] Moreover, the school equally sought volunteers. Despite some exceptions, the hiring process tried to hold true to those standards. During the years 2000–2004, we received approximately three or four candidates for every faculty hire we made—nonvolunteer, nonresident graduates were virtually extinct. A good number of the military faculty held PhDs. At the same time, ACSC launched an ambitious faculty hiring process culminating in the appointment of approximately 16 civilian professors.[9]

This is not a story of constant improvement, however. Gains vanished, progress stalled, and wheels underwent reinvention. By 2006 the quality of the faculty had slipped considerably. By comparison, approximately 50 percent of today's faculty are nonresident graduates, and a fair number of them are nonvolunteers. Whereas the school used to count on 30 high-quality faculty hires out of each graduating class, the numbers today are in single digits. Moreover, only 30—less than 25 percent—possess the PhD.[10] What accounts for this change? Certainly, the wars in Iraq and Afghanistan have played a significant part. However, there are other reasons: a colonel no longer works faculty assignments, the incentive program disappeared for several years before ACSC and AWC reinstated it, maintaining high standards has proven more difficult, and the process has become something other than a self-fulfilling prophecy.[11]

From our perspective, this is not an impossible situation to remedy. At Air University, teaching in the classroom is akin to flying the jet—everything else supports this mission. Manning the instructor force with nonresident/nonvolunteers without the necessary academic credentials, keeping the best for staff positions, is akin to creaming off the best officers in a flying unit to serve in the command post while the cockpits sit empty. A flying outfit would never tolerate that—and neither should Air Force education.

Core Curriculum Called "Core" for a Reason

The core curriculum of any PME institution generally stems from external and internal guidance. At Air University, external guidance comes from Congress, the Department of Defense, the university, the Joint Staff, major commands, Headquarters Air Force, and the chief of staff himself. Internally, guidance comes primarily from the commandant, the dean, and faculty and student feedback.[12] The point here is that nearly everything happening in the classroom is linked to a requirement. Neither the master's degree nor regional accreditation drives what the schools teach. This is worth mentioning because students, administrators, and even faculty sometimes wrongly associate subject matter with the master's degree—quite simply, if that degree went away, the core curriculum would look much as it does now. It is important to stress, however, that faculty holds this together. The faculty interprets and imple-

ments guidance, has a proprietary interest in the curriculum, and must answer to the various accrediting agencies that visit the university regularly.[13]

Despite popular belief, military organizations exhibit strong biases for change because of the wholesale turnover of commanders and key personnel every few years. Each understandably wants to make his or her mark, but this is a dangerous inclination for curricula. Once in a great while, a massive curriculum revision is warranted (e.g., the ACSC revolution in 1992, led by then-commandant Col John A. Warden III). Educators obviously want to ensure that course materials and readings are up to date and of the highest quality. Yet the basics of a good core interdisciplinary PME curriculum change remarkably little over the years. The core curriculum needs to provide our top officers a structured opportunity for reflection. It should allow them to consider their operational experience in a changing international environment in light of a rigorous examination of history, theory, fact, and analysis—seasoned with a healthy dose of service and joint doctrine/planning. Our schools can do all of that within the confines of the external and internal guidance—perhaps with some finessing, but they can do it.

An educated strategist or commander consists of many things, none more important than a mind that seeks to understand the complexities of humankind—one that recognizes the fragility of civilization and grasps the importance of science and the humanities. Such a mind is conscious of the fact that self-determination and freedom may not be the same thing but nevertheless remain essential elements of social life. This mind is practiced in the art of work well done and strives to build bridges across bodies of knowledge that at first glance appear only loosely related. At the same time, we should also seek, as Clausewitz put it, "to distinguish precisely what at first sight seems fused."[14]

To put those sentiments into play, in 1999 ACSC reorganized into a book-based semester system, the fall term focusing on broadening and the spring on depth. It had become apparent that courses could be redesigned and the faculty reassigned along functional lines—with PhDs teaching within their specialty and war fighters theirs.[15] How did this turn out? During the years 1999–2003, Air Education and Training Command rated the dean's directorate outstanding, the directorate won the Muir S. Fairchild award twice (in 2003 and 2004), the Southern Association of Colleges and Schools accredited the college's master's degree and gave its faculty-management process a rare "commendable" rating, and the chairman of the Joint Chiefs of Staff's Process for Accreditation of Joint Education reaccredited the degree twice. These accomplishments culminated in a visit by the chief of staff of the Air Force, who, after receiving a two-hour briefing on the curriculum, proclaimed, "You've got it right"—one reason, perhaps, that he gave the college an additional 24 faculty and a considerable sum of money to institute his revolutionary force-development initiative.[16] Review of the data gives the impression that ACSC was moving in the right direction, but in less than a year it began to unravel. What happened?

Part of the explanation lies in a bias toward change exhibited by senior leaders whose managerial instincts, though excellent in their respective fields, did not translate well into education. Outside agencies have injected themselves more and more into curriculum decisions; "too many cooks in the kitchen" is a common lament from educators contemplating an elegant way to insert mandatory "modules" dealing with everything from sexual assault to customs and courtesies. This situation is not uncommon, and in contrast to what Dr. Hughes implies, it is not strictly a military problem. One cannot pick up the *Chronicle of Higher Education* without reading of a distressing trend in academe: activities such as institutional research, outcomes assessment, and data collection—formerly relegated to their proper place on the periphery

of the enterprise—have lately tended to crowd into the center. The Air Force has an institutional bias toward metrics, quantification, and stratification. In our time, we have seen experienced course directors unable to teach because they are too busy "evaluating" instructors; well-constructed and highly rigorous courses abandoned because they have low student-approval ratings; and the "relevance" of faculty research scored on the basis of factors unrelated to scholarly merit. Additionally, we have seen countless stoplight PowerPoint charts that measure nearly everything but the quality of the faculty. We should certainly strive to create meaningful metrics, but one ought to recognize the number of qualified faculty as the most meaningful thing one can count on.

Organizing for Success

During our tenure, ACSC organized into 44 seminars, each with a student seminar leader who tended to students' needs inside and outside the classroom. A faculty organized into departments did the teaching. Like a squadron commander, the center of gravity of the entire operation—the department chair—was responsible for building a teaching team from whole cloth, a team that planned, trained, flew, and evaluated the mission. In many respects, the chair position is the most senior "honest" job in PME. As is the case at the wing, the further one moves away from the squadron, the harder it becomes to see and assess mission impact.

Currently, no formal mechanism exists for raising up department chairs from the ranks—no ladder to ensure we are grooming the right breed. As for deans, each year or two the school searches far and wide for a colonel who holds the requisite PhD and who may or may not have spent any time in the classroom. After being in business this long, isn't it time to change that model?

A clear fix begins with teaching—and ensuring teaching excellence, the key to the process, is job one. Regarding our uniformed faculty, the advanced academic degree program—by means of which a major or lieutenant colonel goes through a three-year PhD program at a civilian university—remains the surest route to raising our own cadre of PME leaders. These newly minted military PhDs then continue a rigorous progression through the academic ranks. Civilian faculty, already credentialed, must pass a similar series of tests. First, they serve as course director—time spent directing a core course is essential to learning the ropes. From there, they move into an assistant department chair seat, and if they pass that test, they become department chair. A few will go on to become deans and even program managers. Such a process offers another benefit: military and civilian faculty who endure the same rites of passage tend to develop a healthy mutual respect. Ask anyone in the halls of ACSC to name the best seminar teachers—we guarantee they'll list civilian professors, military academics, and war fighters. Their mix of academic preparation, practical experience, and seminar dynamics marks them as masters of their craft. The idea here is straightforward: we wouldn't trust our children's education to amateurs, so why not hold PME to the same standard?

Old Methods Still the Best

Education is notorious for chasing fads. During our tenure, we routinely fought off some colleagues' impulses to tech-out the classroom, streamline readings, go paperless, and institute "revolutionary" teaching methods. More than a few times, we succumbed to baubles such as "just-in-time faculty development" or "student-driven learning"—and found to our dismay that these labor- and time-saving devices were illusory. We are in complete agreement with Professor Hughes here: high standards must be maintained and defended, however unfashionable they may seem.

Though some of us might balk, Kindle and e-readers may in fact eventually sup-

plant cloth and paper. But make no mistake—in whatever medium they may appear, books have for centuries remained the backbone of advanced education for one very compelling reason: they work. Engaging with an author's argument, weighing the evidence, and connecting the book to other readings and to one's experience—this is the essence of education. The most successful course directors realize that they earn most of their pay by selecting the correct readings. It's no accident that reading well-written books and journal articles makes one a better writer. So we must fight the impulse to assign snippets, summaries, and digests in place of the real thing.

Likewise, classrooms of the future might be our fate but should not be our priority because they will look a lot like the ones from the past. Even the world of distance learning, arguably the most demanding teaching environment, emphasizes replicating the classroom experience, not the other way around. Nevertheless, the desire to create a classroom for the future remains real. Once upon a time, a well-meaning team at ACSC designed such a prototype. It was so cluttered with gadgetry and "smart" accessories that quite some time passed before anyone realized it had no room for the teacher.

In general, the problem with calls for designing "revolutionary methods for learning" and the "classroom of the future" stems from reform movements within public education—"teaching experts" have convinced administrators that critical thinking and levels of learning are more important than content. If there were ever two words we could strike from the English language, they would be *critical thinking*. We watched as the concept moved from obscurity to meaninglessness in the blink of an eye, done in largely by the same "experts" who could not agree on its meaning or importance. *Levels of learning*, another meaningless phrase, has no purpose in education—training, perhaps, but not education.[17] The formula for success in PME is all too familiar: it's content over method, not the other way around. Many have it backwards, insisting that a jazzier way of learning will produce dramatic effects. In fact, blocking and tackling win games, not trick plays. Those who call for more critical thinking are no more in tune with classroom needs than those who call for more "cowbell" in the making of gold records. Reading, thinking, writing, and speaking—that's what we need more of, and that is hard work.

With respect to hard work, few things require more time and attention than honing the writing skills of our students. After years of reading papers that would shock our old high-school English teachers, we have come to some conclusions. Legions of the Tweet generation struggle to compose a coherent, well-written sentence. Let's forgo talk of the five-paragraph essay, elements of exposition, or even grammar. In fairness, the roots of this problem extend back to grammar school. The fact is that too many students arrive on the steps of PME schools as remarkably poor writers—and for many reasons.[18] The most prevalent one seems to be that they do not read much either. Crippled writers are oftentimes crippled readers, and that impairment takes much time to fix. What's more, they are shocked to discover that their writing skills, in a word, stink. Many of them will claim that they never received a bad grade in their lives. That might be true, but it does nothing to temper the facts: in a typical seminar of 12, a few students write well, a few are truly handicapped, and a bunch in the middle write prose so muddled it is painful to read. Of all the "problems" we have seen in PME, this one is paramount and, surprisingly, misunderstood.

An ACSC commandant once insisted that students write a formal research paper (he seemed to recall writing one himself and thought that if he had to do it, so did they). An important part of intellectual growth, writing research papers instills good habits of mind and patterns of inquiry that stay with students throughout their lives. But to produce one requires considerable time and hands-on attention. Back then, we were still

building up the faculty and felt that we did not have the talent to supervise 600 research papers. That fact did not sway the commandant, who remained adamant, so one day we said to him, "Boss, give us two numbers from one to 44." "Six and 33," he replied. We pulled the latest exams from those two seminars and gave them to him to read. The next day he came by. "Are they all like this?" "Yes, sir, they are." Shocked by the poor quality, he began a writing mentor program immediately. To this day, all of the PME schools struggle to improve students' writing; it remains a work in progress. Suggestions include requiring entrance examinations, assigning writing projects designed to produce publishable work, and rewarding superior writers with favorable performance reports. In our years at Maxwell's School of Advanced Air and Space Studies, we have learned the value of multiple writing opportunities, coupled with extensive feedback.[19]

One Faculty, "All In"

Unity of effort, a critical factor in the success of air operations, should apply to education as well. Hughes's critique makes a central point that an unbridgeable gulf had opened up between the military and civilian sides, the leaders and the led. Indeed, a PME faculty is spun from two different yet essential fabrics—the active duty force and civilians. At every opportunity—in dean's calls and department meetings—the phrase "We are ONE faculty!" appeared on a slide or otherwise came into play. To return to our flying-unit analogy, everyone in the building was responsible for generating the sorties—educating students from the stage and in seminar. Not everyone literally appeared in front of the students, but—like the maintainers, munitions folks, life-support personnel, security forces, and so on—everyone knew the mission and played a part in making it happen. Faculty unity is all important. Years before Dr. Hughes's article appeared, some other friends of ours at AWC developed a presentation highlighting the incompatibilities between civilian academic and military cultures. The presentation had good points, but we prefer to concentrate on those things that unify rather than divide us. At ACSC nearly every important leadership position (with the exceptions of commandant, vice-commandant, and student squadron commander) was filled by civilian and military faculty at various times—and this practice continues to the present. Not to put too fine a point on it, but we do not recognize the world that Hughes describes—a Balkanized faculty consisting of civilian "academics" and military "operators," with "ersatz civilian colonel doctors" hovering in between.

Lately, it does seem that academic administrators have grown apart from the teaching faculty, an inevitable occurrence to some extent as spans of control increase and internal and external demands on administrators grow. Yet we must resist this trend. Veteran teachers must accept the fact that serving as administrators will often be part of their careers; similarly, administrators, including the top military leadership, must get their feet wet in seminars. A few times at ACSC, the commandant mandated that everyone in the building would teach at some point. Impractical, some said. Perhaps. But it sent a very good and powerful message.

Even senior leaders must teach. It can be done. At a few—not many—PME schools, commandants and deans lecture in their specialty and make the time to teach at least one course in seminar. Senior leaders do not need to be "the best sticks" in the seminars, but their presence there gives them tremendous credibility with the students and the faculty. Just as numbered air force and wing commanders of flying units fly, so should PME administrators, no matter their rank, teach. There is nothing like the common experience of the seminar to blur distinctions among faculty members.

