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Getting Our Partners Airborne

Training Air Advisors and Their Impact In-Theater

Maj Gen Michael A. Keltz, USAF

Most Americans would be surprised to learn that US Air Force (USAF) members fly Russian-made Mi-17 transport helicopters and that a few have even flown Mi-35 gunships. USAF aircrew and maintenance personnel will also soon fly and maintain the Embraer / Sierra Nevada A-29 Super Tucano light attack aircraft and a special-mission variant of the Pilatus PC-12—and will continue to do so for years to come. The origins of these programs can be traced to 2007, when the Department of Defense (DOD) developed a plan to build airpower capabilities in the Iraqi and Afghan air forces. For Afghanistan, the concept of operations proposed the acquisition of 149

rotary- and fixed-wing aircraft for training and a variety of operational missions. This proposal identified the need for an initial contingent of 600 USAF personnel—a number that would increase with growing demand in Afghanistan—to train and advise Iraqi and Afghan partners. Accordingly, the directive called for a capability to train USAF personnel in the air-advising mission prior to deployment. Although Air Force Special Operations Command had been providing this type of training for special operations forces (SOF), no such training existed for these conventional General Purpose Forces (GPF) Airmen. Existing ground-centric, predeployment training centers and SOF aviation-related training venues were at capacity. Consequently, in March 2007, the chief of staff of the Air Force directed Air Education and Training Command (AETC) to establish a permanent AETC-led predeployment training detachment, the Air Advisor Academy (AAA), to prepare air advisors to serve in this capacity.[1]

Photo courtesy of Lt Col Scott Voskovitch, USAF

The Iraqi Air Force flies the C-208B as a flying training platform. Modified versions perform special missions. (From "AC-208 Combat Caravan Light Attack Aircraft, Iraq," airforce-technology.com, http://www.airforce-technology.com/projects/ac-208-combat-caravan/.)

Air Advisor Academy

Since the inception of the AAA in 2007, this AETC schoolhouse has educated and trained more than 4,300 students. Now fully operational at Joint Base McGuire-Dix-Lakehurst in New Jersey, the AAA has the capacity to train up to 1,500 students per year, producing 1,227 graduates in 2013. The school provides education and training in three areas: (1) air-advising core skills; (2) language, region, and culture; and (3) advanced force-protection skills, referred to as "fieldcraft." AETC offers eight different AAA training courses for Airmen deploying to permissive, uncertain, and hostile environments in any region across the globe; furthermore, it can tailor these courses in accordance with particular customer requirements. Airmen preparing to serve as aircrew and maintenance air advisors in Iraq and Afghanistan must complete a five-week hostile-environment course.

Even though this article discusses aircrew and maintenance air advisors, it is important to note that the AAA trains Airmen who will advise foreign partners in nearly every USAF career field. In fact, roughly 75 percent of Airmen who serve as air advisors come from the many other USAF career fields. Similarly, this article focuses on Iraq and Afghanistan, but the school trains Airmen preparing for air-advising activities in every geographic combatant command (GCC). Indeed, AAA education and training are on the rise as the demand for air advisors grows across each GCC. Gen Mark A. Welsh, the USAF chief of staff, explained in a June 2013 interview that "there are lots of other combatant commands that want the things that we offer who haven't gotten them for a while." General Welsh cited "partnership-building capability engagements," among other USAF capabilities, as a requirement across the GCCs that "is not going away; it's just going to shift."[2] Current unconstrained calculations for the next five years indicate that the number of Airmen who need training to perform air-advising and other security-cooperation activities in countries other than Iraq and Afghanistan could meet or even exceed the school's current capacity.[3]

Projections indicate that the demand for air advisors in Afghanistan will remain long after the planned termination of US and coalition combat operations at the end of 2014. In its July 2013 *Report on Progress toward Security and Stability in Afghanistan* to Congress, the DOD assessed that Afghan National Security Forces (ANSF) will "need continued assistance and combat support through the end of the ISAF [International Security Assistance Force] mandate in December 2014; beyond then it will still require substantial training, advising and assistance—including financial support—to address ongoing shortcomings." The latter include "more complex and technologically advanced capabilities that will be fielded, such as . . . air support." More specifically, the DOD found that "ANSF components responsible for these more complex tasks, particularly air operations, will not be capable of fully independent operations by December 2014," citing long-term challenges in more sophisticated aviation career fields.[4] In a news conference on 30 July 2013 aligned with the release of this report, Dr. Peter Lavoy, acting assistant secretary of defense for Asian and Pacific security affairs, elaborated on this assessment: "We envision that it will take a period of time before they can adequately fully have sovereign ownership of all those skill sets, including well beyond the 2014 date."[5] In the June 2013 interview, General Welsh voiced a similar view, asserting that the Afghan Air Force (AAF) lacks "people who are trained to maintain an air force over time" and offered that the USAF "can help them with that. But it's going to be a few more years before they're there, in our estimation."[6] Accordingly, Kristina Wong projected in a June 2013 *Washington Times* article that most of the 940 coalition advisors currently building the AAF will remain through 2017 and that a smaller number could continue advising Afghans until 2024.[7]

Training for Aircrew and Maintenance Air Advisors

In addition to AAA courses, aircrew and maintenance air advisors must have specific training in the partner nation (PN) aircraft they will operate and maintain. Once trained, aircrew personnel receive formal

flight evaluations to gain certification in the operation of these platforms. When the PN aircraft is also flown in the USAF, the major command (MAJCOM) responsible for the training typically manages this portion of air-advising training. In the case of non-USAF aircraft, such as the Mi-17, the aircrew and maintenance training is managed by AETC Headquarters' Special Missions Division (HQ AETC/A3Q) in the Directorate of Intelligence, Operations, and Nuclear Integration at Joint Base San Antonio–Randolph in San Antonio, Texas. To execute these responsibilities, the division works with the theater—US Central Command in the case of Iraq and Afghanistan—to establish and validate the associated training requirements. HQ AETC/A3Q then establishes the USAF program that will support this requirement, develops a DOD or contracted training solution, initiates the contracting process when applicable, and—once the contract is awarded—oversees execution of the contracted training. Additionally, the division develops the syllabus that will guide the training, schedules individuals for training, and manages the associated student pipeline. HQ AETC/A3Q also manages standardization/evaluation programs for each of these non-USAF aircraft. Individuals assigned to the division conduct flight evaluations to certify aircrew members in the operation of these aircraft. Bringing these responsibilities full circle, HQ AETC/A3Q performs assessments of the air-advising programs in-theater and uses feedback from these visits to make necessary changes to air-advising education and training.

Furthermore, AETC's Special Missions Division supplies MAJCOM-level management and oversight of GPF air-advising education and training conducted at the AAA. Centrally managing these programs from a single office makes perfect sense because each is inextricably linked to both the air-advising mission and each other. Since AETC is the lead MAJCOM for air-advising education and training, non-USAF aircrew and maintenance training, flying training, technical training, and expeditionary skills training, it's also logical that the AAA and associated aircrew/maintenance training fall under that command. Since the inception of this air-advising aircrew and maintenance training

program in 2007, AETC—with HQ AETC/A3Q in the lead—has managed the training of a total of 846 aircrew and maintenance professionals in 12 aircraft types at a rate of roughly 150 trainees per year. The program has had a substantial impact in Iraq and Afghanistan and is poised to do even more across the globe in the years ahead.

Photo courtesy MSgt Jay Simmons, USAF

An Afghan Air Force Mi-35 gunship awaits tasking at Kabul International Airport, Afghanistan, on 13 February 2010. Two USAF pilots served as air advisors in Afghan Mi-35s during 2010 and 2011.

Rotary-Wing Air-Advising Programs

After the Soviet-Afghan war in the 1980s, the Soviet Union left the Soviet-backed Afghan government with a fleet of over 400 military aircraft, including a large number of Soviet-made helicopters. Years of

fighting within Afghanistan during the 1990s and the US response to the terrorist attacks of 11 September 2001 left the AAF in shambles. By 2007 the Afghan military had only 20 aircraft in its inventory, mostly Mi-17s and Mi-35s.[8] As a direct result of US security assistance and US-led air-advising programs in Afghanistan, the AAF now consists of approximately 100 aircraft. The fleet includes 48 Mi-17s, six Mi-35 attack helicopters, 26 Cessna 208B (C-208B) Grand Caravan fixed-wing trainers/airlifters, six Cessna 182 (C-182) fixed-wing trainers, and six MD-530 rotary-wing trainers.[9] Two USAF pilots served as Mi-35 air advisors in 2010 and 2011, helping the AAF further develop this preexisting capability.[10] The AAF had 6,277 personnel in March 2013, and—as C-130Hs, A-29s, PC-12s, and more Mi-17s are added to the fold—projections indicate it will have 140 aircraft and 8,000 personnel by 2016.[11] According to the DOD's *Report on Progress*, "The Afghan Air Force faces a number of challenges—particularly recruiting and training personnel to operate and maintain the fleet—and is not expected to be fully mission capable until at least 2018."[12] To meet this objective, the USAF must have a sustained and fully funded air-advising program during this time frame.

USAF air advisors train, advise, and assist Afghan counterparts in Mi-17 operations and maintenance; moreover, the advisors' duties include combat missions with Afghan crews. Prior to deploying, these USAF crew members and maintainers attend AETC's Mi-17 training courses for aircrew and maintenance air advisors. Concord XXI Inc. provides a two-week Mi-17 simulator training course in Daleville, Alabama, during which pilots and flight engineers complete 40 hours of academics and 10 simulator hours, and the flight engineers undergo an evaluation in the simulator. After finishing the course, pilots attend six weeks of Mi-17 flying training in Destin, Florida, conducted by Vertol Systems Company Inc. This course consists of 40 hours of ground academics, 35 hours of flight training, and two formal flight evaluations. Flight engineers attend a four-week course in Destin that includes 25 flying hours. USAF maintenance personnel preparing to deploy as air advisors attend a three-week US Army Mi-17 maintenance course at

Fort Rucker, Alabama, that emphasizes general aircraft familiarization and involves 40 hours of academics and 80 hours of hands-on training. Typically, as many as 25 USAF pilots, six flight engineers, and 48 maintenance personnel are trained each year to perform air-advising duties in the Mi-17. Twelve pilots, 17 flight engineers, and 30 maintainers completed training in 2013.

An Mi-17 search and rescue, humanitarian assistance, and disaster-relief mission conducted on 28–29 July 2010 in northeastern Afghanistan demonstrates one impact not often considered in conjunction with air advising. Massive flooding led local Afghan government authorities to request assistance from Brig Gen Muhammed Barat, the AAF's Kabul Air Wing commander, in the early morning of 28 July 2010.[13] Lt Col Greg Roberts, a career USAF rescue helicopter pilot, was serving at the time as General Barat's air advisor and commander of the USAF air-advising squadron in Kabul.[14] General Barat and Lieutenant Colonel Roberts immediately assembled a team of AAF crew members and USAF air advisors to respond to a humanitarian disaster unfolding in one of the most high-threat, insurgent-laden regions of Afghanistan. In just two AAF Mi-17 helicopters, this team rescued an astonishing 2,080 Afghans over the next two days—the largest two-ship helicopter rescue in USAF history.[15] Arming Afghans with the capacity to conduct humanitarian missions of this type across their country will drastically increase the legitimacy of the ANSF and the Afghan government as a whole. Ultimately, helicopter missions saving Afghans will have a far more powerful effect on the hearts and minds of the Afghan people—and the efficacy of the Taliban, for that matter—than any other effect of direct air combat. If a handful of Afghans and air advisors with two Mi-17s can have such an impact in two days, then one can only imagine what a fully trained and operational AAF will be able to do.[16]

An Afghan Air Force officer who flew on board the Mi-17s rescues a child during the daring two-day operation. (From Lt Col Gregory A. Roberts, "Flight Lead Narrative for Afghan Rescue 705 Flight Operations, 28–29 Jul 2010," 438th Air Expeditionary Wing, 6 August 2010, with updates 24 January 2011 and 1 March 2011.)

As the AAF builds on such experiences, the DOD's *Report on Progress* observed that "the AAF is increasingly capable of carrying out a range of operations" and cited examples of its growing effect.[17] From 15 to 18 November 2012, AAF Mi-17s supported Afghan border police who were providing supplies to local villages in a contested area of southern Afghanistan—"possibly the first time these villages had seen GIRoA [Government of the Islamic Republic of Afghanistan] forces, let alone AAF helicopters, delivering humanitarian aid."[18] In fact, AAF Mi-17 operations have advanced to the point where Afghan crews routinely conduct resupply, casualty evacuation (CASEVAC), and passenger-transport missions across the country without US or coalition air advisors on board.[19] In partnership with coalition and Afghan ground forces, Mi-17s now conduct more sophisticated air-assault operations as well.[20] The same report, however, projected that "the 86 Mi-17 helicopters pro-

grammed for the post-2014 AAF fleet will meet only minimal operational requirements."[21] USAF air advisors will necessarily continue to assist and advise their Afghan counterparts as the AAF develops its fleet of Mi-17s and builds on this progress.

Fixed-Wing Air-Advising Programs

C-172 and T-6

Beyond the Mi-17 program in Afghanistan, AETC-trained USAF air advisors also offered years of assistance to the Iraqi Air Force (IqAF) in the development of a fixed-wing pilot-training program. At its inception, this program consisted of six months of primary flight training in the C-172 and six months of advanced flight training in the C-208B. USAF air advisors served as instructors in both aircraft. The Beechcraft T-6 Texan II is now used for primary flight training in Iraq, and USAF air advisors advise the IqAF on T-6 maintenance practices. USAF air advisors train and advise foreign counterparts to enable the PN air forces they represent to perform, over time, their roles and responsibilities independent of US assistance. This approach is now mature in Iraq, and if the United States stays the course, the air-advising model can prove successful in Afghanistan as well.

C-182 and C-208B

As in Iraq, pilot training in the AAF consists of two phases: the first in the C-182 and the second in the C-208B. USAF active-duty and contracted air advisors instruct in both aircraft. HQ AETC/A3Q is charged with training the active-duty air advisors involved in these and other non-USAF aircraft programs. The Air Force Security Assistance Training Squadron, assigned to the Headquarters AETC International Affairs Directorate at Joint Base San Antonio–Randolph, manages USAF contracts that deploy civilian instructors who support some of these same programs. To prepare USAF air advisors en route to Afghanistan, the

Spartan College of Aeronautics and Technology in Tulsa, Oklahoma, provides C-182 and C-208B aircrew and maintenance training. Spartan previously offered the C-172 training as well. The 15-day C-182 air-advisor pilot course consists of approximately 10 hours of ground academics, 10 hours of flight training, and a flight evaluation. The C-208B pilot course lasts 20 days, with 10 hours of ground academics, 12 hours of cockpit procedural training, 20 hours of flight training, and a flight evaluation. Roughly half of the 15-day familiarization training for the maintenance air advisors consists of hands-on experience.

The training that USAF air advisors provide in the various Afghan airframes has begun to bear fruit. Three AAF classes have completed their pilot training in Afghanistan and, on 23 June 2013, the fourth class began the C-208B phase of training.[22] On 20 May 2013, an Afghan C-208B crew flew a badly wounded Afghan soldier from Kandahar to a hospital in Kabul. A USAF air advisor participated in the operation, but this mission marked only the second time that AAF personnel had planned and led a real-world CASEVAC mission.[23] In fact, the AAF has recently reached the point where it has begun flying operational missions without the assistance of air advisors. On 25 June 2013, two Afghan lieutenants trained by USAF air advisors completed the first all-Afghan C-208B operational flight, airlifting 16 passengers—including four local governors.[24]

Members of the Afghan Air Force's Security Forces Quick Reaction Force of the Kabul Air Wing unload from an Mi-17 and practice insertion procedures during an exercise on 27 March 2013. (From Capt Anastasia Wasem, "Afghan Air Force Conducts Multi-Aircraft, Multi-Capability Exercise," US Air Forces Central Command, 1 April 2013, http://www.afcent.af.mil/news/story.asp?id=123342416.)

Additionally, Afghan forces have begun conducting exercises involving both fixed- and rotary-wing missions. On 27 March 2013, the AAF conducted its first combined training exercise, flying Afghan Mi-35s and Mi-17s in an air-assault capacity and C-208Bs in a CASEVAC role.[25] The Mi-17s inserted and extracted Afghan troops, Mi-35s cleared landing sites and flew armed overwatch, and C-208Bs transported patients. USAF air advisors trained, advised, and assisted the AAF in developing these operational capabilities. These exercises and other ongoing training efforts have stimulated progress on the battlefield. In support of a major Afghan National Army operation in northeastern Afghanistan in the spring of 2013, Mi-17s and C-208Bs flew CASEVAC and battlefield circulation missions.[26] In fact, the AAF increased its CASEVAC mis-

sions by 34 percent from February to June 2013.[27] Such air operations allow the Afghans to take the lead, reducing the ANSF's dependence on US and coalition forces. As a result of the air-advising effort, the United States has in turn begun reducing a commensurate portion of direct air support to Afghan ground forces. In a very real and measurable way, then, air advising allows US military forces in Afghanistan to implement the Obama administration's plan to transition combat operations to Afghan forces by the end of 2014.[28]

Three Afghan Air Force pilots receive recognition after completing aircraft commander upgrade training. Following a year of flying with USAF air advisors, two of these pilots flew the first all-Afghan C-208B mission on 25 June 2013. (From "Major Milestone Achieved As AAF Aircraft Commanders Are Certified and Fly First All Afghan C-208 Mission at Shindand AB," *NATO Training Mission Afghanistan Storyboard*, 838th Air Expeditionary Advisory Group, 25 June 2013.)

Aircraft on the Horizon

Even though projections call for the end of US combat operations in less than a year, the air-advising mission will remain necessary for years to come. Three new Afghan aircraft programs that will need an enduring air-advisor mission in Afghanistan—and will ultimately allow the AAF to stand on its own—include the C-130H, the light air support (LAS) A-29 Super Tucano, and the PC-12. The ANSF is currently dependent on US and coalition capabilities such as medium airlift; special-missions support; intelligence, surveillance, and reconnaissance (ISR); and fixed-wing weapons employment. The development of Afghan-appropriate capabilities in each of these areas is critical. The C-130H, A-29, and PC-12 have been selected to perform these roles, thus prompting the need for USAF air advisors and associated preparatory training in all three airframes. HQ AETC/A3Q will play a key role in the development, implementation, and management of USAF A-29 and PC-12 training programs and will assist in preparing C-130H air advisors.

C-130H

To meet a pressing requirement for a medium-airlift capability, Ashton B. Carter, the US deputy secretary of defense, directed the USAF in January 2013 to provide the AAF with four C-130Hs and associated training.[29] The first two aircraft arrived on 9 October 2013, and delivery of the last two is scheduled for November 2014.[30] The first group of Afghan C-130H pilots began training in the United States in May 2013.[31] Assisting the AAF in fully developing this new program will require a USAF air-advising mission in Afghanistan after 2014. According to the DOD's *Report on Progress*, the new C-130Hs "provide an initial capability to do inter-theater lift that will take several years to mature."[32] USAF aircrews/maintainers with prior C-130H experience will comprise the bulk of initial air advisors, and the USAF's Air Mobility Command will likely provide any necessary training for the aircrew and maintenance personnel. On 14 August 2013, the first group of 31

USAF maintainers preparing to assist the AAF with the new C-130H program completed the necessary predeployment training at the AAA.

A-29

Brazilian Embraer Defense and Security, in cooperation with the US-based Sierra Nevada Corporation, was selected on 27 February 2013 to supply the AAF with 20 A-29 Super Tucanos, training for AAF aircrew and maintenance personnel, and associated logistical support.[33] Sierra Nevada will also train USAF air advisors who will in turn train and advise the AAF. This air-advisor training is scheduled to begin in the fall of 2014. The first A-29s should be available in September 2014, and at that point, plans call for delivering two aircraft per month.[34] The USAF intends to deploy air advisors to Afghanistan to assist Afghan counterparts as they build the organizations and infrastructure required to support this more sophisticated weapons system. The DOD reported that the new A-29 LAS program will "provide the AAF with the capability to conduct air interdiction, armed reconnaissance, air-to-ground support, combat search and rescue, border patrol, and aerial escort missions."[35] To train the AAF to perform these missions adequately, officials project an incremental training approach that includes US aircrew and maintenance air advisors for years to come. In fact, "the full employment of CAS [close air support] capability is not expected until sometime post-2018."[36]

Although this new USAF A-29 LAS program focuses on Afghanistan, it brings with it some extraordinary opportunities elsewhere. Over the past 70 years, the Inter-American Air Forces Academy (IAAFA), located at Joint Base San Antonio–Lackland, has played a central role in USAF security cooperation and engagement efforts across the Western Hemisphere. This AETC organization has trained more than 45,000 Latin Americans in a variety of mission areas, including aircraft operations and maintenance.[37] Meanwhile, the Brazilian-built Super Tucano is rapidly becoming the light attack weapons system of choice across much of Latin America.[38] As the region's air forces transition to the Su-

per Tucano, it will become increasingly important for IAAFA instructors to gain knowledge and expertise in the operation and maintenance of this airframe—and initial steps have been taken toward that end. During a June 2013 visit to the IAAFA, representatives from Embraer and Sierra Nevada delivered A-29 technical manuals. The IAAFA plans to use these materials to incorporate A-29 checklists and procedures into six of its maintenance courses.[39]

The A-29 air-advising mission allows the IAAFA to further improve this effort. As A-29 aircrew and maintenance air advisors to the AAF, USAF personnel will acquire substantial knowledge of A-29 operations and maintenance. Further, they will gain unique combat-related A-29 experience that will greatly assist the IAAFA and its faculty as the academy continues to engage a region moving decidedly toward the Super Tucano. This tie between Afghanistan and the IAAFA mission is instructive insofar as it demonstrates quite poignantly that air advising and security cooperation are more widely applicable beyond the borders of Iraq and Afghanistan. It also shows the critical role that AETC organizations—such as the Air Force Security Assistance Training Squadron; HQ AETC/A3Q; the AAA; and, potentially, the IAAFA—play in institutionalizing the knowledge and experience acquired in Iraq and Afghanistan for use in other countries and GCCs around the world.

During current military operations in Afghanistan, US and other coalition aircraft flying close air support missions receive targeting information and clearance to expend munitions from US and coalition joint terminal attack controllers (JTAC). Prior to deployment to Afghanistan, US controllers complete a rigorous program that often includes training with actual aircraft that will conduct combat operations in that country. It is also quite valuable for the aircrews flying these aircraft to train with the same JTACs who will direct air-to-ground operations intheater. The aircraft and aircrews, however, have multiple other predeployment training requirements; consequently, aircraft availability for JTAC training is often problematic. Because plans call for A-29 air-advising training to take place in the United States, the pilots of these

aircraft may be available for JTAC training. If availability and contractual agreements allow, this training would prove mutually beneficial for pilots and JTACs alike as A-29s take flight in Afghanistan. Over time, A-29s will begin combat operations in Afghanistan, and the training that JTACs and air advisors receive stateside could be put to good use downrange.

KA-350/AC-208B/PC-12

In years past, HQ AETC/A3Q managed two air-advising aircrew and maintenance programs supporting the IqAF that demonstrate the capacity for air-advising efforts to reach their desired end state. A military variant of the Hawker Beechcraft King Air 350 light transport aircraft, the KA-350ER-ISR was introduced into the IqAF in July 2008 to serve in an aerial reconnaissance role.[40] Hawker Beechcraft offered KA-350 maintenance-familiarization training in Wichita, Kansas, to support this IqAF advising mission. Pilots received KA-350 simulator training in Orlando, Florida, and then flew US Navy T-44s with a compatible avionics suite at Naval Air Station Kingsville in Corpus Christi, Texas. Similar to the MC-12W Liberty flown by the USAF in Afghanistan, the modified KA-350 gives the IqAF the ISR capabilities necessary to detect and deter insurgent activity.[41] USAF air advisors launched the KA-350 program and, after it matured, transitioned operations and maintenance to full control of the IqAF.