Senior leaders must also take time to educate themselves about the business. Operators would rightly bristle if a newcomer

asked, "Why do you guys waste so much time mission planning?" and an AC-130 squadron commander would be baffled by the question "How come you people fly only at night?" Yet people often ask us, in all seriousness, why faculty members could not teach every day of the year or why they need time to get ready for class. Certainly a senior leader has no business telling the students, "I slept in that seat when I was here," or the perennial "It's only a lot of reading if you do it." Such academic malpractice does a disservice to Air University. ACSC leadership has the sometimes delicate task of reminding speakers that "this is not your father's PME."

Students: The Only Consumers Who Want to Be Cheated

Lastly, all students seem to prefer teachers who cut corners and hand out high grades like they were candy. How else can one explain the universal joy engendered by the snow day? Nothing pleases youngsters more than not going to school, an attitude that carries forward to college students who insist they must wait no longer than 15 minutes for a full professor to show up for class. No professor, no problem! After many years of reading course critiques, we recognize that student comments such as "Great time management!" often mean "She showed a film, gave us an action-packed 20 minutes, and let us go early!" This is not always the case, but it is mostly true most of the time. However alluring, we must not cave in to the temptation.

This dynamic extends beyond students. Sometimes the senior staff wants to cheat them too. One year at ACSC, during the time to upgrade the leadership program, we happened to have a creative faculty member who had done something like this elsewhere. After we gave him a team of skilled people and the necessary resources, they went to work to build the most comprehensive leadership program ACSC had ever seen. The day came to brief the boss—the lights went down, and they began unpacking a first-rate program complete with new courses, lectures, and writing assignments. When they had finished, they expectantly awaited the commandant's verdict. The boss looked over and said, "Now boys, let's not work the students too hard!" One is tempted to end the anecdote here, but, in fact, the department—military and civilians—went ahead and delivered that first-rate program.[20] The commandant supported it, hard work and all.

Concluding Thoughts

One finds the purpose of PME in the letter "E." On that point, we and Professor Hughes are in complete agreement. Quality faculty, sound curriculum content, and enlightened leadership set the proper tone and get the most out of the civilians, military personnel, and students. No one can deny the importance of education, and the surest way to educate is getting students to read, think, write, and speak—a lot. The faculty represents the key to ensuring the soundness of this process; there are no shortcuts, no magic by which one can bypass hard work and reach an authentic, educated end. And get to the end we must, for the future rests in the hands of those who pass through our doors. Let us never take that for granted. ✪

Maxwell AFB, Alabama

Notes

1. Daniel J. Hughes, "Professors in the Colonels' World," in *Military Culture and Education*, ed. Douglas Higbee (Farnham, United Kingdom: Ashgate Publishing, 2010), 149–66.

2. Thomas E. Ricks, "Need Budget Cuts? We Can Probably Start by Shutting the Air War College," *The Best Defense* (blog), 11 April 2011, http://ricks.foreignpolicy.com/posts/2011/04/11/need_budget_cuts_we_probably_can_start_by_shutting_the_air_war_college.

3. One of us is a retired colonel with a PhD; the other is a civilian professor who has never served in the military. One or both of us were at ACSC from 1991 to 2008. During that time, we both served (at various times) as course director, department chair, vice-dean, and dean of education and curriculum.

4. Readers ought to know that we agonized over this piece for some time, particularly its tone. We do not intend to sound like a couple of old session players blowing their own horns. If that is what you hear, then we missed the mark. Our intention is modest: we saw some good practices along the way, and "here they are."

5. At the School of Advanced Air and Space Studies (SAASS), where we both teach now, approximately 28 percent of our graduates have attained flag rank.

6. One of us was the third civilian PhD hired at ACSC in 1991. See AU-10, *Air University Catalog, Academic Year 2002–2003* (Maxwell AFB, AL: Air University Press, August 2002), 75–80, http://www.au.af.mil/au/cf/au_catalog_2002_03/au_cat_2002-03.pdf. The annual editions of the AU catalog provide valuable information on faculty demographics.

7. Both authors vividly recall the announcements of the results of the promotion lists in the ACSC auditorium. The high promotion rate for ACSC faculty was there for all to see and no doubt helped with recruiting for faculty duty out of the current ACSC class.

8. One should note that Colonel Forsyth did not attend resident intermediate developmental education or senior developmental education.

9. A perusal of the faculty lists published in the *Air University Catalog* from 2000 to 2004 reveals the scope of this effort.

10. AU-10, *Air University Catalog, Academic Year 2010–2011* (Maxwell AFB, AL: Air University Press, October 2010), 264–74, http://aupress.maxwell.af.mil/digital/pdf/book/AU10.pdf. Discussions with current ACSC faculty members and administrators confirmed this impression.

11. In reference to the colonel working assignments, not long ago ACSC had a dean of students who, among other things, worked manning issues directly for the commandant.

12. For an example, see "Guidelines for Academic Year 2000 Resident Curriculum Development," ACSC/DE, 29 January 1999, copy in the authors' possession.

13. Air University is aided by the Board of Visitors, Southern Association of Colleges and Schools, and the chairman of the Joint Chiefs of Staff's Process for Accreditation of Joint Education.

14. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984), 141.

15. "ACSC Academic Year 2000 Curriculum Overview," PowerPoint briefing, 12 July 1999, copy in the authors' possession.

16. "ACSC Modular Curriculum VTC," PowerPoint presentation, 18 December 2002, copy in the authors' possession.

17. Our use of the terms *critical thinking* and *levels of learning* is obviously pejorative. If nothing else, liberal education is a process of developing useful habits of mind and patterns of inquiry. Deciphering what those might be is certainly part of learning how to think critically, but we depart from mainstream advocates of "critical thinking" with regard to the means of developing those skills. For instance, in a widely distributed pamphlet titled "How to Study and Learn," the authors make the following claim: "The skills of critical thinking are the keys to learning every subject." Although this observation may have some validity, its importance is truncated by the other 17 ideas listed as essential for becoming a master student. As mentioned above, master students are a product of reading, thinking, writing, and speaking—that amounts to considerable work, something not mentioned in the pamphlet.

18. Some people have argued cogently that the Air Force, as a highly technical and action-oriented service, tends to attract individuals with little interest in written expression.

19. In a typical SAASS year, a student will write at least 10 essays of 10 pages each and a thesis of 60–100 pages, all extensively critiqued by the mentor, adviser, and reader.

20. Commandant PowerPoint presentation, 16 June 1998, copy in the authors' possession.

Alternative Futures Analysis as a Complement to Planning Processes for the Use of Military Land

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Dr. David Mouat

When I took a decision or adopted an alternative, it was after studying every relevant—and many an irrelevant—factor. Geography, tribal structure, religion, social customs, language, appetites, standards—all were at my finger-ends. The enemy I knew almost like my own side.

—T. E. Lawrence (Lawrence of Arabia), 1933

What transpires outside an installation's perimeter influences mission readiness over the long term. That is why Air Force installations invest heavily in collaborative partnering with off-base agencies to develop plans within a regional context.[1] Ensuring the long-term mission effectiveness of military lands requires that commanders and planners at higher echelons anticipate future conditions, including growth of the regional population and development patterns that may contribute to encroachment.[2] In addition to considering off-base conditions, commanders also recognize that a linear focus in their planning can lead to tunnel vision, leaving the base vulnerable to surprises. How can one counter this potential myopia? This article presents an approach called alternative futures analysis (AFA), which the authors are currently conducting at Nellis AFB, Nevada. The Department of Defense (DOD) has employed this innovative approach at several Army and Marine Corps installations to unveil a variety of plausible regional outcomes or "futures" affecting installation projects. Given the successful application in these test locations, the DOD should apply AFA to any future land use study. This article explains alternative futures, including their development and use, and illustrates how the process works by comparing it to military operational planning. Finally, it examines the utility of this approach for installations—how AFA can enhance current installation-planning processes.

Alternative Futures Analysis

A scenario-based planning tool, AFA improves planning at the regional scale. Ensuring mission sustainability requires comprehensive planning. An effective way to stimulate the planning process involves presenting complex issues in the form of a relatively small number of alternative "visions" of how the future may unfold. Com-

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paring the potential consequences of planned actions against alternative future contexts can provide a basis for discussion among planners and give commanders more information as well as a better understanding of the effects of uncertainty upon decision making.[3]

Scenarios are outlines of events—plausible, fictional plots for the future "constructed for the purpose of focusing attention on causal processes and decision points."[4] Leaders commonly and informally use scenarios to evaluate individual and organizational performance against a range of likely variables, or to "chair-fly" a key policy or practice through a complex, imaginary environment. Scenarios in the alternative futures context contain more carefully defined sociological, political, and environmental factors on which planners can build adaptive policies. The scenarios integrate what is occurring and what may come to pass in the region of an installation; they give decision makers a glimpse of futures that differ from the extrapolated present, which is the typical default "trend future." Blindly relying on a trend future built upon assumptions that might expose the installation to surprises is shortsighted.

Scenarios also offer a context for discussing planning options on base and with regional stakeholders. One can use them as an evaluation tool for predicting shortfalls and inherent inflexibilities before a project begins. The cross-disciplinary planning dialogue integrates typically isolated expertise ("stovepipes") within a single, structured planning framework. Using AFA, planners can integrate information from each planning discipline to build and execute detailed scenarios with concise, measurable, and plausible outcomes. As a result, decision makers can then consider the implications of plans in more concrete, less abstract terms.[5]

This methodology, currently under development at Nellis AFB by a team of external researchers and the Nellis Public Partnerships Office, has proven useful to military and civilian communities as they optimize military infrastructure projects against the backdrop of potential future conditions.[6] The figure on the next page indicates where recent AFAs have been performed.

The AFA process involves describing what the future *could* become (rather than predicting what it *will* become) so that leaders can fashion courses of action (COA) today that address a *range* of potential futures.[7] Planners enumerate multiple possible scenarios, and the alternative futures provide a means whereby military planners can compare how various factors might influence or encroach upon training operations, facility development, and possible base expansion. Rather than generate probabilities for occurrence, as does statistical forecasting, AFA contrasts one future with another to establish a basis for evaluating relationships among system dynamics, policy choices, and potential consequences. No uniquely optimal set of alternative futures exists; the best set reveals a wide range of possible outcomes that evoke creative, forward-looking plans to cover the broadest range of intersecting futures.

Generating Scenarios and Alternative Futures

Developing alternative futures is a two-step process. Planners develop scenarios for how the future could unfold and then spatially allocate alternative futures based on the trajectory of each scenario.

The premise for an alternative futures study is that landscape change and resultant modifications in elements of the ecosystem and socioeconomic systems, as well as military training and support infrastructure, stem from alterations in regional land use patterns, usually related to changes in urban growth. Therefore, AFAs focus on potential variations in land use and land cover, together with the way these affect the installation. Useful scenarios clarify the most important ambiguities for the future—conditions that commanders may not be able to influence but may need

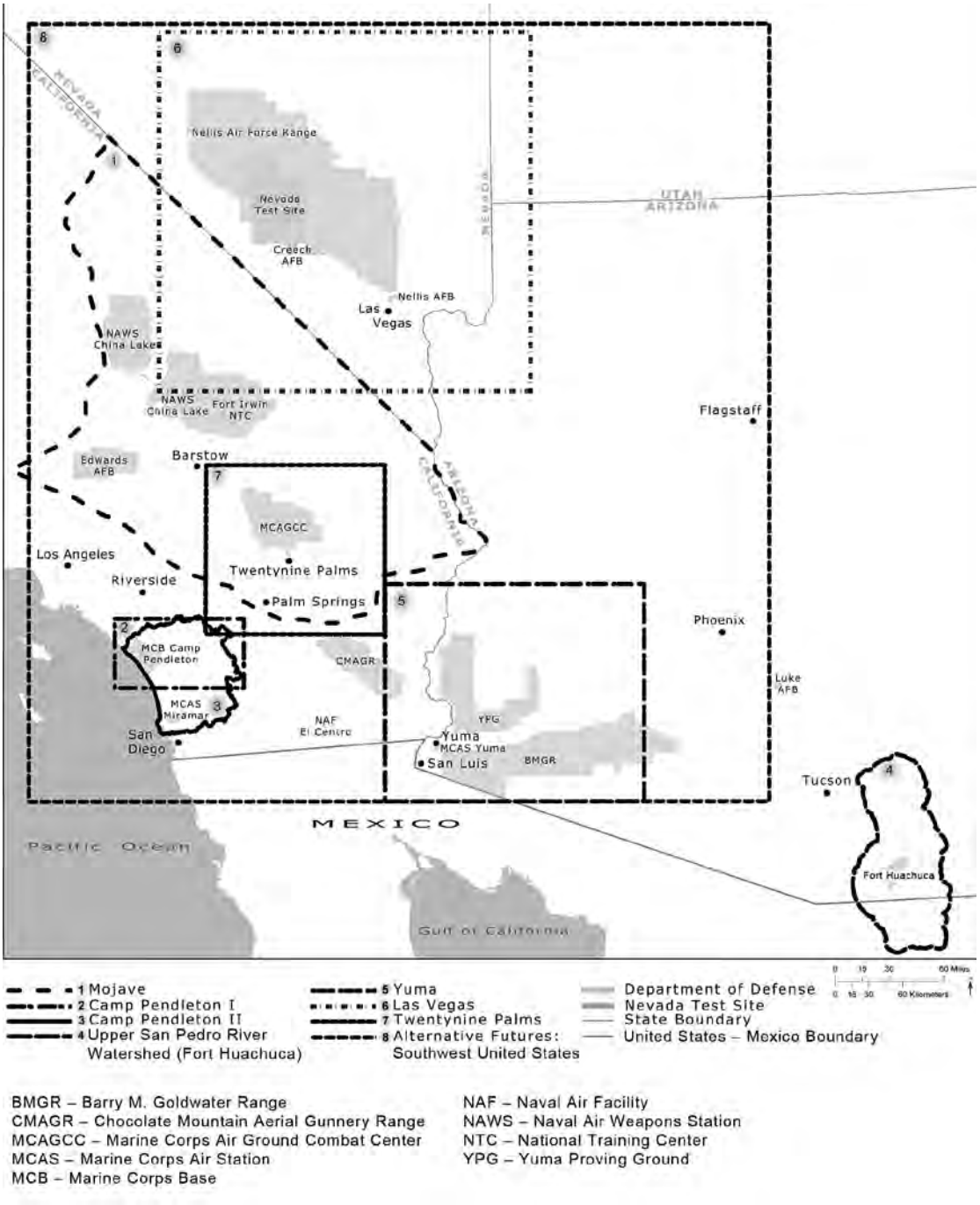

Figure. DOD-oriented alternative futures analyses in the southwestern United States

to cope with. Scenarios can be normative, emphasizing trajectories toward desired goals, or exploratory, examining possible challenges on the horizon.[8]

Understanding the major drivers of transformation in the region enables planners to generate realistic scenarios and explore critical choices that could influence the future. Demographic trends are fundamental drivers of change, as are trends in technology and the economy. Unlike the procedure in trend analysis, planners must also sort through the potential for (and implications of) abrupt shifts in factors ranging from social attitudes to climate change. Critical uncertainties are the most potentially significant of these forces—events that, should they occur, might strongly influence the future of the region; however, planners are fundamentally uncertain about whether or how these events will unfold. One can frame critical uncertainties with questions about, for example, the region's having sufficient water and energy to support military training or about government regulations being more or less restrictive than at present.[9]

Presenting complex issues in the form of several scenarios can lay bare conflicts, inconsistencies, and uncertainties, and reveal how the actions and policies of neighboring land managers might affect an installation's mission over time.[10] Local government actions can influence the patterns of urban growth, including development that might encroach upon military training lands. These government interventions are often reactions to trends (or, conversely, sudden shifts) in the social, economic, and cultural landscape.