Photo courtesy Sgt Brandon Bolick, USA

An Iraqi Air Force AC-208B Combat Caravan fires a Hellfire missile on 8 November 2010 and scores a direct hit on an Aziziyah Training Range target south of Baghdad. (From MSgt Mike Edwards, "Iraqi Airmen Demonstrate Operational Capabilities in Hellfire Exercise," *Inside Af.Mil*, 2 December 2010, http://www.af.mil/news/story.asp?id=123233035.)

The same occurred with a special-missions variant of the C-208B. Three of these aircraft, modified to serve in an ISR capacity, were delivered to the IqAF in 2007. The following year, Alliant Techsystems Inc., a defense company in Fort Worth, Texas, began modifying three C-208Bs to carry and employ the AGM-114M/K Hellfire missile.[42] Alliant delivered the first of these aircraft in December 2008 and the last in November 2009. An IqAF AC-208B aircrew first fired a Hellfire missile on a bombing range near Al Asad Air Base on 4 November 2009. The following year, on 8 November, Iraqis fired a second missile in conjunction with the first Iraqi-run live-fire missile-training exercise since the time preceding Operation Iraqi Freedom in 2003.[43] USAF air advisors played an active role in advancing IqAF capabilities to this point. The

third live employment, on 23 March 2011, further validated the USAF's air-advising mission. An Iraqi special operations forward air controller directed this AC-208B launch, which occurred as part of an increasingly sophisticated scenario.[44] Adding this aircraft to the inventory—and training its crews and maintainers—has enabled the IqAF to better conduct counterinsurgency operations.

These two programs might be considered predecessors of the PC-12 program now on the rise in Afghanistan. An Afghan Special Mission Wing (SMW), established in July 2012, provides air support to the Afghan special forces' counterterrorism and counternarcotics mission.[45] Up to this point, those special forces and the new SMW, together with 30 aging Mi-17s and 180 personnel, have relied heavily on US support to the special operations mission.[46] To enable transition to Afghan air support of special missions, the DOD recently awarded two contracts for a total of 48 new SMW aircraft. Sierra Nevada will supply 18 specially modified PC-12s, and Russian-based Rosoboronexport will deliver 30 new Mi-17s that will replace the existing fleet.[47]

Training and advising Afghan special operations aircrews and maintainers will take time. The new wing plans to have 188 pilots to fly its projected fleet of 48 aircraft; it had 42 pilots as of January 2013. Only seven of them were fully qualified to fly with night vision goggles. The SMW includes a total of 32 crew chiefs / flight engineers but needs 143. Of the 385 Afghan maintenance personnel required, the wing had only 86.[48] Working in conjunction with the theater, HQ AETC/A3Q is developing a plan to help the Afghans fill these personnel shortfalls by training and advising the SMW's aircrew and maintenance force. In addition to the Mi-17 program already discussed, the first USAF aircrew preparing to serve as PC-12 air advisors graduated from training in November and December of 2013. Once again, HQ AETC/A3Q will be responsible for training the active-duty air advisors, and Air Force Security Assistance Training will manage the contracted PC-12 instructors.

Conclusion / The Way Ahead

Multiple, tangible benefits accrue to these air-advising aircrew and maintenance programs in Iraq and Afghanistan. First, USAF air advisors played an important role in enabling an orderly departure from Iraq at the end of 2011 and will remain central to the Obama administration's plan to transition military operations to Afghan control. Simply stated, a viable air force for Afghanistan depends upon the continued support of USAF air advisors. Without an adequate airpower capability, Afghan ground forces either will not have the capacity to maintain security or will require dedicated US and coalition air support beyond 2014—neither of which seems a practical option at present.

More specifically, without AAA and HQ AETC/A3Q support, the Afghan C-130H, A-29, and PC-12 programs will never get off the ground. Nicole Finch and Lt Col Peter Garretson observed that US engagement strategy "cannot consist simply of selling or giving a partner nation equipment and then leaving. The goal of improving a partner nation's aviation enterprise starts long before any equipment is procured or delivered and continues after any equipment is fielded."[49] Accordingly, cutting short the air-advising mission in Afghanistan would likely leave Afghans with new aircraft they cannot adequately operate and maintain. Additionally, the current Mi-17, C-182, and C-208B programs—which are gaining momentum and beginning to show some measurable results—will likely stall without continued and consistent support from USAF air advisors. Similarly, AAF and SMW missions such as pilot training, mobility, CASEVAC, light attack, and air support for special missions would falter. Continuing the USAF air-advising mission, then, offers the only reasonable USAF method by which Afghan forces can reduce current dependence on US and coalition capabilities and ultimately assume control in each of these areas.

The benefit of air advising is not isolated to Iraq and Afghanistan. With AETC in the lead, the USAF has institutionalized GPF air-advising training for aircrew and maintenance personnel and is now poised to apply that model elsewhere. As previously noted, robust air-advising

experience and knowledge of A-29 Super Tucano combat operations and maintenance in Afghanistan will posture the service to train and advise PNs at the IAAFA, across Latin America, and wherever these aircraft may be flown. As budgets decrease and sequestration takes full effect, this low-cost alternative to persistent US military presence abroad allows us to further our national security interests around the world and continue to assist our partners, like Afghanistan, with a substantially reduced financial burden and US military footprint. In sum, USAF air advising will allow us to transition responsibility over time to the AAF as we build the airpower capacity of other PNs around the globe. ✪

Notes

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8. Forrest L. Marion with Gregory A. Roberts, "The Other Face of Airpower: 'Afghan Rescue 705 Flight,' July 28–29, 2010," *Air Power History* 59, no. 1 (Spring 2012): 22.

9. Department of Defense, *Report on Progress*, 75–76; and Wong, "High Expectations." The 48 Mi-17s include 10 currently on loan to the Afghan Special Mission Wing. Of the 38 Mi-17s in the AAF inventory, 29 were operational as of 31 March 2013. Upon the arrival of 12 additional Mi-17s scheduled for delivery between August and October 2013, the ANSF will have 60 Mi-17s. The final programmed number of Mi-17s after 2014 is 86.

10. "The AAF will retire its Mi-35 fleet in 2016. Currently, only two of six Mi-35s with remaining service life are available at any time due to a shortage of spare parts. The AAF is currently conducting autonomous patrols with the Mi-35 in the Kabul area and training crews to perform armed overwatch/escort and air to ground operations." Department of Defense, *Report on Progress*, 76.

11. Ibid.; and Wong, "High Expectations."

12. Department of Defense, *Report on Progress*, 75.

13. Marion with Roberts, "Other Face of Airpower," 23.

14. Lieutenant Colonel Roberts currently serves as deputy division chief of the HQ AETC/A2/3/10's Standardization/Evaluation Division. In this capacity, he works with HQ AETC/A3Q to conduct Mi-17 flight evaluations in support of the USAF's air-advising aircrew training mission.

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37. Marc Stratton, "Bullet Background Paper on the Inter-American Air Forces Academy (IAAFA) Building Partnership Capabilities," Inter-American Air Forces Academy, 20 May 2013, 2.

38. Dave Lopez, "Bullet Background Paper on Initiatives to Incorporate A-29 Maintenance Concepts in IAAFA Courses," Inter-American Air Forces Academy, 318th Training Squadron, 11 July 2013, 1. The A-29 is currently flown by Brazil, Colombia, Chile, Dominican Republic, and Ecuador. Guatemala will join this group in 2014, and five other Latin American countries have expressed interest in the platform.

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Joint Intelligence, Surveillance, and Reconnaissance in Contested Airspace

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Despite unprecedented success with intelligence, surveillance, and reconnaissance (ISR) networks put in place over Iraq and Afghanistan during the last decade, the joint force has yet to come to grips with the challenges and range of possible options to employ ISR platforms in contested airspace.[1] The Department of Defense ISR Task Force that supported innovations such as Project Liberty and

the battlefield airborne communications node in countering insurgencies in Southwest Asia and the Middle East has not yet addressed either the new strategic concepts or the operational challenges inherent in an AirSea Battle in the Western Pacific or the Persian Gulf in an antiaccess/area-denial (A2/AD) environment.[2]

This article seeks to define the attributes of a family of airborne ISR systems required to operate in nonpermissive military environments. It assumes that despite solid progress in integrating ISR into uncontested airspace, these systems, for the most part, will not prove adequate in future contingencies in which the adversary contests the airspace over a vital region. To help expand the scope of options for ISR systems to operate effectively under these conditions, the article identifies operational factors in Iraq and Afghanistan that led to an integrated, joint ISR system of systems. In so doing, it becomes apparent that the force mix of platforms and sensors fielded to support these conflicts is unlikely to be the right system for an emerging security environment characterized by problematic access and the denial of key bases, ports, and lines of communication enabling power projection. When force planners analyze the plausible contingencies facing US armed forces in the future, they find that an ISR network designed for operation in permissive airspace will be quickly stretched to failure.

The article first reviews the ISR network that proved so successful in uncontested airspace in terms of platforms, sensors, and integration systems (command, control, communications, and computers used for processing data). It then examines the tasking declared in *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, inferring from that document and follow-on joint guidance the requirements for a future ISR family of systems.[3] Finally, the article suggests a course of action through investment in ISR platforms, sensors, and system integration that might successfully underwrite this strategic guidance.

ISR in Uncontested Airspace: Platforms, Sensors, Integration

Airborne ISR assets deployed to Iraq and Afghanistan had the good fortune to operate in essentially uncontested airspace in support of counterinsurgency and counterterror operations. Much of that airborne ISR network consisted of unmanned aerial vehicles (UAV) because of their long dwell time, improved sensors, enhanced connectivity, and precision strike capability. By using more than a platform-centric approach, however, the United States successfully created a family of systems during these conflicts that integrated sensors and command and control (C2) systems to prosecute the wars against a mobile and clandestine foe.

The principal airborne ISR platforms employed in Iraq and Afghanistan were UAVs that evolved from use of the Predator drone during the North Atlantic Treaty Organization's air war over the Balkans in the late 1990s. Although the Predator brought newfound capability in its ability to persist over an area of interest and relay video to the air component commander, "it couldn't . . . deliver target-quality mensurated coordinates or designate targets for other aircraft to strike."[4] Furthermore, the Predator may have brought with it the second-order consequence of gluing too many humans in the chain of command to the video screen, forming long lines of intelligence analysts waiting for their opportunity to watch the real-time show from the battlefield and, as a result, slowing decision making. For example, the attack on Abu Musab al-Zarqawi, the al-Qaeda leader in Iraq, was said to have taken 600 hours of Predator time and thousands of hours of analyst time to facilitate a strike executed in a matter of minutes. Nevertheless, Predator ushered in a new era in situational awareness (SA) and inspired a revolution in coupling ISR with strike when it and its follow-on, the Reaper, were mated with the Hellfire antitank missile. That unmanned hunter-killer concept is one of the most important of all military capabilities—a lesson identified—that will carry forward as the United States faces more sophisticated adversaries in the future.

However, Predator and Reaper had relatively narrow fields of view. Therefore, the unmanned, high-flying Global Hawk became particularly valuable to combat commanders owing to its ability to survey large geographic areas from an altitude of 60,000 feet. The United States also deployed in Afghanistan a classified, stealthy remotely piloted aircraft—once referred to as the "Beast of Kandahar"—since identified as the Sentinel, designed and deployed as a tactical reconnaissance asset. Unfortunately, this UAV surrendered its cloak of secrecy when it crash-landed over Iranian territory.[5]

Not all airborne ISR platforms used in Iraq and Afghanistan were unmanned. The MC-12 Liberty, an augmented version of the turbo-propelled King Air 350, was developed and fielded rapidly to focus on improvised explosive devices (IED) in Iraq. By cross-cueing full motion video (FMV), signals intelligence (SIGINT), and backtracking software, the Liberty system could determine not only the location of IEDs but also the events leading to their roadside insertion. Of course, the United States also deployed its more traditional manned ISR platforms to support conventional and counterinsurgency operations in Iraq and Afghanistan, such as the C-135-based capabilities of the Rivet Joint for SIGINT, the Joint Surveillance Target Attack Radar System aircraft for accurate radar imagery, ground-moving target indications and battle management, and the venerable U-2 for photo imagery. These aircraft were unimpeded by enemy air defenses in their ISR operations along and within uncontested airspace.

We should also note the term *nontraditional ISR*, which refers to the use of sensor systems such as targeting pods on manned fighter aircraft that, although not designed for ISR operations, proved very useful in contributing to battlespace awareness in these unconventional campaigns. Examples include F-18s and F-15s collecting imagery with targeting pods, F-16CJs designed for countering surface-to-air missiles collecting SIGINT, and AC-130s using video capabilities to monitor facilities of interest.[6] Such imagery has the advantage of being downloaded and transmitted over data links to the war fighter in near real

time or simply returned to a bank of stored ISR data for processing and disseminating in a less time-sensitive environment.

Similar to the challenges facing platforms in low-intensity conflict, ISR sensors had to be adapted to concentrate on an unconventional adversary. Perhaps the most innovative—and arguably the most valuable—application was the use of FMV. Coupled with the persistence of platforms that could loiter for long periods of time, FMV could distinguish friend from foe on the ground and avoid collateral damage in the event of an attack. Prominent here were the multispectral targeting systems used by the Predator and Reaper drones, employing automated tracking, color, fused images, and electronic zoom.[7] To enlarge the field of view and allow a single aircraft to provide coverage of multiple targets, the "Gorgon Stare" system was designed to augment the FMV capability by adding 10 separate electro-optical (EO) and infrared (IR) sensors to offer a single wide-area perspective over a four-kilometer-square area. On the Project Liberty MC-12s, an IR pointer allowed the aircrew to designate an object to troops on the ground.

The sensors on these manned and unmanned systems were developed specifically for the unconventional, land-based target set in Iraq and Afghanistan. The Global Hawk, developed originally as a replacement for the manned U-2 in a strategic surveillance role, needed additional modification. Block 20 Global Hawks were equipped primarily for imagery intelligence and were later modified to serve as battlefield communications nodes. Block 30 Global Hawk aircraft acted as multispectral platforms with EO, IR, synthetic aperture radar, and SIGINT sensors. At its high-altitude, over-the-battlefield position and with its long endurance, Global Hawk could cross-cue, verify, and link similar sensors and systems operated by manned standoff ISR platforms.

Other ISR force multipliers included the targeting pods carried on tactical fighters—the so-called nontraditional ISR platforms. These pods contained high-resolution, forward-looking IR sensors displaying an image with a wide-angle search capability and a narrow field of view to acquire battlefield-sized targets. These images could be down-

linked in streaming video to forward-deployed ground forces in a form of ISR close air support. Because of this innovation, nontraditional ISR was often specified as a fighter's primary task in the daily air tasking order and coordinated with UAV operations to supply long dwell time when needed and rapid reaction as necessary.[8]

Management and integration of these platforms and sensors have evolved over the last decade, and each of these airborne ISR systems has been adapted to facilitate real-time C2 in support of the war fighter. Unfortunately, as is often the case in individual systems, the C2 network put in place is stovepiped from platform and sensor to a specific user and service-specific distributed ground station, thus failing to cross the air, sea, and land domains and include joint customers seeking essential elements of information.

All of these ISR systems shared the objective of informing ground commanders and increasing their SA within a mobile and complex battlespace. As the initial air operations plan for Operation Enduring Freedom unfolded in late 2001, links between the Predator and AC-130U gunships were established using an omnidirectional C-band antenna. That innovation quickly led to sending Predator video to troops on the ground through a Remotely Operated Video Enhanced Receiver system, eventually supporting video feeds from multiple UAVs and downsized to handheld versions carried by troops on the ground.[9]

The object of Task Force Observe, Detect, Identify, and Neutralize (ODIN)—one of the best examples of air-ground ISR integration to come out of the Iraq and Afghanistan wars—was to counter the enemy's IED campaign. Components of the US integrated ISR system included UAVs with FMV and the Liberty King Airs, also equipped with video and SIGINT. In addition to ferreting out IEDs and shortening the decision chain with radio links to Apache helicopters, the ODIN system proved noteworthy for its ability to distribute collected data to common ground stations, cross-cueing human intelligence, imagery, and SIGINT to create "pattern of life" footprints leading to the

acquisition of high-value targets and the unraveling of complex IED networks.[10]

One concern with the ODIN network had to do with its performance over the rugged and mountainous terrain of Afghanistan compared with that over the relatively flat landscape of Iraq. A solution to this issue involved the use of airborne communications systems to act as a relay to help integrate air and surface operations. The battlefield airborne communications node was developed to overcome these difficulties by allowing air and ground-based units operating far from each other to see the same ISR picture. The node has been deployed on both manned (the E-11A) and unmanned (Global Hawk) platforms to improve system integration, enhance SA, and strengthen beyond-line-of-sight communications.[11]

What might we conclude from this brief description of ISR platforms, sensors, and their integration employed in counterinsurgency and counterterror operations over the last decade? The demand signal was high, and the targets were time-sensitive, resulting in an emphasis on airborne platforms focused on supporting tactical ground operations in complex irregular warfare. Sensor systems deployed to Iraq and Afghanistan were tailored to a target set of IEDs, moving vehicles, and high-value individuals, driving the need for persistence. C2 of these ISR systems tended to emphasize single communications links between sensor and shooter rather than wideband communications conveying SA to the joint force. Clearly, the innovation in ISR brought to this unconventional battlefield was exemplary, from unmanned reconnaissance-strike systems to nontraditional tactics and techniques. Nevertheless, these platforms could operate only within a sanctuary of uncontested airspace. Had air defenses been more robust, these ISR operations might have proved far more difficult—and certainly less successful.

Priorities for Twenty-First-Century Defense: Implications for ISR

The shift from counterinsurgency to broader strategic engagement in support of US and allied security has a number of implications for ISR. The document *Sustaining U.S. Global Leadership*, mentioned above, generates these requirements, tilting America's strategic focus and force posture toward the Asia-Pacific. To credibly deter and defend in the future, the policy directs the US military to "invest as required to ensure its ability to operate effectively in anti-access and area denial . . . environments."[12]

These requirements stand in stark contrast to present US ISR capabilities that emphasize counterterror and counterinsurgency operations. ISR will now have to provide persistent coverage over a vast area that could come under attack by adversaries, threatening the operations of US and allied armed forces. The guidance further warns that adversaries in these A2/AD areas will present difficult obstacles to US military intervention. In a follow-on document, the Joint Chiefs of Staff have clarified the ISR requirements dictated by this strategic shift. Specifically, the *Joint Operational Access Concept* charges ISR assets to

- Prepare the operational area in advance to facilitate access. . . .
- Exploit advantages in one or more domains to disrupt or destroy enemy anti-access/area-denial capabilities in others.
- Disrupt enemy reconnaissance and surveillance efforts while protecting friendly efforts. . . .
- Attack enemy antiaccess/area-denial defenses in depth rather than rolling back those defenses from the perimeter.
- Maximize surprise through deception, stealth, and ambiguity to complicate enemy targeting.[13]

It further emphasizes that the "reconnaissance/counterreconnaissance fight is a critical multidomain contest in any combat operation to gain operational access, as each combatant attempts to gain better situa-

tional awareness than the other" and that the joint force will demand a major ISR effort applied aggressively. Finally, it notes that this concept will put a heavy burden on continued operations supported by robust C2: "Characterizing an adversary is a continuous activity, commencing years before hostilities begin and continuing during and after those hostilities. This has implications for steady state sizing, systemic capacity, and analytic technologies of intelligence forces. Specifically, the reconnaissance and surveillance contest is critical to access operations."[14]

In an open forum, we can best judge the requirements levied on airborne ISR assets through development of the nascent AirSea Battle operational concept. According to analysis conducted by the Center for Strategic and Budgetary Assessments (CSBA), a "blinding campaign" or "scouting battle" will be the first and most important military move in an A2/AD confrontation.[15] During this phase of the conflict, each side will seek to attack the other's ISR assets and battle networks to deprive the opponent of the ability to detect, identify, and target approaching forces at range. The CSBA study concludes that achieving the technical and procedural interoperability required for a successful joint AirSea Battle will "be toughest with respect to C2, communications, and ISR, simply because these drive the information and data flows" essential to SA.[16]

When the CSBA studies move beyond the A2/AD scenarios in the Western Pacific and the Persian Gulf, pondering the implementation problems inherent in AirSea Battle, they point to the need for rapid and continuing investment in integrated ISR systems.[17] This family of joint ISR systems necessary to underwrite AirSea Battle will have long lead times because of the complexity of integrating various platforms and sensors. Most challenging will be fully compatible and interoperable joint C2, ISR, and processing, exploitation, and dissemination (PED) architectures. Thus, the CSBA concludes that "early Air Force and Navy agreement on efficient migration paths for these architectures is particularly important."[18]

ISR in Contested Airspace: Platforms, Sensors, Integration

Two things are clear. First, over the last decade the US military put in place an effective ISR network to prosecute an irregular enemy in relatively uncontested airspace. Second, the United States now needs to replicate that capability in a far more formidable threat environment. In pursuit of this capability, a number of studies are under way that will undoubtedly build on the legacy of effective airborne ISR systems developed and deployed over the last decade. But they are also likely to suggest new approaches in platforms, sensors, and systems to operate effectively in contested airspace.

ISR platforms of the future will need all of the characteristics of those that performed so well over the last decade with one substantial added requirement: survivability in hostile airspace. Although endurance, payload, integration, and connectivity are essential, none of these attributes will be of value if the platform cannot survive in an A2/AD environment. Replacing the Predator and Reaper in the unmanned reconnaissance-strike role will call for new UAVs that can loiter, survive, and attack near and within heavily defended airspace. Most promising here is the unmanned combat air system demonstrator (UCAS-D) undergoing tests by the Navy and the separate but related unmanned carrier-launched airborne surveillance and strike system (UCLASS) program. Whether or not the former is folded into the latter, the unmanned combat aerial vehicle (UCAV) could be designed to carry a suite of sensors and weapons 2,000 nautical miles or more from the carrier without refueling and will have far greater range and persistence if the vehicle can be refueled while airborne. Important to the UAV's survival is its low observability—designed from the start with the stealth to penetrate highly defended airspace. Like its nonstealthy forebears, the UCAV will carry the sensors and weapons to conduct missions of both reconnaissance and precision strike.[19]

High-altitude, long-endurance UAVs will also play a role but, depending on the enemy's air order of battle, will have to be operated judiciously and equipped with self-defense capability. Global Hawk and the Navy's Broad Area Maritime Surveillance System, the Triton, might need a self-protection suite that includes a laser warning system, radar warning receiver, electronic attack or jamming system, and a towed decoy. The ISR provided by those high-altitude UAVs can be supplemented by the stealthy Sentinel drone at the tactical level—reportedly a key ISR asset in preparing the battlefield for the raid that killed Osama bin Laden.[20] For the longer term, it may make sense for the Air Force to convert its MQ-X UAV program, now on hold, into a land-based version of the vehicle emerging from the Navy's UCAS-D/UCLASS programs.[21]

The F-22's and F-35's low observability could allow them to conduct nontraditional ISR missions in contested airspace. As the number of jointly operated Joint Strike Fighters increases, they will be able to operate in groups—separated at distances so as not to compromise their stealth but close enough to offer mutual support, such as standoff jamming by one flight of fighters while others penetrate. These stealthy aircraft will have impressive sensor suites characterized as "vacuum cleaners"—collecting data about the enemy's posture and feeding it to joint networks. Meanwhile, the F-35's formidable computational power will allow a real-time recalculation of alternative mission routing in response to intelligence regarding enemy air defenses.