The process for scenario development entails working with military planners and regional stakeholders to develop a set of scenarios that incorporate multiple influences upon an installation's infrastructure, support, and military-training operations. The basic framework consists of six steps: (1) specifying focal issues or decisions, (2) identifying driving forces of local and regional change, (3) ranking the factors of change by importance and uncertainty, (4) using the most potentially significant and uncertain forces to frame the logic of the future, (5) fleshing out the scenarios, and (6) assessing their implications.

Steps one through three develop through workshops, questionnaires, or guided surveys designed to elicit stakeholder opinion. In this process, planners may include managers of installation resources and facilities, military operations personnel, representatives of higher headquarters, representatives of a regional planning agency, and members of advocacy groups.[11]

Examining a variety of scenarios can reveal strategies for promoting desirable outcomes across a range of possible futures. Having an array of scenarios helps prevent tunnel vision, and leaders can concentrate on critical decision points. Commonly, a group initially develops a rather large set of potential scenarios and then condenses them into a manageable few—typically three to eight which capture the most important uncertainties spanning the range of conditions that the installation and surrounding region might face.

Planners then establish a "future" associated with each scenario. Whereas one may view scenarios as plots or story lines, futures are "snapshots" of specific points along the story line (often 20–30 years into the future).[12] Applying the term *alternative futures* to the set of futures connotes the implicit comparison among them. Divergent scenarios present a range of conceivable trajectories that a system might take, but carrying each scenario to a logical conclusion reveals the consequences of choices and provides a tangible vision of an installation and its neighbors operating within transformed circumstances at a future point in time.[13] Planners compare the alternative futures to one another relative to the effects upon valued resources. For military studies, such effects often include encroachment upon military facilities and training activities, as well as other factors (see table).

By examining scenarios and their resultant alternative futures, commanders, planners, and regional land use managers can

Table. Factors typically considered in alternative futures analysis

Society	*Military*	*Biophysical*
Social Trends	Training-Range Capabilities	Land Cover
Cultural Trends	Base Population	Hydrology
Economic Trends	Flight Routes	Biodiversity
Politics	New Weapons Systems	Air Quality
Demographic Trends	Encroachment	Soils
Urbanization	Regulations	
Aesthetics		
Regulations		

better interpret consequences associated with policies and take action to ensure mission sustainability. The desired outcomes from the AFA process include enhanced understanding of several factors important for planning:

- drivers of change (major trends and forcing factors)
- alternative patterns of land use, mission activities, and resultant effects
- long-term planning needs (for installation and region)
- increased capacity for collaboration and consensus
- mission sustainability

Processes for Military Operational Planning

Although it represents a new method for planning at installations, AFA shares principles with military operational planning. To present AFA in familiar terms, the following discussion compares it to two military operational planning processes—intelligence and war gaming.

Intelligence

AFA is analogous to intelligence preparation of the battlespace (or battlefield) (IPB), the decision-support process for understanding the battlespace and the options it presents to friendly and enemy forces. IPB is a systematic, continuous process of analyzing enemy capabilities and the environment in a specific geographic area. The products of IPB become part of an intelligence estimate used as a reference by various staff disciplines (such as logistics and operations) to develop staff estimates of the situation and COAs. The IPB process enables the commander to apply and maximize combat power selectively at critical points in time and space.

The first step in IPB, defining the battlefield, focuses the process by identifying aspects of the environment that could influence both friendly and enemy forces. Describing battlespace effects, the second step, entails an in-depth evaluation of the constraints and opportunities offered by the environment. In the third step, intelligence planners concentrate on the capabilities and behavior of the enemy forces, such as size and weapons systems available and the way they organize for battle. Incorporating the results of IPB into COA development ensures that each friendly COA takes advantage of the opportunities offered by the environment and threat situation.[14]

Just as IPB emphasizes aspects of the environment and enemy capabilities that most influence the mission, so does AFA address factors that propel the current system (key drivers) as well as those not yet

understood (critical uncertainties).[15] IPB assembles intelligence from a variety of sources to define constraints and opportunities relevant to operational planning; similarly, AFA draws upon diverse information sources to define constraints and opportunities useful in planning for base facilities and range management. Furthermore, IPB informs staff planning during development of an operations plan in much the same way that AFA informs staff planning (as examined in the Nellis AFB case study, below). Although AFA takes more time to employ than does IPB, the processes are similar.

War Gaming

AFA resembles war gaming in several ways. The war game helps the commander identify strengths and weaknesses, associated risks, and asset shortfalls for each COA. During the war game, the staff assembles information from IPB as well as other sources and "fights" the set of enemy COAs (developed during the IPB process) against each friendly COA. The war game proceeds according to an event matrix, not unlike a scenario story line. Matching each friendly COA against each projected enemy COA, the game enables refinement of staff estimates and recommendation of the optimal friendly COA to the commander. War gaming stimulates the staff to consider ideas and insights from new perspectives.[16]

The process whereby AFA assembles information is similar to but usually more protracted than that employed in war gaming. Alternative futures analysts use techniques such as questionnaire surveys, planning "studios," and facilitated workshops based on a Delphi approach—a method developed by the RAND Corporation in the 1960s to make effective use of informed, intuitive judgment. The study team distributes questionnaires to a participant group and compiles the responses, returning the results to participants *without attribution* for additional consideration in light of the group responses. The iterations continue until the group reaches consensus (or until additional convergence of opinion is unlikely).[17]

Analysts use the input gathered to identify focal issues and to rank factors of change by importance and level of uncertainty. They identify the critical uncertainties to frame the logic of the scenarios—"What are the most important variables to examine?" In this context, one can view the Delphi approach as an analog for war gaming. Both activities are iterative, facilitated processes for assembling and scoring expert opinion and facts drawn from multiple disciplines.

Much as war gaming examines the relative strengths and weaknesses of COAs, AFA examines key drivers and critical uncertainties to frame scenarios, defining direction and the pace of change. In essence the process presents a geographic vulnerability assessment that can help planners and stakeholders understand the implications of land use choices and tailor the development of COAs to address these futures.

Notional Case Study: Nellis Air Force Base

To demonstrate how one performs an AFA, this article now examines a notional case study—notional because the results of an alternative futures study currently under way at Nellis AFB are not yet available.[18] Details of the research design and the results of that study will appear upon its completion. In the meantime, however, we explain the conduct of the study and anticipate application of the results to installation planning processes.

The research team and representatives from Nellis AFB identified regional stakeholders from a broad range of interests. The team and base personnel met with the stakeholders several times to explain the study process and begin assembling the data necessary for analysis, collecting their input using an e-mail survey instrument that followed the Delphi approach. Stakeholders submitted their views regarding ex-

isting conditions and the future of the region. Concurrently, the research team assembled quantitative and spatial data concerning regional socioeconomic and environmental conditions.

The team generated a set of scenario narratives describing possible changes during the years 2010 to 2040. The scenarios were defined by the key trends and critical uncertainties identified and prioritized by the Nellis AFB team and the stakeholders. Analysts designed the scenarios to explore causal processes and identify key decision points. The figure included earlier in the article depicts the study area—the context area of Nellis AFB; Creech AFB, Nevada; and their training ranges.

Analysts created alternative futures for each scenario, using urban development models to define changes in land use. This process evaluated the attractiveness of available land for development and allocated changes in land use according to model assumptions in keeping with the logic of the various scenarios. The research team then examined these alternative futures for the effects of potential encroachment upon the installations, flight routes, and training ranges, as well as their differential effects on hydrology, biodiversity, and other factors important to installation planners and regional stakeholders. This brief explanation of the study process provides a basis for discussing how the commander and staff of Nellis AFB might use the results.

Encroachment Management

At the establishment of Nellis AFB, many miles separated it from Las Vegas; however, urbanization has crept up to the base perimeter and appears likely to continue to encroach upon the installation, causing problems. The latter include civilian use of airspace interfering with military training, development occurring too close to flight paths, and the construction of infrastructure such as power lines and towers that jeopardize low-level flight.

The Public Partnerships Office at Nellis (in coordination with planners at higher echelons) could use the study to employ strategies for managing "encroachment partnering" and to acquire buffer lands. In these processes, the installation enters into partnerships with agencies or conservation organizations to obtain real estate interests that prevent incompatible uses of the land. Such interests often entail restrictive easements. Another approach, taken by the Joint Land Use Study program, involves installations issuing community-planning assistance grants to help state and local governments better understand and incorporate into their planning the technical aspects of studies on an air installation's compatible-use zones (air and/or range) and on operational noise management.[19]

Importantly, the acquisition of buffer lands preserves significant off-base habitats, potentially alleviating the pressure of environmental encroachment and ameliorating possible regulatory restrictions upon military training. Nellis AFB could use alternative futures to examine how nearby land use might change, thus obtaining insight into prioritizing encroachment partnerships and land acquisitions.

Management Planning for Range Complexes

Installations develop management plans for range complexes in order to sustain the capabilities of military training ranges. One aspect of this planning has to do with identifying and establishing baseline requirements for range maintenance—a baseline used to justify funding and resources necessary to sustain the range and training-area complex.[20] Nellis could use AFA to provide context concerning how its ranges and the surrounding lands might change over time. Such information could facilitate prioritization of requirements for range maintenance relative to projected future conditions, potential sources of encroachment pressure, and fiscal constraints.

Comprehensive Planning for Installations

Scenarios and alternative futures can prove useful to facilities and infrastructure planners at the installation and higher echelons. Long-range facilities-development plans represent a long-term investment strategy for developing an installation's physical plant and training lands to support the military mission.[21] Regulations emphasize the vital relationships among component plans that address sustainable range planning, management planning for real-property assets, environmental planning, and sustainable design and development. Installations coordinate such planning with the local community and must account for regional development and change, identifying strategies for addressing sustainability issues and possible effects on the base's mission.

AFA generates the baseline data and context for any alterations of these same parameters. The assessment of how the region may change over time can inform assumptions about facilities planning and key components of comprehensive planning such as transportation, environment, future development, and encroachment. Knowledge gained through scenario development can assist the Nellis staff in prioritizing specific projects.

Additionally, AFA could enhance comprehensive planning by graphically depicting the multiple ways in which the surrounding community and region might alter over time, presenting new challenges or opportunities to the installation. In this case, planners could check the plan against each future, performing a vulnerability assessment based on the dictum that a plan designed to be robust enough to accommodate multiple potential futures is superior to and more resilient than a plan that considers only the trend future.

Integrated Natural Resource Management Planning

Like all bases with terrain that supports significant natural resources, Nellis AFB implements integrated natural resource management planning (INRMP), basically a master plan for natural resources.[22] Analysis of plausible futures can assist in goal setting and choosing the means to realize those goals by emphasizing key system drivers and critical uncertainties. Robust strategies would posture the installation adaptively, with the installation formulating exploratory policies and monitoring programs to address unknowns and standing ready to meet a range of future possibilities, as projected within the alternative futures. AFA conveniently fits within the INRMP process. Managers at Nellis could use AFA during the next five-year update to their INRMP.

Programmatic Environmental Consultation

Programmatic agreements for conserving wetlands and habitats offer a means of consulting efficiently with regulatory agencies by bundling a number of resources for regulatory consultation and the issuance of permits. For example, a single umbrella Biological Opinion or Clean Water Act permit could identify and manage all endangered species or wetlands subject to effects produced by military training or infrastructure. However, regulatory agencies might require that the base undertake a comprehensive assessment of the potential impact upon natural resources, as well as the cumulative effects of change over time. Such an assessment would allow the agency to certify that the agreement would not put resources in peril. If Nellis AFB were to engage in this sort of compliance strategy, it could use AFA to supply the regional context for such an assessment.

Higher-Echelon Planning Processes

The perspective gained through AFA may prove particularly relevant to planners and program managers at the major command or service headquarters level—individuals tasked with addressing issues defined by greater temporal and spatial scales than installation commanders must deal with. Although these planners and program

managers play a vital role in planning at the installation level, they are also responsible for planning among installations and training ranges at the regional level. Therefore, regional studies might be especially valuable for integrating plans and programs among bases and across service (and agency) boundaries. In fact, state and federal agency representatives participating in the Western Regional Partnership, led by the Office of the Secretary of Defense, desire this sort of utility from an ongoing alternative futures study that encompasses the Southwest Range Complex—an integrating, large-scale analysis that will anchor the installations within a coherent, albeit dynamic, context.[23] Such a study has the goal of enabling leaders and program managers to envision future support requirements for the training of military forces across a complex of bases, ranges, and operating areas in an altered landscape at some point in the future.