Space-based platforms have been major contributors to collecting ISR data over Iraq and Afghanistan, particularly in cueing other platforms to areas and targets of interest. However, due to the strategic nature of their collection missions and the time that elapses between passes over those areas of interest, satellites have not been considered major players in the pursuit of high-value, mobile, tactical targets. Under new tasking that demands greater wide-area surveillance and strategic assessments over the Western Pacific and Persian Gulf, that perception is likely to change. The increased fidelity of satellite-mounted

sensors such as IR and radar, as well as their significant contributions to communications and C2, will likely place greater priority on space-based ISR systems—including the X-37B reusable space plane—in the future.

The systems of targets and the wide-area surveillance needed for the rebalancing of US military forces to the Pacific will also prompt a shift in sensor focus and capability. Each of the platforms described above must tailor its sensing capabilities toward detecting the A2/AD forces and networks (e.g., antisatellite weapons, long-range ISR systems, and precision-guided conventional land-attack and antiship cruise and ballistic missiles) arrayed against the operation of US and allied assets in the region. The ISR capabilities of UAVs will have much to offer, as long as those platforms remain survivable. Thus, a suite of multi-intelligence (INT) sensors, similar to that carried by Reaper and Global Hawk but improved in terms of range and low observability, will allow a new generation of UAVs to make major contributions to SA. For example, advanced sensors with multispectral imaging and multiwave radars might penetrate structures, exposing anything hidden inside. Just as UAV remote sensor requirements stemmed from past changes in military missions, so will new capability requirements arise from emerging military doctrine, including the need for persistence and penetration of advanced air defenses.

UAV payloads might consist of a modular, open-architecture suite of sensors for collecting reconnaissance from across the electromagnetic spectrum and, in the UCAV version, precision munitions capable of exploiting processed information to target enemies with pinpoint accuracy. The requirement for high-definition FMV with its attendant bandwidth, considered so important over the last decade, may take a backseat to large, strategic UAVs with long-range radar, SIGINT, and EO/IR sensors and multifunction radio-frequency-sensor payloads. For example, the Global Hawk Block 40 aircraft with a high-range resolution sensor will allow precision target measurement and classification from high altitude and longer standoff ranges. Similar sensor payloads

may let the UCAV find imprecisely located targets on its own, similar to programs such as Tacit Rainbow and the low-cost autonomous attack submunition—abandoned in the past because of uncertainty regarding the unmanned vehicles' reliability for autonomous munitions delivery.

The F-22 and F-35 will also assume ISR roles well beyond the nontraditional role played by fourth-generation fighters with targeting pods over Iraq and Afghanistan. Most notable may be the spherical SA system termed the distributed aperture system developed for the F-35. That system of six EO sensors offers ballistic missile detection and tracking, including launch point detection as well as IR search-and-track functions and day/night navigation. Moreover, both of the fifth-generation stealthy fighters will add ISR capability through their active electronically scanned array (AESA) radars, supplying enhanced target resolution with low probability of intercept and increased resistance to jamming. These aircraft have enhanced defensive sensor suites as well. Just as AESA radar can be used for electronic attack of enemy air defenses, so will the F-35's digital radio-frequency memory capabilities allow the aircraft "to duplicate incoming radar signals, alter them, and send them back to the receiver modified to suggest that the fighter is either not there or is somewhere else."[22]

Given the revived importance of satellites to ISR gathering under the new strategic priorities, space-based sensors must also receive added emphasis. Two capabilities appear particularly significant: space-based radar and IR. The former was an ambitious program initiated a decade ago, designed to provide high-volume, readily available synthetic aperture radar imaging, surface moving-target indications, and high-resolution terrain information to the joint war fighter. Although the program's complexity and cost led to its cancellation, the strategic pivot to A2/AD areas argues for its rebirth. Space radar, which offers coherent change detection to track an enemy order of battle in A2/AD scenarios, has the granularity to detect the launch and track the arc of cruise missiles.

A new generation of space-based IR satellites will make major contributions to denied-area ISR. Somewhat ironically, the difficulty experienced by the United States in locating the launch of Scud missiles during the 1991 Iraq war led to an improved capability that now has application in more far-flung theaters of operation. The new space-based IR system, in addition to detecting long-range ballistic missile launches, will contribute to SA of theater missile defense, characterize IR event signatures, and provide intelligence to support force protection, strike planning, and other missions conducted in an A2/AD scenario.[23]

The challenge of integrating ISR assets will become even more complex when military forces operate in A2/AD environments. Over Iraq and Afghanistan, the principal issue involved the quantity of ISR data—a complex system of PED moving vast amounts of data around the theater. In A2/AD airspace, we must pay greater attention not only to the joint and interoperable PED processes but also to their security. One of the approaches both to improving security and handling large amounts of data will entail improvements in the PED process at the multiservice distributed common ground/surface system nodes. A major task at hand involves integrating airborne ISR data into these communications centers. The ultimate architecture must create a network that can fuse and interpret data from multiple sources as well as process and disseminate those data to joint users at just the right time. Particularly important here is an integrated presentation of multisensor, multi-INT inputs on a common joint display.

No matter how streamlined and secure the PED process, however, disseminating ISR data to C2 facilities followed by subsequent tasking to a strike platform imposes unavoidable delays and inserts C2 uncertainties. We learned from operations in Afghanistan that sensor-to-shooter links communicated faster than could be supported by a C2 process requiring evaluation and approval at numerous decision levels. Inadequate communications links, incomplete bomb damage assessment, and poor dynamic airspace management all contributed to

shortfalls in the ISR integration process. In uncontested airspace, the Predators and Reapers with FMV and precision-guided weapons filled this gap nicely. Building on that practice, ISR assets in A2/AD environments will need greater airborne persistence as well as sensor-to-sensor integration and data processing at the point of origin to supply real-time information on time-sensitive targets.[24]

A complex mix of platform, sensor, and integration attributes is required to effectively engage time-sensitive or mobile targets in contested airspace. They include range, endurance, survivability, short reaction time, flexible munitions mixes, network connectivity, and onboard mission planning and targeting.[25] Platforms possessing these attributes in varying degrees of effectiveness include the F-22 and F-35 fighters, an armed UCAV (presuming that strike authority is granted with a human in or on the loop), and the B-2 bomber or its advanced technology replacement now under the cloak of security and in development. As autonomous as these platforms and sensors might be, coordinated tactics and engagement profiles in antiaccess environments will demand that stealthy platforms be able to talk to each other. The multifunction advanced data link with high-data-rate, low-probability-of-intercept, and low-probability-of-detection properties is in development for the F-35, but plans to place the link on the B-2 (or the future bomber) and F-22 may have stalled. To integrate these stealthy ISR and strike systems, we must field this data link or something like it.[26]

Just as space-based sensors and platforms will prove critical to ISR in A2/AD scenarios, so will space-based communications prove essential to ISR integration. Replenishment of the Global Positioning System, now under way, is needed for the timing and positioning of ISR assets and required for the guidance of air-launched precision weapons. The jam-resistant and nuclear-hardened Milstar communication satellite constellation is being replaced by the advanced extremely high frequency (AEHF) satellite system, which will provide enhanced capacity and clarity-enabling ISR asset integration at both the strategic and tactical levels. The next generation of satellite terminals, known as the

Family of Advanced Beyond-Line-of-Sight Terminals, is also necessary to facilitate communications between airborne ISR assets and AEHF satellites.[27] We can also protect satellite communication by restarting the laser-based transformational satellite system, once abandoned but now strengthened by a broadened industrial base and mature technology readiness.[28] Finally, self-defense will also be necessary for space-based assets in A2/AD scenarios.[29]

Conclusion

In directing a strategic shift away from a decade's emphasis on large-scale counterterror, counterinsurgency, and prolonged stability operations, the nation's defense leaders have issued a powerful challenge to the airborne ISR enterprise. Because of the uncontested environment for the operation of an ISR family of systems over Iraq and Afghanistan, the platforms, supporting sensors, and C2 connections cannot simply be lifted and relocated to a new theater of operations. Nevertheless, the joint force can still profit from years of effort in establishing tactics, techniques, and procedures that replaced the ponderous practice of transferring actionable intelligence to the operator, which so often had the counterproductive effect of disrupting the relationship among sensor, decider, and shooter.

Force planners with an airborne ISR portfolio can also profit from the joint "family of systems" approach adopted by their colleagues who deliberate future platforms, sensors, and integration for long-range strike.[30] As comparisons are drawn across different scenarios, the worth of these individual systems varies markedly. Penetrating deeply into defended territory, surveilling targets from long range, loitering and tracking time-sensitive targets, and surviving in defended airspace with integrated ISR and strike capabilities can all lead to differing solutions. Given this range of requirements, a family-of-systems approach that offers diverse ISR platforms, sensors, and integration options appears prudent in a security environment populated by emerging ad-

versaries who present differing antiaccess challenges. But this family of systems must be connected across the armed services.

More work remains, and several studies exploring ISR in contested airspace are under way. Lessons identified from recent wars continue to stress the power of ISR integration for effective C2 while the challenges of operating in contested airspace will place a premium on varying approaches to survivability. In any scenario, the issue of ISR in A2/AD environments will involve getting the right information to the right person at the right time to make the right decision. We should use studies and war games to adapt the effective ISR network put in place over the last decade to more stressful conditions, and we should identify the investments needed, particularly when a long lead time is necessary to gain a desired ISR capability. To ensure that the prowess so ably demonstrated by airborne ISR systems in uncontested airspace does not atrophy in the face of increasingly nonpermissive environments, we must accelerate those studies and provide the needed investment. ✪

Notes

1. Joint Publication 2-01, *Joint and National Intelligence Support to Military Operations*, 5 January 2012, defines ISR as "an activity that synchronizes and integrates the planning and operation of sensors, assets, and processing, exploitation, and dissemination systems in direct support of current and future operations" (GL-12).

2. The battlefield airborne communications node is an airborne communications relay system mounted on manned and unmanned aircraft to link air and ground forces with a common ISR picture. See Adm Jonathan W. Greenert, USN, and Gen Norton A. Schwartz, USAF, "Air-Sea Battle," 20 February 2012, http://www.the-american-interest.com/articles/2012/02/20/air-sea-battle/.

3. Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington, DC: Department of Defense, January 2012). For reinforcing guidance, see Department of Defense, *Quadrennial Defense Review 2014* (Washington, DC: Department of Defense, 2014), http://www.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf.

4. Richard Whittle, *Predator's Big Safari*, Mitchell Paper 7 (Washington, DC: Mitchell Institute for Airpower Studies, August 2011), 4.

5. The conditions surrounding the crash landing of the RQ-170 drone in Iran in December 2011 remain murky, and the competing claims on both sides are unlikely to be resolved

conclusively. Regardless, the United States lost a valuable ISR asset in defended airspace. See Robert Haffa and Anand Datla, "6 Ways to Improve UAVs," *C4ISR Journal* 11, no. 2 (March 2012): 30–31.

6. See Curtis E. LeMay Center for Doctrine Development and Education, "Annex 2-0, Global Integrated Intelligence, Surveillance and Reconnaissance Operations," 6 January 2012, https://doctrine.af.mil/DTM/dtmisroperations.htm.

7. "Raytheon Nets $31.4 Million Contract for MTS-A on MH-60, Predator," Space War, 28 September 2005, http://www.spacewar.com/news/uav-05zzzzl.html.

8. John A. Tirpak, "Eyes of the Fighter," *Air Force Magazine* 89, no. 1 (January 2006): 40–44.

9. Whittle, *Predator's Big Safari*, 28.

10. Jon W. Glass, "Taking Aim in Afghanistan," *DefenseNews*, 5 February 2009, http://defensenews.com/article/20090205/C4ISR02.

11. See "USAF Continues to Grow, Strengthen Its BACN Fleet with New E-11A Buy," InsideDefense.com, 30 August 2012.

12. Department of Defense, *Sustaining U.S. Global Leadership*, 4–5.

13. Department of Defense, *Joint Operational Access Concept*, Version 1.0 (Washington, DC: Department of Defense, 17 January 2012), iii.

14. Ibid., 22–23, 29. See also Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020* (Washington, DC: Joint Chiefs of Staff, 10 September 2012).

15. Jan van Tol et al., *AirSea Battle: A Point of Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), xiii, 56.

16. Ibid., 112.

17. See also Mark Gunzinger with Chris Dougherty, *Outside-In: Operating from Range to Defeat Iran's Anti-access and Area-Denial Threats* (Washington, DC: Center for Strategic and Budgetary Assessments, 2011).

18. Van Tol et al., *AirSea Battle*, 122.

19. See Thomas P. Ehrhard, PhD, and Robert O. Work, *Range, Persistence, Stealth and Networking: The Case for a Carrier-Based Unmanned Combat Air System* (Washington, DC: Center for Strategic and Budgetary Assessments, 2008).

20. See "RQ-170 Unmanned Aerial Vehicle, United States of America," airforce-technology.com, accessed 7 March 2014, http://www.airforce-technology.com.

21. However, the Air Force may have another solution to conduct ISR in contested airspace—the RQ-180. See Amy Butler and Bill Sweetman, "Return of the Penetrator," *Aviation Week and Space Technology* 175, no. 42 (9 December 2013): 20.

22. John A. Tirpak, "A New Revolution in Military Affairs," *Air Force Magazine* 94, no. 7 (July 2011): 10, http://www.airforcemag.com/MagazineArchive/Pages/2011/July%20 2011/0711watch.aspx. See also Barry D. Watts, *The Maturing Revolution in Military Affairs* (Washington, DC: Center for Strategic and Budgetary Assessments, 2011), 29.

23. "Space Based Infrared System (SBIRS)," Lockheed Martin, accessed 7 March 2014, http://www.lockheedmartin.com/us/products/sbirs.html.

24. David Deptula, "Integration Nation," *C4ISR Journal* 11, no. 3 (April 2012): 32.

25. See Christopher J. Bowie, *Destroying Mobile Ground Targets in an Anti-access Environment*, Analysis Center Papers (Washington, DC: Northrop Grumman, December 2001).

26. The Air Force and its industry partners are working this problem. See Amy Butler, "Cross Talk," *Aviation Week and Space Technology* 176, no. 7 (3 March 2014): 24.

27. Amy Svitak and Amy Butler, "Fabulous Opportunity," *Aviation Week and Space Technology* 174, no. 26 (23 July 2012): 41.

28. See Stew Magnuson, "Military Space Communications Lacks Direction, Critics Say," *National Defense*, January 2013, http://www.nationaldefensemagazine.org/archive/2013/January/Pages/MilitarySpaceCommunicationsLacksDirection,CriticsSay.aspx.

29. See Robert P. Haffa Jr., *Full-Spectrum Air Power: Building the Air Force America Needs*, Special Report no. 122 (Washington, DC: Heritage Foundation, 12 October 2012), 18, http://thf_media.s3.amazonaws.com/2012/pdf/SR122.pdf.

30. See Robert P. Haffa Jr., and Michael W. Isherwood, "Long-Range Conventional Strike: A Joint Family of Systems," *Joint Force Quarterly* 60 (1st Quarter 2011): 102–7.

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Nightfall

Machine Autonomy in Air-to-Air Combat

Capt Michael W. Byrnes, USAF*

Although one finds no shortage of professional and academic conversation about remotely piloted aircraft (RPA) and potential unmanned combat aerial vehicles (UCAV), there is a distinct lack of forecasting of their futures on the basis of a tight fusion of tactics, technology, and the enduring truths of air combat. This article claims that a tactically autonomous, machine-piloted aircraft whose

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design capitalizes on John Boyd's observe, orient, decide, act (OODA) loop and energy-maneuverability constructs will bring new and unmatched lethality to air-to-air combat. It submits that the machine's combined advantages applied to the nature of the tasks would make the idea of human-inhabited platforms that challenge it resemble the mismatch depicted in *The Charge of the Light Brigade*. A convergence of new technologies indicates the earliest stages of emergence of a tactically game-changing approach to air warfare, but the institutional Air Force appears skeptical—perhaps since this theory of air dominance begins life in an environment resistant and rightfully cautious toward its development.[1] To date, a credible RPA optimized for air combat has not been developed, and the nation and service face severe fiscal austerity, increasing risk aversion.[2] Furthermore, the idea of a machine outflying the world's best fighter pilots may frustrate and unsettle conventional wisdom, inviting political contention.

However, if logic proves the dominance of this theory of machine autonomy in airpower and if the technology to execute it emerges, then making the emotional decision to reject it places our forces at strategic risk. To show that such claims are reasonable, the article presents a notional UCAV termed *FQ-X* to provide a guided tour through emerging real-world technologies and to show their tactical implications in an engagement. The discussion shifts to assessing briefly how these tactical effects ripple into the operational and strategic and then closely examines autonomous decision making in the context of the OODA loop before taking a deep dive into the technologies behind machine pilotage. Finally, the article counters prominent objections to the machine pilot in the arenas of cyber defensibility and the ethics of killing by a proxy weapon capable of making its own decisions. It wraps up with an assessment of the tactical and cultural integration challenges that lie ahead for the Air Force at the appearance of these novel systems.

FQ-X Design and Features

The form of a machine like FQ-X, whose purpose is to find and destroy enemy aircraft, will favor small size and weight, great speed, low detectability, and unprecedented accuracy. The design exploits cutting-edge metamaterials that complement radar-absorptive materials to generate specific tactical advantages. Metamaterials are synthetic structures that demonstrate effects previously thought physically impossible. Specifically, negative-index-of-refraction metamaterials are capable of refracting electromagnetic energy in a way that "bends" it around (rather than bounces it off) an object, rendering it invisible in a particular region of the spectrum. Researchers proved techniques to do so as early as 2001 and less than 10 years later in the visual and infrared spectra.[3] By 2012 a team had even devised methods to overcome geometry and polarization limits, which were showstoppers for the use of metamaterials to hide a large object like an aircraft.[4] The implication for airpower is that a new generation of extremely stealthy materials is emerging, and the military does not have the luxury of keeping them a secret. Their utility in a variety of civil and military applications may also lead to their relatively cheap and plentiful manufacture. Although no stealth technique is flawless, metamaterial layers within a dielectric composite skin of FQ-X severely hamper current detection and identification methods. Preventing an enemy missile lock on an FQ-X is an excellent return on investment, but the overriding reason for stealth is that FQ-X focuses religiously on the OODA loop. The priorities are to defeat the operator's decision cycle first and missile-guidance systems second. When the aircraft is successful at both, it sidesteps a staple of modern air combat, undermining a multibillion-dollar national security investment.[5] When a scenario does not permit slipping past the allowable weapons-employment zone of air-to-air missiles, existing countermeasures and emerging directed-energy point defenses are excellent options for an aircraft with millisecond reaction times.[6]

Defensive capabilities are of limited value if not paired with tools to find, fix, identify, and target hostile aircraft. Radar technology has evolved to the point that superficial assumptions about its capabilities are no longer accurate. For example, it would be natural to think that if a transmitting aircraft sends out a pulse of energy to detect an opponent, then that opponent (who was just hit with that energy) should be able to notice and respond. However, modern radars with low-probability-of-intercept technologies transmit at power levels below the receiving aircraft's detection threshold, working across multiple frequencies and across time to integrate the collection of weaker returns into a coherent signal.[7] Modulation techniques applied to active electronically-scanned-array antennas allow for multiple beams, which translates to multiple target acquisition and engagement.[8] The key to all of these fantastic capabilities is the capacity for digital signal processing.[9] The principle of "first look, first kill" belongs to the aircraft with the most processing power and the best software to leverage it. F-22 processing power is on the order of 5 billion decimal operations per second.[10] Modern graphics processing units can execute digital signal processing for radar applications at 10 to 100 times that speed and are available as affordable commercial off-the-shelf hardware.[11] FQ-X uses arrays of graphics processing units to showcase how much the "find and fix" stage of air combat is really a battle for computing power, which it leverages from general-purpose hardware, shifting task specialization into software to reduce cost and increase flexibility.

Today's predominant use of guided missiles is already an implicit admission of reliance on automation, and if the machine pilot can outperform human processing in the most allegedly artistic piece of air combat, simpler ones also likely favor the machine. To demonstrate, FQ-X collapses to gun range to outmaneuver the modern human-inhabited fighter, exploiting both positive and negative G choices. FQ-X's options are flexible, thanks to carbon nanotube composite structures and the absence of a human inside. Carbon nanotubes are microscopic structures formed in 1952 lab experiments that did not reach broad awareness in the Western scientific community until 1991.[12] In 2012 re-

searchers at North Carolina State University demonstrated fabrication of large-scale carbon nanotube materials that showed a remarkable 30 percent improvement in specific strength over the world's best-engineered composites.[13]

Once positioned to attack, FQ-X needs to deliver hyperprecise effects to maximize use of a comparatively lean arsenal that a small craft is likely to contain. To that end, it has a nearly all-aspect targeting system accurate enough to pick a particular spot on an opposing aircraft to place a high-explosive round or directed-energy burst. To positively identify the target and hit the desired spot, FQ-X must have integrated multispectral optics and computer vision software. One of the largest commercial drivers of this object detection software is Google (which pursues the technology for image-based search engines).[14] However, open-source projects like OpenCV, containing more than 2,500 optimized detection and recognition algorithms, are also rapidly advancing application of the science.[15] Computer vision frameworks such as OpenCV also take advantage of graphics processing units to speed processing functions five to 100 times faster than traditional computer hardware.[16] Figure 1 depicts an engagement approaching this endgame state from FQ-X's computer vision perspective, first from a notional US system's display and then from a hypothetical competing foreign version.

Figure 1. Dealer's choice: Mock-up graphics of computer vision for a sixth-generation approach. (USAF stock image of F-35A in flight and author's rendered image of J-20 using royalty-free 3D model purchased at TurboSquid, http://www.turbosquid.com/FullPreview/Index.cfm/ID/745460. The author edited both images to illustrate basic object detection, recognition, and tracking principles inherent in the field of computer vision.)

With clearance to engage, it fires an armor-piercing high-explosive incendiary round into a critical system like the first compressor stage of an engine, rapidly ending the engagement with little opportunity for the adversary to adapt. FQ-X, on the other hand, learns from every detail of the encounter with real-time machine learning. It can pass lessons to other UCAVs, making partnered aircraft smarter by every engagement. Besides direct aircraft-to-aircraft sharing, the FQ-X air vehicle can send its telemetry to a ground control station (GCS). In the event an air vehicle is destroyed, its last moments may be stored on a secure network via the GCS. The implication may not seem obvious at first, but contrasted to the loss of a human-inhabited fighter, the difference is staggering. Losing a human pilot is a tragedy, and in cold but factual terms that a commander must face, it means the loss of an enormous investment of time and money in training and operational experience. If a veteran pilot falls in combat, then a young rookie has to take his or her place, starting a cycle of development all over again. The machine pilot, however, learns from death and in near real time commits adaptations to other UCAVs in the fight. Opponents may find that the same tactic never works twice against these systems.

Implications: Ripping into the Operational and Strategic

If machine-controlled maneuvering and accuracy make every cannon round a "golden BB," then left unchecked a single FQ-X with a few hundred rounds of ammunition and sufficient fuel reserves is enough to wipe out an entire fleet.[17] The economics of this approach are similarly stunning to consider and require examination with a global airpower perspective. The Russian-Indian jointly developed FGFA (PAK-FA derivative) is still several years from reaching initial operational capability and seems subject to the same delays and cost spirals of any highly complex development program.[18] Conservatively, current estimates are about $100 million per copy and likely to rise.[19] On the US side of the equation, each Raptor has a flyaway cost of $148 million, each F-35 in low-rate initial production was $153 million during 2011,

and a fighter pilot costs an estimated $2.6 million.[20] An AIM-9X missile is approximately $300,000.[21] If the aircraft and crew are fixed setup costs and their weapons are marginal costs of engaging a target, then the FQ-X system is poised to become substantially more affordable than the fifth-generation fighters it is engineered to overcome. FQ-X has a high percentage of commercial off-the-shelf hardware, small size, and no need for a one-to-one crew-to-aircraft ratio. The marginal cost for two stabilized cannon rounds fired at close range is a mere $20.[22] A rechargeable directed-energy weapon's cost to employ would depend on maintenance required per 100 firing cycles but would be inexpensive in a mature design.