Conclusions

The methods employed in conducting an AFA are similar in process and function to those currently used by military operational planners; for this reason, they complement existing planning processes at installations especially well. Since AFA can stimulate cross-discipline planning, it is particularly useful in bridging the stovepipes of traditional staff functions and in integrating disparate facilities, operations, and environmental-planning activities.

Commanders and planners can use AFA to examine how to orient an installation's internal planning process to accommodate changes, both gradual and abrupt, within a region and to determine the most valuable strategic relationships as the future unfolds. Moreover, such analysis can integrate plans across spatial and temporal scales, assimilating regional perspectives and addressing long-term prospects of interest to major commands, headquarters, and interservice coordination. AFA enables planners to assemble an array of plausible futures and determine whether plans in use today are robust enough to encompass the implications of each alternative future. Commanders may direct proactive measures to pursue or avoid particular futures.

Granted, a few military installations have used AFA, but the Air Force would benefit by employing it more widely. Future efforts in this area of research should focus on methods for doing so in an efficient and economical manner. ✪

Reno, Nevada

Notes

1. For collaboration requirements and plans, see US Department of Defense, *Resources for INRMP Implementation: A Handbook for the DoD Natural Resources Manager* (Washington, DC: Legacy Resource Management Program, 2005), http://www.denix.osd.mil/nr/upload/INRMP_Handbook_September2005_highres.pdf. See also John S. Thomas, "Ecosystem Management on Military Bases" (PhD diss., George Mason University, 2004), 90–93; Allan W. Shearer et al., *Land Use Scenarios: Environmental Consequences of Development* (Boca Raton, FL: CRC Press, 2009), 37–39; and Department of Defense Directive (DODD) 3200.15, *Sustainment of Ranges and Operating Areas*, 10 January 2003, http://www.dtic.mil/whs/directives/corres/pdf/320015p.pdf.

2. Allan W. Shearer et al., "Examining Development-Related Uncertainties for Environmental Management: Strategic Planning Scenarios in Southern California," *Landscape and Urban Planning* 77, no. 4 (September 2006): 360. See also Shearer et al., *Land Use Scenarios*, 38; and Thomas, "Ecosystem Management," 270–81.

3. For background on scenario studies, see Peter Schwartz, *The Art of the Long View: Planning for the Future in an Uncertain World* (New York: Doubleday, 1991), 29–117. For discussion of support to decision making, see Shearer et al., "Examining Development-Related Uncertainties," 362, 378–79.

4. Schwartz, *Art of the Long View*, 3–6; and Shearer et al., "Examining Development-Related Uncertainties," 362. The quotation is from Herman Kahn and Anthony J. Wiener, *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years* (New York: Macmillan, 1967), 6.

5. Shearer et al., "Examining Development-Related Uncertainties," 362.

6. Researchers from the Desert Research Institute (Reno, Nevada), the University of Nevada–Reno, and the University of Texas–Austin are conducting the ongoing project. For the Camp Pendleton and Marine Corps Air Station Miramar study, see Shearer et al., *Land Use Scenarios* as well as Carl Steinitz et al., *Biodiversity and Landscape Planning: Alternative Futures for the Region of Camp Pendleton, California* (Cambridge, MA: Harvard Graduate School of Design, 1996). The Fort Huachuca study is the subject of Carl Steinitz et al., *Alternative Futures for Changing Landscapes: The Upper San Pedro River Basin in Arizona and Sonora* (Washington, DC: Island Press, 2003). Ongoing studies by the authors' research team involve the Barry M. Goldwater Range, Marine Corps Air Station Yuma, the Marine Corps Air Ground Combat Center, and Yuma Proving Ground.

7. Shearer et al., "Examining Development-Related Uncertainties," 379–80; and Garry D. Peterson et al., "Assessing Future Ecosystem Services: A Case Study of the Northern Highlands Lake District, Wisconsin," *Conservation Ecology* 7, no. 3 (January 2003): 1, http://www.ecologyandsociety.org/vol7/iss3/art1/print.pdf. For simplified, concise examples of scenarios supporting management programs, see Brian Walker and David Salt, *Resilience Thinking: Sustaining Ecosystems and People in a Changing World* (Washington, DC: Island Press, 2006), 53–63.

8. Shearer et al., "Examining Development-Related Uncertainties," 363; and Walker and Salt, *Resilience Thinking*, 102.

9. Shearer et al., "Examining Development-Related Uncertainties," 365.

10. Ibid., 363.

11. Ibid.

12. Ibid., 379.

13. Ibid., 363.

14. Field Manual 34-130, *Intelligence Preparation of the Battlefield*, 8 July 1994, chap. 2, http://www.fas.org/irp/doddir/army/fm34-130.pdf; and Joint Publication (JP) 2-01.3, *Joint Intelligence Preparation of the Operational Environment*, 16 June 2009, https://jdeis.js.mil/jdeis/new_pubs/jp2_01_3.pdf.

15. Shearer et al., "Examining Development-Related Uncertainties," 365.

16. JP 5-0, *Joint Operation Planning*, 26 December 2006, sec. 3, https://jdeis.js.mil/jdeis/new_pubs/jp5_0.pdf.

17. For a discussion of the Delphi approach, see Olaf Helmer, *Analysis of the Future: The Delphi Method*, no. P-3558 (Santa Monica, CA: RAND, March 1967), http://www.rand.org/content/dam/rand/pubs/papers/2008/P3558.pdf. For a description of various methods for eliciting stakeholder input and developing scenarios, see Shearer et al., *Land Use Scenarios*, 69–77.

18. Researchers at the Desert Research Institute, the University of Nevada–Reno, and the University of Texas–Austin are conducting the Alternative Futures of the Southwest Range Complex study, funded by the Office of the Secretary of Defense and managed by the US Army Corps of Engineers Combat Engineering Research Laboratory.

19. Regarding easements and land use, see the Trust for Public Land, *Department of Defense Encroachment Partnering*, accessed 20 November 2010, http://www.tpl.org/what-we-do/policy-legislation/federal-funding-programs/department-of-defense.html.

20. See DODD 3200.15, *Sustainment of Ranges*.

21. See USAF Directorate of Engineering and Services, *Long Range Facilities Development Planning Bulletin*, August 1989, http://www.afcee.af.mil/shared/media/document/AFD-070924-059.pdf. See also par. 2.6 of Air Force Policy Directive (AFPD) 32-10, *Installations and Facilities*, 4 March 2010, http://www.e-publishing.af.mil/shared/media/epubs/AFPD32-10.pdf; and AFPD 32-90, *Real Property Asset Management*, 6 August 2007, http://www.e-publishing.af.mil/shared/media/epubs/AFPD32-90.pdf.

22. Required by Title 16, *United States Code*, sec. 670, Sikes Act, http://www.fws.gov/endangered/esa-library/pdf/2004SikesAct%20NMFWA.pdf, INRMPs are prepared according to Air Force Instruction 32-7064, *Integrated Natural Resources Management*, 17 September 2004, http://www.e-publishing.af.mil/shared/media/epubs/AFI32-7064.pdf.

23. The Office of the Secretary of Defense, with other state and federal partners, formed the Western Regional Partnership. See Western Regional Partnership, accessed 16 January 2011, https://wrpinfo.org/Default.aspx.

We all wonder about ourselves and how we would react to combat. Further, we can hardly doubt that the vicarious experience of reading cannot substitute for the real thing. But we cannot start wars to explore our behavior in them; thus, aspiring leaders must supplement their experience with professional study. Readers who want entertaining but informative reading during temporary duty should carry along *Men at War*. If they desire professional enhancement, then *The Face of Battle* is a better choice.

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Men at War: A Soldier's-Eye View of the Most Important Battles in History edited by Bill Fawcett. Berkley Caliber (http://us.penguingroup.com), 375 Hudson Street, New York, New York 10014-3657, 2009, 336 pages, $15.00 (softcover), ISBN 978-0-425-23013-8.

Men at War is a readable work that will provide the air-warrior with an evening or two of entertaining reading relevant to the military life. As usual, the advertising hype overstates the case, but readers may learn something about the soldier's life from it. Not really a first-person account, the narrative is filtered through the minds of the professional writers of the several chapters. Many are novelists, all write well, and some are better informed on military history than others. The chapters run from Roman times to Vietnam. The one on the Civil War Soldier is the best of the lot. Others include Roman soldiers of antiquity; battling knights of the Third Crusade; a French artilleryman at Waterloo; Soldiers who fought at Gettysburg; a rifleman in the last American battle of World War II; the invasion of France; a Marine in Korea; and a Navy SEAL in Vietnam. Sometimes fiction represents the truth better than formal history, but it is hard to tell. In this work, despite the historical soundness of the story, the reader has difficulty distinguishing fiction from fact. *Men at War* is not as unique as the hype claims.

John Keegan's *The Face of Battle*, one of the classics in this category, covers the Battles of Agincourt and the Somme, as well as one also described in *Men at War*—Waterloo. Possessing top-of-the-line credentials as a military historian, Keegan taught the subject at the British military academy at Sandhurst for many years. His prose is as readable as that in *Men at War*.

Final Countdown: NASA and the End of the Space Shuttle Program by Pat Duggins. University Press of Florida (http://www.upf.com), 15 Northwest 15th Street, Gainesville, Florida 32611-2079, 2007, 264 pages, $24.95 (hardcover), ISBN 978-0-8130-3146-0; 2009, $19.95 (softcover), ISBN 978-0-8130-3384-6.

The space shuttle is an intriguing craft. Part spaceship, part glider, sometimes boxcar or bus, it is a wondrous vehicle. Originally billed as the new vehicle to carry Air Force satellites, the shuttle came into its own in 1993 by transporting segments of the International Space Station as that program took off. The shuttle's life is complex and multifaceted, fraught with lofty successes and equally grim tragedies.

Pat Duggins, National Public Radio's resident space expert since 1996, does yeoman's work in chronicling the story of the space shuttle. Well suited to write this book, he has covered a multitude of shuttle missions, two of its tragedies, and the twists and turns of the spacecraft's career from inception to scheduled retirement.

An easy read, *Final Countdown* does not serve up dry history or include facts or dates without reason. This book is packed with insider information about the space shuttle, the National Aeronautics and Space Administration's (NASA) space program in general, and many of the key figures in the shuttle's history.

The first chapter, "The Future," splendidly lays out a synopsis of the space program from Mr. Carl Walz's announcement in 2005 about the future of the moon and Mars programs to development of the Crew Exploration Vehicle (CEV). Duggins weaves in pieces of Apollo and space shuttle program history and lessons learned,

aptly applying these in the context of the upcoming CEV and its missions.

The author sets the stage for discussion of the shuttle's birth and development as well as NASA's plans for the CEV after the shuttle program ends. He cites a press meeting in February 2006, during which a reporter asked Astronaut Steve Lindsey and his crew if any of them were thinking of training for a moon mission. Evidently caught off guard, after exchanging looks with his crew, Lindsey responded, "I think we're too old" (p. 27). Duggins repeatedly shows that as NASA changed missions and vehicles, it also traded in its old astronauts for new ones. The pattern is already set for the postshuttle era.

He also launches into the troubled history of the space shuttle program, doing so in an engaging manner by coupling personal observation with stories recounted by many astronauts and shuttle personnel. For instance, Duggins includes a lighthearted exchange from 1959 between soon-to-be-hired NASA (eventually shuttle) engineer Sam Beddingfield and astronaut Gus Grissom. Beddingfield confesses to Grissom that he wants a job at NASA; Grissom says that NASA has jobs. Beddingfield further admits that he doesn't know anything about rockets. "That's OK," Grissom responds, "neither does NASA" (p. 45).

To his credit, the author does what he says he would do: tell the story of NASA and the end of the space shuttle program. However, it seems to me that Duggins spends too much time on the shuttle and too little on what might follow. The book left me wanting more of the story. I felt that Duggins missed a golden opportunity to explore where few have explored so far—for instance, NASA's plans beyond the CEV and the prospect of landing people on Mars. Despite this shortcoming, I recommend *Final Countdown* as a valuable insider's view of the space shuttle program.

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War and the Engineers: The Primacy of Politics over Technology by Keir A. Lieber. Cornell University Press (http://www.cornellpress.cornell.edu/), Box 6525, 750 Cascadilla Street, Ithaca, New York 14851-6525, 2005, 256 pages, $57.95 (hardcover), ISBN 978-0-8014-4383-1; 2008, 256 pages, $21.00 (softcover), ISBN 978-0-8014-7487-3.

Keir Lieber's sophisticated critique of technology as a determinant of national security policy is worth noting for several reasons. His monograph aims to unhinge a laboriously constructed, fiercely guarded citadel of social science wisdom: the idea that new technology, most importantly nuclear weapons technology, can alter the fundamentals of political competition. Lieber mostly succeeds in this endeavor, but, as he implies in the conclusion, his achievement leaves those concerned with international relations and defense policy with much work to do.

Lieber's demolition strategy forces so-called offense-defense theory into social science requirements espoused by leading methodologists, so it can be rigorously tested against the historical record. He identifies the core of the theory with military technologies that dramatically increase either the mobility or firepower of land-based forces. Expansion of railroad networks during the late nineteenth century increased the quantities of men and materiel that could be moved, and reduced the time for mobilizing armies. Incorporation of the tank into combined-arms operations freed fighting from the static trench warfare of World War I. Railroads and tanks, then, are candidates for offensive technologies. By contrast, the small-arms and artillery revolution of the late-nineteenth century and the nuclear revolution of the twentieth century are evaluated as harbingers for defensive dominance.

In case after case, Lieber finds that new mobility at the tactical or operational levels can be harnessed at the strategic level to serve defensive as well as offensive political goals. On the other hand, firepower, up to and including nuclear warheads packing the explosive punch of over one million tons of TNT, can be overcome—using duck-and-cover tactics in the conventional realm or brinkmanship in the nuclear era. In sum, Lieber finds little evidence that technology, in and of itself, ever exacerbated or ameliorated international competition. What matters is what mattered to Machiavelli—opportunities for gains in influence afforded by the international balance of power.

Unfortunately for the purist version of realism that *War and the Engineers* espouses and fortunately, perhaps, for international politics, readers may question whether national-power comparisons confound scholars as much as net assessments for offensive advantage. When analysts attempt to measure the systemwide distribution of capabilities or break this down into smaller dyadic comparisons, they find that power,

like advantage, involves other variables besides numbers of troops or classes of equipment. As Raymond Aron persuasively argued during America's Cold War trials with irregular warfare, the balance of power for a given conflict also depends on skill, geography, and domestic comity—in other words, the kinds of variables Lieber eschews as so much unscientific hand waving.

Lieber reserves his most devastating criticism for Stephen Van Evera's *Causes of War: Power and the Roots of Conflict* (Cornell University Press, 1999), an ode to defensive dominant technology as a means for warding off tragedy in great-power politics. Yet, Van Evera's argument is not engaged on its own terms. Lieber assiduously separates technology from organization and doctrine while Van Evera does not.

In justifying the spare approach, Lieber asks readers to consider how equipment variables are easier to measure compared to doctrine. Also, he argues, powerful militaries generally get it right: they rapidly optimize their use of acquired technologies to support offensive or defensive political objectives. Still, Adam Stulberg and Michael Salomone of the Georgia Institute of Technology analyze defense transformation as a complex, managerial challenge that some militaries address ahead of others. Their blow-by-blow account of German reorganization and experimentation across the interwar years in *Managing Defense Transformation* (Ashgate, 2007) contrasts sharply with Lieber's epiphanic debut for blitzkrieg in the May 1940 Battle of France.

In isolating equipment from doctrine, Lieber does demonstrate how little developments in pure technology alter the fundamentals of international competition. Those who favor arms control as a means of mitigating certain deadly incentives for aggression are obliged to push back against Lieber's thesis at least enough to show how variation in science and technology management drives increases in offensive military power as well as perceptions of its effectiveness. In this context, Van Evera's prodding to think holistically about technology—in terms of what happens under varying combinations of doctrine or geography and in terms of how certain weapon technologies sow seeds of overoptimism—has to be carefully reevaluated.

Today, the United States engages other militaries in a mixed world, featuring space-based targeting systems that might allow standoff platforms to pick apart another state's defenses with impunity, alongside the presence of robust nuclear arsenals capable of administering unbearable punishment to a would-be conqueror. For Lieber, few technical arrangements could soften fears of an opportunistic, space-supported strike or discourage aggression even after nuclear weapons entered the arena.

On the other hand, Lieber's critics will recall instances when the "president's explicit and public rejection of mutual assured destruction" (p. 147) succumbed to joint declarations averring that a nuclear war cannot be won and must never be fought. Beyond bans on equipment, exchanges of information as part of the negotiation and verification processes in arms control can buttress defense estimates and leaders' perceptions respecting the full costs of a first strike.

War and the Engineers speaks directly to military strategists and students of international politics. Within these audiences, modern skeptics of arms control will find systematic, historical support of their inclinations. For foreign policy and defense analysts who hold out hope, *War and the Engineers* provides the right kind of provocation. A less rarefied, more practical version of offense-defense theory may yet rescue deterrence policy. An improved version of offense-defense theory, however, will still confront Lieber's gauntlet: under what conditions, if any, can technology be engineered to preserve peace?

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The Intelligence Wars: Lessons from Baghdad
by Steven K. O'Hern. Prometheus Books (http://www.prometheusbooks.com), 59 John Glenn Drive, Amherst, New York 14228-2197, 2008, 292 pages, $25.98 (hardcover), ISBN 978-1-59102-670-9.

The Intelligence Wars should have been a true-life spy adventure set in war-torn Baghdad, but author Steven K. O'Hern was not satisfied with recounting his time as leader of a human intelligence (HUMINT) unit tasked with hunting insurgents. When the book discusses HUMINT tradecraft and demonstrates such techniques via personal experiences or anecdotes, it is an engaging, often educational, read. Unfortunately, Colonel O'Hern, now retired, wastes too many pages either regurgitating "generational warfare" myths or railing against issues often better addressed in professional journals.

A career officer in the Air Force's Office of Special Investigations, the author subsequently assumed command of the Strategic Counterintelligence Directorate (SCID) of Multi-National Force–Iraq. His years as a special agent and the six months he spent in Baghdad in 2005 lend credibility to discussions of HUMINT, a traditionally Army-dominated field. But Colonel O'Hern's lack of experience with other intelligence disciplines stands in stark contrast to his HUMINT background. The author's consistent laments regarding an intelligence community focused excessively on technology, though possibly accurate, are not sufficiently substantiated in the book.

Chapters 5 and 6, about HUMINT operations, are certainly the most rewarding ones. Through a careful, comprehensible explanation of source selection and handling, Colonel O'Hern sets the stage for a number of interesting demonstrations of tradecraft in use. Sadly, many of his stories, truncated to two or three paragraphs, easily could have filled the remainder of the book and provided a much better opportunity for learning lessons developed by the author and his SCID team. Instead, these chapters serve only as a minor respite in what is otherwise a largely academic discussion about theories of the evolution of war and the US military's ill-preparedness to engage in "fourth-generation warfare."

Although Colonel O'Hern acknowledges the contributions of other intelligence disciplines and the importance of intelligence "cross-cue" only in passing, his insights into HUMINT offer excellent education to intelligence professionals throughout the community. Equally enlightening are his observations about the cultural and interpersonal dynamics of a divided Iraq. The author's recounting of visits to the Iraqi Ministry of the Interior, each floor occupied by different sectarian factions, or his trip to Kurdish-dominated regions that consider Iraq a foreign country is both informative and frustrating with regard to US goals for the region.

Chapter 3, "Fourth-Generation Warfare," and chapter 9, "The Next War," represent the low points of the book. Although Colonel O'Hern is intellectually honest enough to acknowledge the existence of criticisms of generational-warfare theory, he continues to cling to a concept likely to alienate his more studied audience. The greatest disappointment, however, is that these chapters contribute nothing to the book; indeed, their absence would not detract from important topics that should be its sole focus. A simple examination of insurgency would have proven sufficient for establishing the context of the author's experiences conducting HUMINT operations in Iraq. Furthermore, the opening fictional account of chapter 8 is insulting in its depiction of intelligence officers and, again, contributes nothing. Readers will find similar pettiness in the latter part of the chapter, which discusses analysts, although the treatment of analyst-handler fusion is valuable.

A lesser failing of the book, one that affects Colonel O'Hern's contributions to professional thought, concerns the inescapable difficulty of writing a "history" about a war in progress. Limiting the story to a chronicle of his experiences would have largely eliminated this predicament, but the emphasis on "fixing" the problems encountered in his six-month tour, four years before publication, only wastes ink. The author's recommendations for better integration of reservists and guardsmen with law-enforcement backgrounds into intelligence, and for the establishment of a single officer in charge of all intelligence operations in-theater are worth investigating. Unfortunately, many of his other concerns, particularly regarding the bureaucratic nature of the US military, the sharing of intelligence among agencies, and the pairing of analysts with operators have already been addressed in the years since Colonel O'Hern's tour of duty. Current solutions have not yet proved fully successful, but his recommendations are now outdated.

When he concentrates solely on HUMINT, the author does an excellent job of highlighting both its importance to counterinsurgencies and its weaknesses, such as a lack of precision and reliability. His "lessons learned" from Iraq regarding the use of analysts to feed guidance directly to handlers and their sources, the pitfalls of using contractors to support HUMINT operations, and the lack of actionable intelligence from the vast majority of "casual sources" could serve as important guides for intelligence personnel. Oddly, in chapter 7, which criticizes the existence of "stovepipes," Colonel O'Hern writes about the importance of protecting information from misuse by outside agencies, thus validating the rationale for such stovepipes. Aside from his own designated lessons, readers can learn more from his stories about the operations of SCID personnel.

An interesting read for anyone studying counterinsurgency operations in Iraq, *The Intelligence Wars* has value primarily to intelligence professionals. Appropriately, it concentrates on the Army's management of HUMINT, but most

members of the Air Force community will have little use for it.

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The U.S. Citizen-Soldier at War: A Retrospective Look and the Road Ahead edited by Malcolm Muir Jr. McCormick Foundation (in conjunction with Virginia Military Institute) (http://www.mccormickfoundation.org/), 205 North Michigan Avenue, Suite 4300, Chicago, Illinois 60601, 2008, 142 pages (softcover).

The U.S. Citizen-Soldier at War: A Retrospective Look and the Road Ahead examines issues with the All Volunteer Force and the current posture of the Guard and Reserve. This compilation of 12 papers, presented in October 2007 at the First Division Museum as part of the McCormick Tribune Conference Series, touches upon three broad themes for the All Volunteer Force—roles, manning, and future concerns—pointing out the need for and reliance on the Guard and Reserve. As Duncan reminds the reader, from Panama in 1989 to 11 September 2001 (9/11), the United States intervened with significant military force an average of once every 18 months (p. 70). Several of the contributors note that increased US military involvement has led to more reliance on the Guard and Reserve as part of the Total Force originally envisioned in 1970 by Secretary of Defense Melvin R. Laird. His concept of the Guard and Reserve as a strategic reserve has changed, particularly since 9/11, since the military depends more heavily upon those forces for operational missions. Pointing out that they were not created, funded, or organized as operational forces (p. 75), Wormuth points out that consistent use of the Guard and Reserve in this manner will require institutional changes.

Several of the authors' discussions of the capabilities offered by the Guard and Reserve give readers an idea of how much the active component and the country truly depend on these citizen-soldiers. Wormuth notes that part of the problem with the Total Force concept is that certain military capabilities such as civil affairs, medical expertise, and military police reside almost solely within the reserve component, forcing automatic mobilizations in support of active-component deployments. Vaughn affirms how much the nation depends on the Army National Guard, whose eight divisions and 28 brigade combat teams make up 38 percent of the Army's force structure and whose aviation assets comprise 43 percent of all Army aircraft (pp. 94–97). Yet, as Doubler observes, the Army National Guard struggles to match the active component in both equipment and manpower utilization as it contends with its traditional role of protecting the homeland while deploying overseas. The Air National Guard does not have a problem matching the active component. According to McKinley, the Guard had cultivated an operational capability and spirit through its "volunteer" process well before the end of the Cold War by deploying its refueling units in support of operational missions and assuming the interceptor mission for the continental United States. The increased requirements as a result of 9/11 have largely been transparent.

Nieberg, Williams, Millett, and the late Moskos raise the key theme of citizen-soldier manning, each addressing the equity-of-service argument and erosion of the citizen-soldier concept. A fraction of the population bears the burden of military service and sacrifice. Moreover, skewed economic and geographic demographics—reflecting overrepresentation of the poor and the South—continue to plague recruiting. Williams calls enlistees "economic conscripts," noting that recruiters use economic rather than patriotic incentives to attract them (p. 32). All four contributors consider this societal and economic misrepresentation a problem that needs fixing. However, none of them offers a realistic solution. Moskos, one of America's great military sociologists, proposes a military draft while Bell suggests that society needs to change its view of who should serve. In terms of utilization and resources, instituting a draft is economically unfeasible, and expecting society to change is unrealistic. Further, is this a problem that needs correcting? Nieberg notes how the Reserve Officer Training Corps has unintentionally integrated the officer corps with minorities and members from lower economic means, and Williams acknowledges that the All Volunteer Force is working better than expected (p. 32). Societal misrepresentation within the military has long been a problem and will continue as such until the option not to serve exists.

Military readers should pay attention to the concern expressed by several authors about the future force structure. Millett notes that the increased call-up of Reserve members has affected retention while Bell observes that citizen-soldiers cannot be expected to endure the sacrifices of the "long war" without greater support from the

population (p. 84). More importantly, Duckworth, Millett, and Williams ask how the military will continue to attract and retain members, especially now, in a time of extended conflict. This question leads Williams to wonder about the sustainability of the All Volunteer Force, given current circumstances. As *The U.S. Citizen-Soldier at War* illustrates, we must truly discern whether or not the All Volunteer Force is meeting the nation's defense needs. This book offers insight into some of the key challenges that policy makers will contend with as they forecast future manning and equipping requirements for the US military.

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America's Defense Meltdown: Pentagon Reform for President Obama and the New Congress edited by Winslow T. Wheeler. Stanford University Press (http://www.sup.org), 1450 Page Mill Road, Palo Alto, California 94304-1124, 2009, 272 pages, $19.95 (softcover), ISBN 978-0-80476-931-0.

In a speech of 21 April 2008 to the Air War College at Maxwell AFB, Alabama, Secretary of Defense Robert Gates implored his listeners to "become . . . forward-thinking officer[s] who [help] the Air Force adapt to a constantly changing strategic environment," offering Col John Boyd as an example of the kind of officer needed to lead our military to success in the twenty-first century ("Remarks to Air War College," Department of Defense, Office of the Assistant Secretary of Defense [Public Affairs], http://www.defense.gov/speeches/speech.aspx?speechid=1231). The notion of whether or not Secretary Gates's fondness for Boyd extends to respect for the ideas of his associates and modern-day acolytes will be tested in the months ahead as the Defense Department faces the budget realities of an economic downturn. A Center for Defense Information book, *America's Defense Meltdown* includes essays from Boyd's successors in the military-reform movement that chart fresh approaches to old defense issues. Many of the ideas detailed here will probably crumble under scrutiny; nonetheless, this short tract is worth reading for the sheer number and variety of innovative ideas it offers.

The book's 11 chapters adhere to Boyd's maxim regarding defense priorities: "people, ideas, hardware, in that order" (p. 19). The first chapter, written by Lt Col John Sayen, USMC, retired, cogently defends Boyd's priority principle, and the chapters that follow paint a portrait of a people-ideas-hardware US military. Airpower-minded readers will want to pay particular attention to chapters 7 and 8.

Col Robert Dilger, USAF, retired, and Pierre M. Sprey, who contributed chapter 7, "Reversing the Decay of American Air Power," examine airpower in twentieth-century conflicts, seeking to undermine Giulio Douhet's theory that strategic bombardment of enemy heartlands can win wars by itself (p. 129). They contest the claim that strategic bombardment played a central role in defeating Iraq in the first and second Gulf Wars and question the usefulness of airpower in a wide range of circumstances. They praise airpower only for close air support (CAS) missions, pointing to German Stukas and US P-38s, P-47s, and P-51s in World War II as examples of successful interdiction platforms. Dilger and Sprey contrast this success with the tremendous losses and limited results of Royal Air Force, US Army Air Forces, and German Luftwaffe strategic bombers (pp. 131–44). Similarly, they criticize the first Gulf War's strike campaign for utilizing the F-117 and applaud their own A-10 CAS efforts against fielded units of the Iraqi Army (pp. 149–52).