Any compromise of defensive counterair ability jeopardizes high-value airborne assets, tanker and mobility aircraft, and the Airmen aboard them, opening the possibility for losses on a scale that our own service has not endured since its bombers attempted daylight raids in the 1940s.[23] The difference between then and now, of course, is that our industrial production base and budget are not configured to replenish such high attrition. In our efforts to become an effects-based force, we redefined mass by concentrating more capabilities in fewer physical assets, and that strategic choice has trade-offs.[24] Europe, Russia, India, and China have followed us into the game of big, high-tech fighter projects as well, thus framing a global problem-solving mind-set about how nations build airpower.[25] With so much depending on the current paradigm, an aggressor FQ-X performing as advertised in a US Air Force Weapons School event would become an inflection point in airpower history. Assuming that sixth-generation systems will simply be refinements of their fifth-generation predecessors falls well short of positively revolutionizing lethality, economy, and capability of airpower, and it invites increased risk to our current assets.[26] The path forward to continued assurance of air dominance starts by redefining our most basic understanding of what an airplane is and continues by applying well-established truths about air combat to new technological opportunities.

Flying Machines: Heart of the OODA Loop

Aviators instinctively see the airplane as a machine whose purpose is to fly rather than a machine that flies to serve its purpose.[27] However, if the Boyd cycle lies at the heart of describing success in air combat, then it makes sense to give priority to the elements of an aircraft most responsible for supporting speed and accuracy in the OODA loop and call all others secondary. RPAs and UCAVs are computers with airframes strapped to them, not the other way around. Flight-control actuators, avionics, radios, sensors, and even weapons are like plug-and-play peripherals for this platform, just as one might plug in printers, scanners, or cameras to a personal computer. This view reveals an opportunity to affect the flexibility and affordability of sixth-generation airpower. Decades ago, open architecture of IBM PC clones enabled massive proliferation of computing technology.[28] Similarly, pursuing plug-and-play standards, commercial off-the-shelf hardware, and common operating systems for autonomous aircraft and their GCSs supports proliferation and cost reduction that help to accelerate the pace of research, development, testing, and operational use. A tactically autonomous aircraft like FQ-X need not seek science-fiction-like self-awareness; within the scope of air-to-air combat, it is an airborne computer that executes the underlying mathematical truths of what human combat pilots do in the cockpit, doing so more quickly and with more precision.

Boyd's OODA loop implicitly reveals that the "art of flying" is actually a cyclical processing activity. It includes sensory data acquisition, reconciliation against known information to derive meaning, selection of a response from a known repository of possible choices or synthesis of a new option when none is satisfactory, and execution of the choice. Machine-learning algorithms address these tasks in two modes: supervised (designers train the software by telling it right from wrong) and unsupervised (it determines if a new action is right or wrong by experimentation and by extension of what it already knows).[29] A machine pilot with appropriate sensors and multiple computing cores can ac-

quire and integrate information from diverse sources more quickly and reliably than a human.[30] With a trained artificial intelligence (AI), it can also draw clearer interpretation from data without human psychological biases. Humans average 200–300 milliseconds to react to simple stimuli, but machines can select or synthesize and execute maneuvers, making millions of corrections in that same quarter of a second.[31] Every step in OODA that we can do, they will do better. Although Boyd's hypothesis is a cornerstone of fighter aviation, an inadvertent consequence of its logic in this evolving context is that machines will inevitably outfly human pilots. Furthermore, machine pilots do not have continuation-training requirements or currencies to maintain.[32] Unlike humans, whose skills regress without reinforcement, tactically autonomous aircraft can "sit on a shelf" for extended periods of time and remain exactly as sharp as they were the day they were pulled from service. Budget sequestration grounded 17 squadrons and did long-term damage to combat readiness—an effect that autonomous airpower would not suffer from. That $591 million cut represents an overhead cost which simply would never have existed in the first place with machine pilots.[33]

Tactical Autonomy Today

A common objection to this application of the OODA loop claims that the machine will not be able to do one or more of these tasks at the same level as human cognition, particularly the "orient" and "decide" steps. One author concludes that "the information required to make such a decision [to fire weapons] comes from so many sources and could be so easily spoofed or jammed by the enemy, that the validity of that computerized decision could never be fully trusted."[34] Unfortunately, he presents no discussion of the specific technical challenges and solutions, instead generalizing to conclude that "what separates men from machines is the ability to see opportunity and use it creatively."[35] In fairness, that author's point was not "anti-unmanned aerial vehicle (UAV)" but a wise call for caution about how much faith

we put in these yet immature aircraft. Still, reconciling his perspective against recent technical developments reveals that his viewpoint does not anticipate the direction in which machine pilotage is evolving.

In 2012 the Defense Science Board released a study on the role of autonomy in Department of Defense systems, finding significant opportunity for RPAs to further leverage existing computer vision, AI, and machine-learning technologies to add value through onboard autonomy.[36] To get a sense of how underexploited existing AI really is, consider that in 2008 an MIT researcher (and former F-15C pilot) successfully executed machine-learned, real-time, basic fighter maneuvering using a neurodynamic programming technique in a flight-test lab.[37] The software adapted rapidly and learned to maneuver into a weapons-employment zone by discovery rather than by being taught exemplar tactics (fig. 2). The MIT work shows that the basis for autonomous unmanned fighters exists in building blocks and that future maturation would add sophistication to take the technology beyond the lab and into complex flight environments.[38] In another compelling development that would facilitate machine pilotage, researchers in the AI subdiscipline of neuroinformatics recently constructed "neuromorphic" chips that behave like synthetic neurons on silicon substrate, imitating brain function and allowing incorporation of complex cognitive abilities in electronic systems.[39] A University of Zurich team presented a design capable of performing complex sensorimotor tasks that, in an organic brain, require short-term memory and context-dependent decision making.[40]

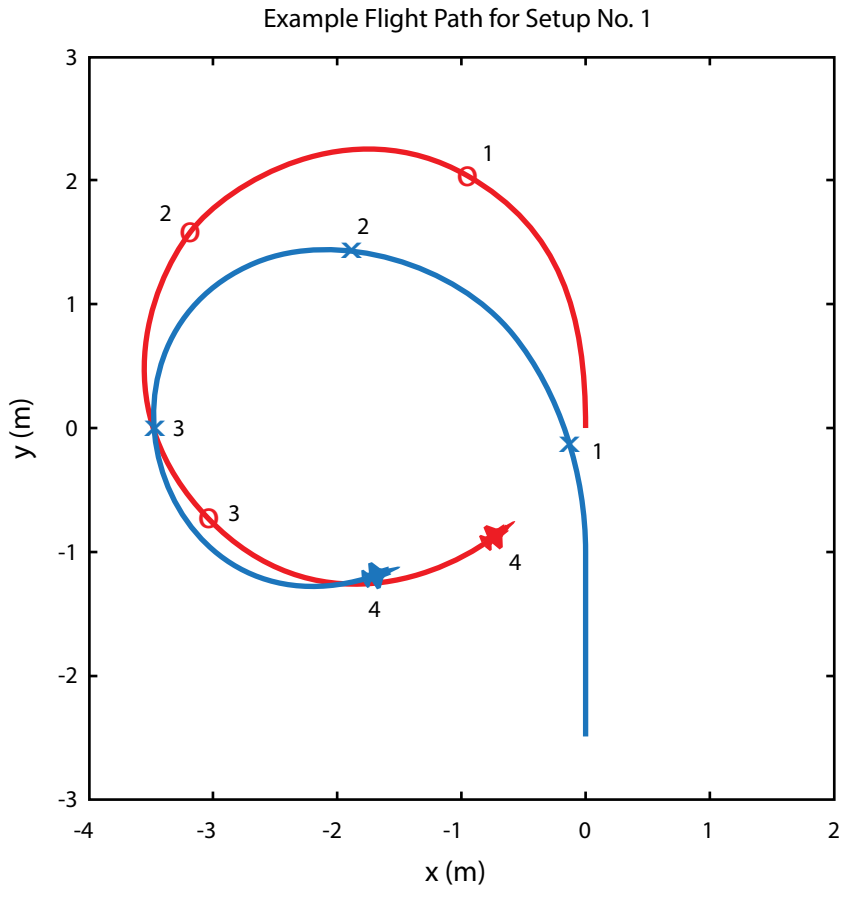

Figure 2. UAVs learning basic fighter maneuvering from a perch setup. (Adapted from James S. McGrew et al., "Air-Combat Strategy Using Approximate Dynamic Programming," *Journal of Guidance, Control, and Dynamics* 33, no. 5 [September–October 2010]: 649. Reprinted with permission from James S. McGrew.)

An applied information technology perspective and increasingly evolved AI technologies suggest that new UAVs will thrive when granted tactical autonomy. These machines cause us to revisit the notion of "centralized control, decentralized execution." This codified Air Corps doctrine, born in a world without real-time video feeds, taught that commanders of an air campaign had to grant crews a high degree of autonomy, entrusting them to accomplish a mission.[41] Later, real-time connectivity to the cockpit (or a GCS in control of a remote air-

craft) allowed commanders to be as tactically hands-on or -off as they saw fit.[42] With FQ-X, autonomy for the conduct of the engagement would return to the air vehicle to take advantage of its superior processing speed and reaction times. The Defense Science Board study, however, points out that a machine's autonomy to perform tasks does not preclude its adherence to rules of engagement or suggest that it is totally absent of human supervision.[43] Human decision making at a higher level is crucial to bridge the tactical to the operational, but these machine-pilotage technologies suggest that stick-and-rudder skills might not be an Airman's central value proposition.

Hacking the Mission

Reliability of the machine pilot is a natural concern. Potential defects in the design are more likely than computer hacking and are most effectively abated through comprehensive testing demanded by the best practices of software engineering. The fear of cyber attack relies on the belief that any computer system can be hacked.[44] A more accurate answer, however, is that breaching the security of an information technology system *requires the defender of that system to make a mistake in design or operation*. In highly complex systems, that fact leads to a cycle of vulnerability discovery, analysis, and repair or mitigation. It is therefore critically important to engage in thorough testing and security reviews at every step of the system's design and to keep the authorized user's opportunities to commit an unsafe act to a minimum through excellent design of human-computer interaction.[45] All "cyber" attacks are attempts to negatively affect the confidentiality, integrity, or availability of a system.[46] Like their counterparts in the kinetic realm, they are observable, repeatable tactical actions that one can study and counteract.