Based on this historical analysis, the authors envision a new procurement schedule of 4,000 CAS fighters; 2,500 forward air control aircraft; a reduced buy of 100 KC-X tankers; 1,000 dirt-strip airlifters akin to the C-27J; 1,100 austere air superiority fighters; and 200 F-35s—an outline rooted in a preference for large-number acquisitions, an aversion to high-tech airframes, and a belief in the supremacy of CAS over independent air operations. Dilger and Sprey seek to "procure only aircraft and weapons of the utmost austerity, stripped down to the only capabilities directly required by actual combat experience" (p. 159).

The premise for the authors' procurement outline emanates from faulty historical analysis filled with assertion and little documented support. Focusing particularly on the Gulf Wars, Dilger and Sprey question—without citation—the stealth capabilities of the F-117 and criticize the fighter-bomber for its small payload and low production numbers. Their analysis excoriates all stealth capabilities without discussing alternatives for penetrating contested airspace. Further-

more, they advocate the purchase of large numbers of airframes—claiming unimaginably low purchase prices—without discussing the resulting long-tail costs in personnel, ramp space, fuel, and maintenance. Emphasizing numbers of tails—rather than capabilities inherent in the fleet—ignores the lessons of the effects-based-operations construct. Despite the logic of their advocacy for an austere CAS airframe, particularly in the face of conflicts with nonstate actors, creating an entire Air Force around this singular mission set seems shortsighted.

In chapter 8, "Air Mobility for a New Administration," James P. Stevenson, author of *The Pentagon Paradox*, offers a primer on air-mobility terms and concepts, introducing readers to strategic and tactical airlift, air refueling, and special air-mobility operations. He makes a few key recommendations for the new administration, advocating "increased emphasis on aerial refueling, strategic sealift and specialized air, with a decreased emphasis on strategic and tactical airlift" (pp. 172–73). Recognizing the need for cost savings in mobility operations, Stevenson sees financial gains in cutting back on the C-5 and C-17 for strategic airlift of outsized cargo and supplementing these airframes with fast sealift and an expanded Civil Reserve Air Fleet. Similarly, he claims significant cost benefits by increasing the "building partner capacity" capability, which would emphasize utilization of allies' tactical airlift to decrease demand on the US fleet. Although brief, insufficiently sourced, and at times vague—at one point recommending that the Air Force "develop innovative options" (p. 176) to reduce the cost of strategic airlift—this chapter contains ideas worthy of serious examination.

In his Air War College speech, Secretary Gates claimed that "an unconventional era of warfare requires unconventional thinkers" (see "Remarks to Air War College," above). *America's Defense Meltdown* succeeds as a repository of unconventional ideas in Colonel Boyd's tradition. Its recommendations, which address Army, Marine Corps, Navy, and Air Force issues, are worth due consideration in the budget battles ahead if only for their power to stimulate debate that will eventually lead to workable solutions for today's defense challenges.

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Missile Contagion: **Cruise Missile Proliferation and the Threat to International Security** by Dennis M. Gormley. Praeger Security International (http://www.praeger.com/PSI), 88 Post Road West, Westport, Connecticut 06881, 2008, 272 pages, $54.95 (hardcover), ISBN 978-0-275-99836-3.

A leading expert on cruise missile proliferation, Dennis Gormley has written *Missile Contagion*, a highly readable volume that presents clearly and concisely his concern that cruise missiles are on the edge of becoming a primary threat to international stability. Gormley has considerable experience in this area. In fact, this book is his second exploration of the cruise missile—and it is more than just an update. Rather, it is a cry for the world to wake up and recognize the new menace.

Ballistic and cruise missiles date to World War II, the notorious V-1 and V-2 representing the earliest military iterations. At that time, the V-1, a primitive cruise missile, was slow, noisy, and easily destroyed. The V-2 ballistic missile, having longer range and greater speed, posed much more of a danger. Since World War II, the powers have focused on ballistic missile technology and have attempted to counter enemy ballistic technology. Finally, a semblance of defense seems to be developing. Problem solved.

In the 1980s, cruise missiles belonged only to Russia and the United States. In the first Iraq war, the United States handled Iraq's primitive cruise missiles readily. Between the two wars against Iraq, however, the technology blossomed and simplified, and the United States found itself defenseless against that country's cruise missiles in the second war.

Cruise missiles are small, fast, low-flying, retargetable, and nearly impossible for radar to detect, particularly when it is seeking high-flying ballistic missiles. The relatively simple technology costs considerably less than ballistics and defenses. Launched in large numbers, the missiles can overwhelm modern defenses, and they are easily outfitted to carry chemical or biological agents. They present a fearsome threat that the US government and others ignore, still treating them as low-risk export items.

While the United States busily negotiates treaties involving ballistic missiles and develops defenses against them, technology makes both the treaties and the defenses largely meaningless. The cruise missile offers a more immediate threat, and the technology is proliferating—in part due

to American absentmindedness, in part because America allows business to sell technology and provide technical expertise to nations that otherwise would only slowly develop the technology without major assistance.

Gormley says it's time to wake up. He documents his case by detailing the performance of cruise missiles and defenses against them in the two Iraq wars, citing the characteristics by model and nation, and dealing with the geopolitical rivalries in Asia and the Middle East. He even talks of the Bush Doctrine of preemption as a green light to regional rivals as well as to countries such as North Korea who represent a potential threat to the United States. In less than a decade after the invasion of Iraq, already Pakistan, India, China, Japan, North Korea, Israel, and Iran are busily developing cruise missile capabilities.

Because of the ongoing concern about missile proliferation and because the situation changes rapidly, Gormley is developing a Web site to offer current information after the release of the paperback version of this work (see http://missilecontagion.com/Missile/Home.html). In the meantime, the hardcover edition of *Missile Contagion* will provide a sufficient primer on the danger that widespread ownership of cruise missiles presents.

Dr. John H. Barnhill
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Information Strategy and Warfare: A Guide to Theory and Practice edited by John Arquilla and Douglas A. Borer. Routledge (http://www.routledge.com/), 270 Madison Avenue, New York, New York 10016, 2007, 272 pages, $150.00 (hardcover), ISBN 978-0-415-77124-5; 2009, 254 pages, $39.95 (softcover), ISBN 978-0-415-54514-3.

Information Strategy and Warfare includes nine essays by 10 authors, most of whom have a connection to the Naval Postgraduate School in Monterey, California. Divided into two halves, the book first assumes a conceptual point of view and then examines "prescriptive, policy-oriented ways to improve American information strategy" (p. 11). Further, it explores three themes: (1) "the rise of the information domain itself and information strategy's emergence as an equal partner alongside traditional military strategy" (pp. 1–2); (2) "the notion that an undue focus on technology will leave one wandering in a labyrinth" (p. 2); and (3) "the broad, amorphous realm of what has been called 'information operations' " (p. 2).

Chapter 1, "The Rhetoric of Terror," takes issue with the use of the war metaphor with respect to combating terrorism. Authors Frank J. Barrett and Theodore R. Sarbin argue that framing the issue as a "war on terror" filters out important distinctions and possibly effective strategies. In a key passage, they note that "one of the consequences of framing the struggle against terrorism as war and the depiction of terrorists as evil is that it might obfuscate efforts to understand the conditions that have given rise to terrorist activities" (p. 25).

In chapter 2, "Al-Qaeda and Its Affiliates," David Ronfeldt attempts to reframe the understanding of al Qaeda as more a manifestation of tribalism than of extremist religion. He argues that under such societies, maximizing honor is more important than power or profit.

"Winning Hearts and Minds," the third chapter, identifies nine centers of gravity for social-influence campaigns, offering richly illustrated examples of each. Anthony R. Pratkanis concludes his essay by introducing and explaining 19 influence tactics used in war and conflict.

Chapter 4, "Jihadi Information Strategy," explores the idea that "the relative success [that al Qaeda has] enjoyed despite the unpopularity of [its] view of what constitutes a proper Muslim society can be attributed largely to [an] innovative and nimble information strategy" (p. 86). It argues that, in spite of the organization's popularity for confronting the West, "al-Qaeda faces structural-ideological limits to its power" (p. 86) that will restrict its influence to a small minority of Muslim adherents. Author Glenn E. Robinson shows how jihadist elements reinterpret Islamic history to meet their ideological and power needs, such as the reinterpretation of the idea of *jahiliyya* (historically referring to Arab societies before Mohammed) to mean any society that rules today through non-Islamic means.

Beginning the second half of the book, the fifth chapter, "Reorganizing for Public Diplomacy," focuses on policy responses. It chronicles the poor state of public diplomacy in the United States and explains how it could be improved. The author, Carnes Lord, roundly criticizes the failure of the US Department of State to accept the mantle as leader in public diplomacy.

Chapter 6, "The One Percent Solution," by Barton Whaley, addresses military deception,

using quantitative data from several conflicts to assess the costs and benefits of different actions. Whaley concludes that "deception is worth the cost and effort in almost all situations" (p. 154).

In chapter 7, "Strategy and Psychological Operations," Hy S. Rothstein assesses the changing role of psychological operations amidst the new environment of terrorism, "shock and awe," and network-centric warfare.

In "Assessing the Computer Network Operations Threat of Foreign Countries," chapter 8, Dorothy E. Denning argues the need for "sound assessments of vulnerabilities in critical infrastructures and how risks can be mitigated" (p. 188). She examines, for foreign countries, whether network attack operations were "tolerated, encouraged, or even supported" on behalf of the host government (p. 194). Furthermore, Denning looks in depth at the capabilities of Iran and North Korea for computer network operations, based on recent student research at the Naval Postgraduate School.

In chapter 9, "Blogs and Military Information Strategy," James Kinniburgh and Dorothy Denning explore "the possibility of incorporating blogs and blogging into military information strategy, primarily as a tool for influence but also for gathering intelligence" (p. 212). They also review different methods for measuring the reach and influence of blogs.

As evidenced by this brief synopsis, the various chapters are somewhat diffuse. Although each brings an important component to the overall discussion of the book's central subject—information strategy and warfare—the collection would benefit from tighter focusing. The division of the book into halves, first examining concepts and then policy responses, helps alleviate some of the lack of focus. However, the three themes, identified above and in the introduction to the book, do not always come through clearly in each of the essays. One might expect this problem in a collection of essays about a broad subject, but the editors could have done more to ensure greater cohesion.

By necessity, the chapters avoid any use of classified material, but one wonders, given the nature of the subject matter, whether the contributors could reasonably address it in any significant way without the use of such sources. Moreover, because of the classified status of many information systems used by the defense community (e.g., the Secret Internet Protocol Router Network [SIPRNET] and the Joint Worldwide Intelligence Communications System [JWICS]), how thorough can a study of information operations be without assessing the vulnerability of such systems vis-à-vis the conventional Internet?

In the "Conclusion," Douglas Borer writes, "Harnessing the power of information in terms of desired outcomes is much more of an abstract art than it is a predictive science" (p. 237)—a true statement. In spite of its flaws, *Information Strategy and Warfare* does offer some sound advice and direction to the practitioners of that very art.

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Vietnam: The History of an Unwinnable War, 1945–1975 by John Prados. University Press of Kansas (http://www.kansaspress.ku.edu), 2502 Westbrooke Circle, Lawrence, Kansas 66045-4444, 2009, 704 pages, $34.95 (hardcover), ISBN 978-0-7006-1634-3.

John Prados, a senior fellow of the National Security Archive at George Washington University, has produced the most comprehensive, authoritative, and readable single-volume narrative history of the American war in Vietnam yet seen. Benefiting from many recently declassified documents and presidential tapes in the United States, as well as significant foreign-source documentation, Prados brilliantly draws together what he calls a "*unified field theory* . . . [that] attempts to weave an account of both action and context that includes all necessary elements" (italics in original, p. xiii). The result is a narrative history of remarkable scope and considerable depth that weaves together military threads with political, social, economic, and foreign policy threads, forming a policy envelope that "narrowed over time due to developments in all those fields" (p. xi). This ever-more limited range of potential policy choices for the United States in Vietnam essentially made the war unwinnable. In a very real sense, Prados demonstrates the inconvenient yet fundamental truth of the Clausewitzian dictum about the relationship of war and politics.

He makes very clear in a three-page "Note to the Reader" (p. xxi) that he writes from a strong antiwar point of view and takes pains to discuss how, as an Army officer's son who wanted to attend West Point, he came to that perspective.

Such candor is very refreshing and highly unusual even though all historians write from a definite point of view (whether they admit it or not). As a college student in the 1970s, he became deeply involved in the antiwar movement and helped the Vietnam Veterans against the War (even though he was not a veteran) as they organized demonstrations during the Nixon administration. In the narrative discussing the antiwar demonstrations of the 1970s, he notes his roles in several, sometimes lengthy, insertions set off from the main body of his discussion by italic type (pp. 426, 476–80, 496–503, and 514–16). Some readers may think that Prados gives too much credit to the antiwar movement for forcing the Nixon administration to bring an end to American participation in the war. But this reviewer—a Vietnam vet from the mid-1960s who witnessed the near chaos in the United States in the early 1970s—thinks that, if anything, Prados undersells the influence of the movement.

Given his theme of an "unwinnable war," it is only natural that the author not shy away from confronting revisionist historians (e.g., Mark Moyar) who claim that the United States had virtually won the war at various points but that we either didn't recognize or take advantage of those situations. The reader should be sure to check the endnotes, for it is there (rather than in the basic text) that Prados directly takes on the revisionists.

As one would expect of a historian and senior fellow at George Washington University's National Security Archive, Prados has heavily documented his work with 60 pages of often very illuminating endnotes followed by an 18-page bibliographic essay. Anyone who reads the text without referring to the endnotes will miss many clarifying parts of the story. (As a personal aside, the importance of the endnotes to this narrative history argues in favor of publishers using footnotes rather than endnotes. Readers would vastly prefer having explanatory footnotes readily available on the same page to searching for endnotes at the back of the volume.)

Prados has produced a wonderful one-volume history that makes a significant contribution to the literature of the Vietnam War. Clearly, *Vietnam: The History of an Unwinnable War, 1945–1975* is the most comprehensive single-volume history of the war yet published. The author's acknowledged point of view may irk some readers, but he is candid about his views and argues them well, using excellent evidence. Frankly, if I could have only one volume about the Vietnam War, Prados's book would be it.

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Night Fighters: Luftwaffe and RAF Air Combat over Europe, 1939–1945 by Colin D. Heaton and Anne-Marie Lewis. Naval Institute Press (http://www.usni.org), 291 Wood Road, Annapolis, Maryland 21402, 2008, 224 pages, $27.95 (hardcover), ISBN 978-1-59114-360-4.

During World War II, the British nighttime aerial bombardment of Germany and occupied Europe, against a determined and skillful defense, represented a distinct campaign of great scope and sacrifice. At odds with the American daylight precision bombing strategy, the Royal Air Force (RAF) steadfastly pursued night attacks from 1939 to 1945 at a loss of "nearly 10,000 bombers and over 55,000 airmen killed, wounded, or captured" (p. 13). In *Night Fighters*, Colin Heaton and Anne-Marie Lewis—a photographer, researcher, and digital image specialist—recount the history of the ever-evolving tactics and technology of this air war, primarily from the perspective of the Luftwaffe fighter forces and RAF Bomber Command.

The book's hallmark is tracing the evolution of night-fighting tactics, doctrine, and technology across the course of the war. Over the years that this campaign persisted, a deadly balancing act played out between belligerents as first one side, and then the other, adapted and became superior with deadly innovation in "the greatest technological arms race in history" (p. 28). Heaton painstakingly studied and conducted face-to-face interviews with many of the air war leaders and noble night-fighter pilots such as Wolfgang Falck, Hajo Herrmann, and Hans-Joachim Jabs. In this aspect, Heaton (a professor at the American Military University, a major online institution) shows obvious admiration for German aviators' valor in the air and engineers' ingenuity in the laboratory.

Night Fighters asserts that the tactics and technology of this battle "underwent a greater revolution . . . than in any other area of operations in any preceding era in history" with the exception

of the nuclear age (p. 78). Heaton traces postwar advances in fly-by-wire technology, all types of radar, microwave ovens, transistors, ejection seats, shatterproof glass, motion sensors, and rocket and jet engines "to World War II and mostly to the night war in Europe" (p. 137).

Heaton is as critical of British leadership and tactics as he is full of admiration for the valor of the Luftwaffe pilots. The book occasionally becomes sidetracked from the subject of air-to-air combat to examine the failures and savagery of RAF Bomber Command's nighttime area attacks on German cities versus the daylight precision bombing favored by the US Army Air Forces. It further touches on the desperate lot of the British bomber aircrews, their loss rates, the misunderstanding associated with treating woes stemming from low morale, and its connection to faulty leadership: "The class-conscious British hierarchy did little to instill faith in one's superiors, who may have been promoted through family connections or had the privilege of an upper-class education" (p. 105). Conversely, Heaton finds fault with a less-than-competent Nazi hierarchy that denies critical resources and support necessary for the fighter force to prevail. In the Germans' defeat, he finds that under their high command "it was as much an internal implosion as an external eradication" (p. 138).

Although the author gives due credit to the skill of the fielded Luftwaffe fighter force, *Night Fighters* is too small a volume (140 pages of narrative) to document the many conclusions that distract it from its thesis. The book's strength lies in its colorful and energetic descriptions of nighttime air-to-air combat in World War II Europe, but its shortcomings are its expansive findings in tangential but related fields of strategy, leadership, and aircrew morale. *Night Fighters* gives serious attention to the worthy and underrepresented field of study involving how this arms race was fought and won in the night skies of World War II Europe. Airmen today would do well to heed the lessons of their predecessors—how they adapted and where they came up short.

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Effects-Based Operations: Applying Network Centric Warfare in Peace, Crisis, and War by Edward A. Smith. Command and Control Research Program Publications (http://www.dodccrp.org), c/o Evidence Based Research, 1595 Spring Hill Road, Suite 250, Vienna, Virginia 22182-2216, 2002, 558 pages. Available free from http://www.dodccrp.org/files/Smith_EBO.PDF.

Effects-Based Operations is the third entry in the Command and Control Research Program's series of books that addresses information age transformation. David S. Alberts—former director of research for the Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence—notes that this study "speaks directly to what we are trying to accomplish on the 'fields of battle' and argues for changes in the way we decide what effects we want to achieve and what means we will use to achieve them" (p. ix).

Author Edward Smith—a retired captain with 30 years of Navy experience, holding a doctorate in international relations—begins by defining effects-based operations (EBO) and the need for them: "[they] are coordinated sets of actions directed at shaping the behavior of friends, foes, and neutrals in peace, crisis, and war" (p. xiv). After systematically describing an effects-based concept of operations that deals with an enemy who uses asymmetric or symmetric (or both) tactics, he rationalizes the need for EBO by stating that in a post-9/11 world, America realizes that the enemy is no longer the obvious uniformed military posing a threat, as the Russians did during the Cold War. Rather, we now face an asymmetric foe, and that fact is driving an American technological revolution in sensors, information technology, and weapons, providing new tools and operational models for implementing EBO in a network-centric approach to warfare. Not just another study of EBO, this book offers an intelligent, thoroughly researched discussion of the modern applications of this much-debated approach.

Numerous illustrations drive home important concepts of warfare, especially the systematic description of the three domains of conflict—cognitive, information, and physical—derived from the observe, orient, decide, act loop discussed in previous Command and Control Research Program publications. The narrative effectively walks the reader through each domain, referring to illustrations and building a presentation of an EBO concept of operations that goes far beyond a mere definition and a few historical examples.

Speaking of such examples, they complement the discussion rather than overwhelm the reader. Dr. Smith contrasts the symmetric, attrition-based world wars and the American Civil war with asymmetric aspects of the Cold War and the war on terror. For instance, in a meticulous analysis of the major components of Attain Document—a series of operations launched by the US Navy off Libya in 1985 in response to anti-American terrorism perpetrated by Hizballah and the Abu Nidal organization—the author demonstrates the success of an effects-based approach from the tactical to the strategic levels of war.

Although the book makes a compelling argument for the continued application and evolution of EBO, it treats network-centric warfare only sporadically throughout the text, not giving it significant attention until the final chapter. Nonetheless, the author has a knack for making complex material understandable, thereby promoting a reading experience that feels like participating in a fascinating "master class."

Effects-Based Operations, which challenges current thinking on the operational art of war and provides insight into conducting operations more efficiently and effectively, is relevant not only to the Air Force but also to the entire defense community. I highly recommend it, especially to individuals who serve at command and control nodes or at the operational or strategic levels. Dr. Smith sought to portray "how network-centric operations and effects-based operations fit together, and how they complement one another in meeting the needs of the new security environment" (p. xxii). Let there be no mistake, he has achieved his desired effect.

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Road to Mach 10: Lessons Learned from the X-43A Flight Research Program by Curtis Peebles. American Institute of Aeronautics and Astronautics (http://www.aiaa.org), 1801 Alexander Bell Drive, Reston, Virginia 20191-4344, 2008, 250 pages, $39.95 (softcover), ISBN 978-1-56347-932-8.

At hypersonic speeds, defined as Mach 5 or higher, the compressive heating generated by a vehicle as it passes though the atmosphere is so intense that the air itself undergoes chemical changes. Such heating would destroy turbine or ramjet engines constructed of any known material. Although a variety of rocket-propelled vehicles have flown at hypersonic speeds (e.g., ballistic missile reentry vehicles, the X-15, and the space shuttle), no air-breathing vehicle until the X-43A has proved capable of sustained hypersonic flight.

At least in theory, the scramjet (supersonic combustion ramjet) can serve as a hypersonic jet engine. Conceived more than 50 years ago, it differs from the ramjet in that the latter's inlet slows the air down to subsonic speed, while the scramjet inlet only decelerates the flow to supersonic speeds, which reduces heating. The scramjet introduced many complications, however, especially the problem of sustaining combustion in a supersonic flow.

After decades of analysis, wind tunnel tests, and concepts for flight research projects that never reached fruition, the National Aeronautics and Space Administration (NASA) began work on the Hyper-X project in 1996. Hyper-X consisted of the X-43A (a 12-foot-long unmanned research vehicle with a scramjet engine) and a rocket booster to push the X-43A to hypersonic speeds at an altitude of approximately 100,000 feet. At that point, the vehicle would separate from the booster and start its scramjet engine. A B-52 bomber lifted the entire stack, releasing it over the Pacific Ocean off the coast of California.

Curtis Peebles drew on his unique vantage point as NASA project historian to write this book about the Hyper-X. Based on both internal and published documents, interviews with project participants, and the author's own observations, *Road to Mach 10* offers an insider's detailed view of one of the most exciting flight research projects in several decades. As befits a book published by an organization of aerospace engineering professionals, this one is highly technical in places. Although he has not written an engineering textbook, Peebles assumes that the reader has a good background in the full range of aerospace technologies. If readers have difficulty with such sentences as "The computational-fluid-dynamics data were used to quantify the ground-to-flight scaling and unsteady-flow phenomena during the dynamic separation" (p. 64), then they may want to pass by this book.

Those undaunted by the required level of technical knowledge are rewarded with a detailed but readable story that begins with a background of scramjet research and continues to Hyper-X design, manufacturing, integration and checkout, and flight operations. The first flight

tumbled out of control shortly after release from the B-52, but the second and third flights successfully demonstrated scramjet-powered flight at Mach 6.83 and 9.68, respectively. Peebles offers an excellent description of all the missions as well as the mishap investigation.

The book includes numerous good photographs; unfortunately, they are reproduced in black and white rather than color. More significantly, it omits line drawings of the vehicles and their systems. Specifically, at several points, the book describes intricate mechanisms, but the absence of supporting illustrations makes it difficult to visualize the systems.

Quibbles about illustrations aside, *Road to Mach 10* is an outstanding recounting of an exciting and notable project. Individuals with a professional interest in modern flight research at the leading edge of technology will benefit greatly from reading it.

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Robots in Space: Technology, Evolution, and Interplanetary Travel by Roger D. Launius and Howard E. McCurdy. Johns Hopkins University Press (http://www.press.jhu.edu/), 2715 North Charles Street, Baltimore, Maryland 21218-4363, 2008, 336 pages, $35.00 (hardcover), ISBN 978-0-8018-8708-6.

Roger Launius, former chief historian of the National Aeronautics and Space Administration (NASA), and Howard E. McCurdy, a professor at American University, have produced a remarkably well-written and lucid book with a catchy, if misleading, title. It is not a technical manual or catalogue of the various robots that humans have sent to orbit Earth, prowl extraterrestrial landscapes, or pierce the heavens. Rather, the book is actually about the ongoing debate within the American civil space agency between proponents of human spaceflight and those who advocate robotic or "unmanned" spaceflight. And what a debate it is—one that has spanned more than five decades and that has ranged from boardrooms at NASA to backrooms on Capitol Hill to the living rooms of the general public!

The authors skillfully lead us through an eminently readable and entertaining history of the early "space race" and the nascent space program (although they focus on broad brushstrokes, not a detailed account of each space mission), including changes in the roles of humans and robots over the past 50 years of spaceflight. Launius and McCurdy's articulate narrative examines the paradigm that effectively dominated the civil space agency for the first few decades of its existence, the dream of human spaceflight, and human interplanetary colonization.

To some extent, advocates of human spaceflight were simply lucky in their timing: As the authors point out, "The 'space age' opened a few decades after the closing of what commentators termed the 'heroic era' of earthly exploration" (p. 100). The explorers' exploits inspired more than a generation of science fiction writers, who "primed the pump" with wild tales of space exploration and overtly utopian depictions of life on the frontier. And the American public remained in awe of the technological marvels of the atomic age. Finally, escalating Cold War tension gave impetus to the national space race, captured the attention of the American public, "energized the creation of a larger coalition that forced policy change," and created a "pro-space majority" made up of "pro-space true believers," scientists, senior military leaders, businessmen, industrial engineers, and politicians "hoping to benefit from the symbolic resonances of the space race" (p. 41). If ever there was a moment when all the stars aligned to create a zeitgeist favoring a bold, new direction for American "Big Science" and the space program, this was it. And so it was that proponents of human spaceflight won the debate, and robotic missions received little priority and negligible funding.

Human spaceflight, however, reached its zenith with the Apollo moon landing in 1969. Launius and McCurdy compare the competition between human and robotic spaceflights to the fable of the tortoise and the hare. The hare dashed to an early lead in the race but then took a break, only to be overtaken by the stolidly plodding tortoise. Similarly, human spaceflight raced ahead to an impressive lead with the moon missions but then stalled; in the decades since, human spaceflight has failed to develop long-term, cost-effective solutions to the numerous problems associated with keeping humans alive in the hostile environment of space. Robotic spaceflight, meanwhile, made steady, incremental gains as robotic technology improved.

The exploration of Mars offers a perfect example of this stark contrast: despite the exhortations of several presidents to begin a manned mission to Mars, the government has yet to pony

up the (estimated) $500 billion that such a mission would require. Yet for a fraction of that cost ($820 million), NASA has had two rovers, *Spirit* and *Opportunity*, exploring Mars in more or less continuous operation since 2004. Since 1972, human spaceflight has been limited to the aging fleet of five space shuttles, which have flown a total of 113 missions (two of which were catastrophic failures resulting in the deaths of 14 people), have cost $40 billion (adjusted for inflation) to develop and build, and have flown only to near-Earth orbit at a cost of roughly $1.5 billion per flight. In contrast, the United States has fielded scores of more economical robotic spaceflight missions, including orbiters and probes of the moon, sun, various asteroids and comets, all of the major planets in our solar system (even including a mission to the planetoid Pluto, expected to arrive in 2015), and beyond; moreover, it has established a complex Global Positioning System, an impressive array of sophisticated space telescopes, and more.

Launius and McCurdy contend, however, that the competition between robotic and human spaceflight is ultimately a "false dichotomy" (p. xi). The correct paradigm involves not humans versus robots but humans and robots working together. Indeed, the book's thesis takes this thought even further: "given enough time, human and robotic characteristics tend to merge" (p. 254). The timeline contemplated in this metamorphosis spans centuries, not decades. This may be one of the strongest aspects of the book: although it explicitly concerns the *civil* space agency, eschewing discussion of military space programs (thus appearing to have limited utility for a uniformed audience), the discussion of the merging of human and robotic characteristics will likely interest military readers. The authors devote the concluding two chapters to exploring ideas that the future of space travel belongs to "transhumanist" and "postbiological" entities that blend human and robotic capabilities. When earthlings eventually get around to colonizing other worlds, those beings will likely take the form of "evolved" or genetically engineered humans so changed that they bear minimal resemblance to their forebears—or they may not be biological organisms at all.

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Criminal-States and Criminal-Soldiers edited by Robert J. Bunker. Routledge (http://www.routledge.com/), 270 Madison Avenue, New York, New York 10016, 2008, 322 pages, $150.00 (hardcover), ISBN 978-0-415-45765-1; $49.95 (softcover), ISBN 978-0-415-46206-8.

Criminal-States and Criminal-Soldiers is a collection of essays intended to reflect the changing face of international relations. Specifically, Robert Bunker—editor and contributor—offers selections that highlight problems in the context of a "state" related to criminal nonstate actors. Bunker organizes the book according to three clustered topics: (1) "Theory and Law" discusses the status of the Westphalian state in the current global context and expounds the new types of polities emerging; (2) "Criminal-States" loosely links Clausewitzian thought as it relates to conflict with rogue states and gangs (additionally, the operation of selected criminal-states receives attention); and (3) "Criminal-Soldiers" looks at gangs as nonstate actors, the nature of international crime, and the meaning of some crimes from an international perspective (e.g., the symbolic meaning of beheadings).

Unfortunately, this work suffers from three problems, beginning with the timeliness of the publishing. The book's liner notes describe it as "cutting edge." Perhaps so in 2008, but its perishable information is now three years stale. Granted, it takes time to put material together, print copies, and distribute them. But this seems to be a persistent issue with these types of current-events books: cutting-edge information in 2008 no longer dazzles our understanding amid a new US administration, a changed international setting, an entrenched recession, and so forth. Second, the contributors offer essays written at very different "levels"— some scholarly, others (e.g., "The Use of Beheadings by Fundamentalist Islam") reading like slide notes for an intelligence briefing. (Indeed, one can almost imagine the slides to go along with the text.) Third, and mostly a minor annoyance, is the quality of the publication. For some reason, the pages of the book are sprinkled with spelling errors that seem not so much misspellings as errors on the part of the spell-checking software.

The essay "Does Clausewitz Apply to Criminal-States and Gangs?" stands as the gem of the book. Clashing with both John Keegan's and Martin van Creveld's opinions that Clausewitz has a reduced place in contemporary thinking, the author demonstrates that nonstate actors

using violence do indeed employ war (read as acts of violent terrorism, crime, etc.) as policy. Despite criminal states and gangs lacking the status of a legitimate polity, they can—and in some cases do—share features with the commonly accepted idea of a state. In other words, criminal states, gangs, and warlords exercise sovereignty over territory, control borders, and interact with other state or nonstate actors. These "state-like" activities, including the use of violence as policy, tie them directly to Clausewitz's thinking. Clausewitz can apply at the microlevel, such as a gang that controls turf inside a city. To restrict Clausewitz to large-scale conflict removes the idea of a nontraditional actor using violence as a matter of policy. This especially comes to light when Marx and, in turn, Lenin and Mao give credence to Clausewitzian thinking in their revolutionary theorizing.

Criminal-States and Criminal-Soldiers is a marginal work. The unevenness of the essays detracts from its overall quality. Readers interested in international relations or nonstate actors might find the book appealing. However, given the abundance of materials on the topics it addresses, one could just as easily browse for better information elsewhere.

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The Brenner Assignment: The Untold Story of the Most Daring Spy Mission of World War II by Patrick K. O'Donnell. Da Capo Press (http://www.perseusbooksgroup.com/dacapo/home.jsp), Eleven Cambridge Center, Cambridge, Massachusetts 02142, 2008, 304 pages, $25.00 (hardcover), ISBN 978-0-306-81577-5; 2009, 320 pages, $14.95 (softcover), ISBN 978-0-306-81841-7.

On 2 August 1944, in the dark, silent skies over the jagged Alps of northern Italy, Capt Stephen Hall, a daring young American special forces operative, parachutes into Nazi territory. Hall's mission: to seek and destroy targets of opportunity and degrade or disable key routes of transportation that the German army would soon rely on for its pending retreat from Allied forces steadily advancing northward from Rome. Capt Howard Chappell and his team of demolition and espionage experts would follow in his path just weeks later. Their dramatic efforts to rendezvous with Hall resulted in one of the most fascinating real-life adventure stories to come out of World War II. This is an intriguing tale of the intertwining destinies and ultimate fates, both tragic and heroic, of two young officers as they attempt to seal the Germans' escape route through the Brenner Pass.

Skilled author Patrick O'Donnell masterfully tells the story of the brief and adventurous military careers of Hall and Chappell, energetically weaving historical fact into an exciting, page-turning drama that reads like the best of adventure fiction. In 1944 both officers are recruited by the clandestine Office of Strategic Services (OSS), the World War II precursor to the current US Central Intelligence Agency. Hall, a creatively energetic and possibly somewhat introverted young officer, submits to the OSS his novel idea of using US secret operatives to demolish key railroad tunnels in the Italian Alps, essentially bottlenecking the German army into the mountain valleys as easy targets for Allied airpower. Intrigued by his proposal, the OSS recruits and trains Hall for this very mission, and within months he is covertly roaming the Italian Alps, evading the ruthless searches of thousands of German troops, and systematically destroying targets of opportunity as he postures for the ultimate mission of closing the Brenner Pass.

Of a distinctly different cut is Captain Chappell, a daring, almost reckless, self-sacrificing warrior and a naturally charismatic leader. As commander of a small band of special operations troops, Chappell and his team are covertly inserted into northern Italy to join Hall in his mission to bring German troop movements to a halt. The fighters of various Italian resistance factions who facilitate Chappell's team challenge his diplomatic skills as well as his patience as he seeks to meet up with Hall amidst a maze of some of the world's most tortuous mountain terrain while eluding the gaze of the ever-vigilant German soldiers.

The fast-paced action and serial combat engagements experienced by these men almost obscure the underlying strategies and counterstrategies of insurgency warfare at play. Hall and Chappell's nemesis, Nazi major August Schiffer, whose area of responsibility coincides with the Americans' primary target, the Brenner Pass, employs ruthless and persistent means to capture both Italian partisans and any foreign operatives who might be assisting them. Schiffer and his Nazi forces rely on intimidation and torture in their efforts to coerce the Italian civilians not

only to abandon their support of the partisans and Allied agents known to be operating in the area, but also to turn them over to the German forces. Schiffer also conducts persistent and highly effective counterinsurgent sweeps, called *rastrellamentos*, through the mountainous wilderness, netting several of Chappell's men—and Chappell himself.

Filled with firefights, captures and escapes, close calls, dangerous liaisons, stealthy airdrops, and coded radio communications, *The Brenner Assignment* is a thrilling read. The intricate depiction of the converging fates of Hall and Chappell, the immensity of the wilderness setting, the complexities of the political and military interactions, and the tenacity of the German antagonists, all make this book highly entertaining. Although some of the subtle concepts and themes throughout could serve as intriguing, perhaps unsettling, parallels between the Nazi counterinsurgent efforts in the desperate, waning days of World War II and the US efforts against enemies in Iraq and Afghanistan, O'Donnell in no way attempts to present or propose strategies or tactics for current operations.

The Brenner Assignment reads like an adventure novel. The fact that one is reading about the lives, heroics, and tragic deaths of real Soldiers can sometimes be overlooked amidst the heart-pounding action of rapid-fire gunfights, middle-of-the-night bridge demolitions, and edge-of-your-seat escapes under the enemy's very nose. Thoroughly researched, the book is rich in fact and soundly credible. I most definitely recommend *The Brenner Assignment* to readers interested in the early days of US special operations, especially from the perspective of the individual operator, and to anyone looking for a great action story. This true tale of parallel lives, both tragic and heroic, contending with intense combat and the demands of extreme physical exertion in a harsh environment is a solid read and worth the time.

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Gods of Tin: The Flying Years by James Salter, edited and introduced by Jessica Benton and William Benton. Counterpoint (http://www.counterpointpress.com/), 1919 Fifth Street, Berkeley, California 94710, 2004, 150 pages, $14.00 (softcover), ISBN 978-1-59376-079-3.

James Salter's *Gods of Tin* is a compilation of two works of fiction (*The Hunters* [Harper, 1956] and *Cassada* [Counterpoint, 2000]), a memoir (*Burning the Days* [Picador, 2007]), and a personal journal—all by the author. Relating Salter's experiences as a Korean War–era F-86 "Sabre" fighter pilot (with one MiG-15 kill), the book traces both his and his fictional characters' various flying assignments around the globe. Editors Jessica and William Benton weave the four sources together chronologically, separating them with artistic symbols and dividing the narrative into four sections to encapsulate the author's major periods of flying: the beginning (cadet pilot training), the post–World War II Air Force, the Korean War, and post–Korean War Europe.

Written by a combat-proven aviator, which gives the book a measure of validity, the flying passages are vivid. At times Salter fills them with metaphorical detail that reads like poetry, drawing the reader into the cockpit: "Gathering speed, they moved down the runway together. It was the highest moment of confidence forever renewed upon taking off, the soaring of spirit" (p. 98). At other times, he writes in a piercing, staccato style, bringing the reader into the split-second decision-making process of fighting MiGs over Korea: "*24 June 1952*. Left the briefing nervous. Dressed, flight briefing. Finally we were off. North in ominous silence" (italics in original) (p. 99). Although this switching of styles demonstrates the author's skill as a writer, it fails to produce a smooth, uniform piece of literature—the result of cutting and pasting excerpts from multiple books.

Since two of the book's sources are novels, I would classify *Gods of Tin* as fiction. Disappointingly, it's challenging at best—and close to impossible at times—to distinguish between the fictional and nonfictional passages. For readers hoping to discover the exhilaration and occasional terror of flight, this issue won't matter. For those looking for a more autobiographical work, the book falls flat. Read individually, the excerpts are interesting—often engrossing; however, character development often suffers at the hands of the editors' cutting and pasting.

Without a doubt, James Salter is a talented writer. Nevertheless, *Gods of Tin* is far from being his best effort. In fact, it appears to be more the work of the editors who cobbled it together. Readers who prefer an engaging story about the life-and-death struggles over the jet-filled skies of Korea should read *The Hunters.* Even though it's a relatively quick and easy read, *Gods of Tin*

misses the mark and certainly does not live up to the quality of Salter's other works.

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War Wings: Films of the First Air War: A Guide to the World War I Aviation Documentary Motion Pictures Held by the U.S. National Archives by Phillip W. Stewart. PMS Press (http://www.pmspress.com), P.O. Box 1496, Crestview, Florida 32536, 2008, 218 pages, $24.95 (softcover), ISBN 978-0-9793243-4-5.

I should make clear up front what this book is and what it is not. Phillip W. Stewart's *War Wings: Films of the First Air War* is not an examination of how World War I aviation films were made, nor is it a study of their meaning or effectiveness. Rather, it is a reference work that catalogues and documents the National Archives and Records Administration's (NARA) holdings of World War I aviation films produced during the Great War. As the author notes in his introduction, the book deals with what he considers a "forgotten, or at best, rarely used resource of information for those of us who are keenly interested in this period of aviation history: the motion picture" (p. xiii). Noting that many belligerents shot millions of feet of film during the war, Stewart sought to document the NARA's aviation holdings, about 95 percent of which were filmed by the US Army Signal Corps.

The work's three general sections encompass six chapters. The first section briefly examines "combat photography" of the US Army and Navy. The brief introduction, a reprint of historian K. Jack Bauer's introduction to the book *List of World War I Signal Corps Films* (1957), is a dated—though still useful—overview of the subject. The second section examines what the author terms "A-List" films (p. xv)—those concerned primarily with aviation. The third section examines "B-List" films (p. xvi)—those that focus on other topics but that include brief aviation scenes. The author also offers three appendices: an alphabetical listing of the 71 A-List films in the NARA collection, a basic chronology of World War I aviation, and a reprint of an essay written in 1919 by Brig Gen William "Billy" Mitchell, in which the outspoken aviator describes the American Air Service in World War I.

Of course, the heart of the book is the 71 A-List films. Clearly, the author has spent countless hours in the National Archives painstakingly examining every reel of every film. Indeed, the level of detail with which the author breaks down each film is impressive, as reflected by the following categories: "Training Airmen," "Building Aircraft," "Getting to France," "American Expeditionary Forces (AEF) in the Skies over France," "Combat Films of Other Nations," and "Films Shot after the Armistice." For each film, Stewart provides a brief description of the contents, length, and number of reels, followed by an exhaustive frame-by-frame description. Consider the following from a film about the artillery training centers at Valdahon and Saumur, France: "Taxi of a Caudron G.4; G.4 takes off; G.4 taxis; G.4 takes off; French troops man the balloon 'spider' and walk it" (p. 32). (Obviously, the book is not meant to be read from cover to cover.) Finally, the author sprinkles the work with stills taken from the films. Of varying quality, some of the photos are striking and probably have not been seen before.

From a reference standpoint, this impressive work would certainly prove useful to researchers, particularly those who can visit the National Archives to view the films, since the book would help them prepare and make the experience worthwhile. Furthermore, the author deserves praise for his research and for reminding us of the existence of some vastly underutilized primary source documents. Finally, readers interested in and knowledgeable about the Army Air Service during World War I should examine a copy of *War Wings: Films of the First Air War*. However, those who seek thoughtful study and critical analysis of the aerial campaigns during that war should look elsewhere.

Capt Gregory W. Ball, PhD, USAFR
Alexandria, Virginia

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