The intersection of classically kinetic air combat and more novel cyber activities paints a fascinating picture of the potential employment methodologies and skill sets demanded of crews that operate assets like FQ-X. From a cyber-defense perspective, for example, shooting

down the air vehicle falls under the category of a physically based attack against system availability.[47] A fighter pilot would simply say, "You lost and got shot down," analyze the tactical reasons in a debriefing, and teach how to win next time. Both perspectives are simultaneously valid, and both mind-sets extend from common points of overlap in different directions: one toward a very kinetic, visceral, tactical set of problem-solving skills, and the other toward analytically preventing exploitation of a computer system. A design like FQ-X is subject to the rules of both worlds and needs those employing it to operate in a unified framework that addresses both air combat and cyber-defense concerns. The cyber defender is unlikely to be able to look at an air battle and integrate tactical- and operational-level concerns to prosecute a war. The fighter pilot is unlikely to be able to detect and counter an enemy's attempt to launch a complex exploit against the UCAV's operational flight program. The good news for the US Air Force is that it has a rich heritage of expertise at all levels of air warfare and is actively developing capability in the cyber realm.[48]

Ethics of Autonomy

As frequently as skeptics cite hacking as a potential weakness of unmanned flight, consideration of the ethics of autonomous weapons employment captures far more public apprehension. The discussion sits amidst a much larger and more ambiguous debate about remote and robotically enabled warfare. A search on Amazon for "drone warfare" books revealed nearly 30 promising titles and almost 200 total results. A Google Scholar search for the same topic returned 14,800 results. A third of the *Routledge Handbook of Ethics and War* is dedicated to drone and cyber topics, and the entire cover image depicts an armed MQ-1B.[49] *Jus in bello* (the justice of conduct in war) arguments regarding the use of RPAs focus much of their contention on targeting criteria, collateral damage, and debates about the wisdom of overreliance on military instruments of power. Those issues are important national discussions, but to cut through the noise of so many conversa-

tions and emphasize the ethics of truly tactically autonomous combat calls for a scholarly work like Armin Krishnan's *Killer Robots*.[50]

Krishnan clearly delineates between the types of robotic systems involved in the military's trade, and the FQ-X concept intersects his definitions of the terms *unmanned aerial vehicle* and *autonomous weapon*.[51] He raises the concern that once an advanced machine demonstrates capability and offers the economy of not having to pay health care or retirement benefits, the military and its political masters will become fixated on the efficiency and convenience of replacing humans on the battlefield. If they do so, perhaps also seeking the political convenience of minimizing casualties, they will fail to consider the qualitative, long-term consequences of that choice.[52] The irony of a pure, unbridled quest for combat efficiency, as political-military strategist Thomas K. Adams points out, is that sooner or later the inventors realize that humans are always the weakest link in a system. They optimize human operators and then human decision makers out of the equation to replace them with another machine. As an argument to the extreme, he suggests that the cycle repeats until the tactical level of war involves no humans at all, rendering the whole activity a pointless waste of resources that fails to resolve the human needs that triggered it in the first place.[53] A government must respect the ethics of its civilization and consider what statecraft and warfare communicate to the world about its people. In the case of FQ-X, the most pressing question concerns whom to hold responsible for the conduct of a proxy weapon that makes its own decisions.

If the device functions as intended, the ethics are simple: the UCAV is an extension of the will of the person who commanded it, and the chain of responsibility traces from the operator up the kill chain of the command and control structure. If, however, the system deviates and kills people the operator never intended to harm, then assignment of blame becomes more complicated, calling into question the degree of autonomy one can grant a machine and how much human supervision must remain in the kill chain.[54] The Air Force encountered a parallel

situation in which a complex system broke down during the 1994 Blackhawk incident. Skilled Airmen working across multiple platforms to control airspace utterly failed, and 26 people died unnecessarily as a result. That system was defined by people, policies, practices, training, technologies, and rules of engagement. In the end, not one person went to jail because of the incident.[55] Systems like FQ-X will similarly employ procedural guidance to reflect a combatant commander's intent, though translated into a digital form subject to error checking and closer scrutiny. Regardless of analog or digital means, however, an enduring takeaway of the Blackhawk incident appears to be that attaining the satisfaction of justice becomes difficult when responsibility is diffused in complex systems. We must deliberately plan how to take responsibility for the things we intend to create; otherwise, we will have no more satisfying answers than we did in 1994—or in any friendly-fire or civilian-casualty event before or since.

Ethical debates guide the implementation of any new means of war fighting, making a technology either admired or monstrous before the court of public opinion. Autonomous weapons must reconcile a tactical desire to exploit the benefits of their independence—for example, reducing signatures by disabling data links during an engagement—with our moral need to limit the diffusion of responsibility to nonhuman actors in a system. One solution is to break the autonomous air-to-air engagement into five phases—searching, stalking, closure, capture, and kill—and then assign discrete levels of autonomy and operator interaction per phase.[56] This approach would allow the UCAV to maximize its time under autonomous, low-detectability conditions and reach back to its human operator at key junctures where moral questions trump the tactical risk. Another method would authorize firing freely on enemy unmanned systems but require operator consent to take a human life. Such techniques are merely extensions of existing methods of managing lethal autonomy.[57] Joint terminal attack controllers call for close air support in one of three types, and each type allows the pilot (a semiautonomous entity to the controller on the ground) different degrees of freedom.[58] Just as air forces build the

ground component's trust in airpower, so must UCAV designers progressively prove new systems—as one author suggested might be appropriate in pursuit of an optionally manned design for the Air Force's next long-range bomber.[59] This line of thinking is consistent with the Defense Science Board's study on the role of machine autonomy.[60]

Integration and Cultural Issues

Air forces that have an ecosystem of aircraft specialized in distinct tasks succeed over those with aircraft designs burdened by divergent workloads. L'Armée de l'Air learned that lesson disastrously at the hands of the Luftwaffe in 1940.[61] Systems with the capacity for tactical autonomy, like FQ-X, will not go to war alone and will need to integrate their capabilities with dissimilar UAVs and human-inhabited vehicles. Autonomous aerial refueling, for example, may manifest from follow-on work after the Defense Advanced Research Projects Agency's KQ-X project or the Navy's unmanned combat air system demonstrator.[62] If so, KC-46 acquisition just beginning in the midst of UAV advances suggests a long period of overlap with both manned and unmanned platforms providing global reach. The exact pattern of integration—which assets will be autonomous, remotely piloted, or human inhabited—will have as much to do with availability of assets that can do the job as with the combatant commander's vision, preferences, and comfort level. Certainly, a strong need will exist for deep, pervasive integration across all available air assets in order to maximize the utility of every platform in the ecosystem of an air force.

Recent discussion of how to fit future autonomous and remotely piloted systems into an air order of battle and into the cultural fabric of the service has been lively in *Air and Space Power Journal*. The prevailing theme is that semiautonomous UCAVs will serve as wingmen while the manned fighter remains the centerpiece of air warfare. The most disturbing thing about this notion is that it attempts to serve two masters: avoiding saying anything upsetting while also trying to advance the development of UAVs. It is also strictly "forward pass" think-

ing, as if chair-flying an ideal sortie without simulating enemy responses in a "backward pass" through the concept.[63] Its assumptions are that (1) force multiplication is all we require of UAVs and (2) in air combat, none of these platforms can defeat manned fighters directly. One author even states that they "will not replace the manned fighter aircraft—we cannot build a control system to replicate the sensing and processing ability of trained aircrews."[64] That article offers neither technical nor research data to qualify its indefinite, unrestricted claim. In light of the research evidence in favor of machine pilotage, that statement is suspect.

In another article from the same release of the *Journal*, Maj David Blair and Capt Nick Helms suggest that manned-remote fusion represents the future of airpower and argue that the principal hindrance to realization of that future lies within Air Force culture rather than technology.[65] Their analysis seeks to reconcile the roles of these two breeds of airpower and their accommodation within the Air Force's operational culture. However, it also envisions the fusion of manned assets and UAVs whereby human-inhabited assets unquestioningly lead the fight into contested airspace. It never stops to ask whether the application of Boyd's words to this emerging technology would actually render such a future improbable. As a competing construct, FQ-X pushes OODA to nanosecond resolution and argues that the air-to-air decision-making cycle of a human pilot, at its best, could never logically win a direct contest with pure machine autonomy—meaning that competition for primacy does in fact exist.

Still, they believe that

> the true conversation does not deal with competition between humans and machines. Instead, it concerns the nature of cooperation between them. . . .
>
> . . . The fear that pilots are replaceable is best answered by using the lens of technology to amplify the things truly irreplaceable about them. Technology then ceases to be a threat, allowing us to magnify our distinctively human capacities of judgment, reasoning, and situational awareness across the battlespace.[66]

These authors seek the inclusion of RPA operators into the larger fold of pilots, emphasizing the Air Force's chosen *RPA* term, to demonstrate that pilotage is more than sitting in the cockpit.[67] Conversely, thinkers such as Houston Cantwell recommend dropping the pilot terminology, along with the stick and rudder, to allow these aircraft to come into their own and realize a potential separate and distinct from that of manned aircraft.[68] He also exposes a hurdle to Blair and Helms's seemingly reasonable approach in that many pilots have wrapped their personal identities so tightly around the act of flying that they will not give it up if asked politely. In fact, one-third surveyed would rather leave the service than fly RPAs.[69] Cantwell, Blair, and Helms would all agree, however, that a concentration on inputs (the stick and rudder) rather than outputs (combat effects) reflects twentieth-century thinking that will not advance airpower.[70]

Regardless of the terminology or approach selected, these cultural issues drive organizational priorities that affect how, when, and even if the Air Force chooses to invest in autonomous technologies. Research on organizational core competencies published in the *McKinsey Quarterly* reveals that "the company's power structure cannot be driven by several functions at once. . . . A world-class competence must steer the power structure in a company. The keeper of the skill drives all the company's major decisions, even in unrelated functions."[71] Although the Air Force espouses three core competencies that enable six distinctive capabilities, in practice it cannot escape the interplay of core competency and power structure.[72] The apparent skill driver in the Air Force is the successful execution of air-to-air combat. Recent commentary from Lawrence Spinetta highlights that leaders in the fighter enterprise have the opportunity to command at 26 wings whereas the RPA enterprise has only one.[73] His interest in the discussion is not about emotive perceptions of fairness; rather, it hangs on Stephen Rosen's observation that the pace of innovation in the military is restricted by the speed at which officers (who, in retrospect, possessed the innovation) rise to consequential levels of the command structure.[74] The concern articulated by Spinetta is that hanging on to fight-

ers so tightly as to slight RPAs (or UCAVs) discards opportunities to preserve the nation's technological edge. Choosing not to respond to FQ-X on the basis of perpetuating the service's power structure could actually nullify the value that structure delivers.

Conclusions

The technological landscape is replete with advances heralding profound change for the means of success in air combat. Nevertheless, certain long-standing discoveries about the nature of airpower itself endure—namely, Boyd's OODA loop and the value of an aircraft's autonomy, whether or not a human is physically aboard. Hyperstealthy metamaterials, carbon nanotube composites, sophisticated computer vision, and advanced AI work in concert to open the door to a new generation of aircraft. These technologies can improve the survivability of human-inhabited vehicles, but combined application in a tactically autonomous system is key to unlocking new levels of performance and economy in air combat. Consideration of cyber and ethical dimensions remains a responsibility of exploring this new potential. Integration with other assets and primacy in the battlespace will prove contentious, particularly since today's RPAs exhibit such constrained performance; however, the notion that all such aircraft will be mere force multipliers for manned fighters represents a potentially tragic underestimation of the capability, efficiency, and lethality of machine pilotage. Functional and subsequent political displacement of the fighter pilot may be an emotionally charged idea, but our developmental priorities must reflect the need to preserve our Airmen, fleet, and sovereignty. Being second to market with tactically autonomous UAVs adds risk. Whether the technology reaches viability next year or in 30 years, its present-day versions prompt us to analyze the logic of their potential. If the machine pilot can usurp the organic one's most prized art form, then that ability raises the question of why any nation would seek a human-inhabited sixth-generation fighter—even if both options were similarly priced.

Aviators may dislike it, the public will question it, science fiction imagines harbingers of the Cylon apocalypse, and we are uncertain about how to best utilize it within the context of a larger Air Force.[75] Nevertheless, the FQ-X concept is too dangerous to our current thinking to ignore forever. The standard rules of the arms race apply: if a rival succeeds first, then our failure would be judged by the words of our own airpower theorists. Just as air superiority is a prerequisite for combined-arms victory, so will tactically autonomous UCAVs (or a novel measure to counter them) become a prerequisite for the survival of fleets of human-inhabited air vehicles. In a technology-dependent service, the cycle of invention, skepticism, resistance, and adaptation continues—all of this has happened before, and all of it will happen again. This particular time, however, it may not matter how undesirable the Air Force culture finds it. Key enabling technologies are evolving outside the military's control. Much of the maturation of unmanned systems occurs with commercial capital to meet civilian business objectives across multiple industries.[76] Creating legal controls is precarious for dual-use technologies that serve principally civil purposes and simultaneously underpin devastating capabilities like FQ-X. Common technical standards obscure the line, and increased computing power raises the stakes for what these systems can accomplish. Ubiquitous dual-use, however, is an opportunity for cost reduction in the development of these aircraft.

Deliberately ignoring tactical machine autonomy may do little to slow its arrival, and for the Air Force, the most proximate threat to resistance may not come from foreign entities but from within the joint team. The US Navy, whose institutional future is tied to its ships rather than what flies off their decks, has outshined its sister services in advancing UAV technology. Common GCS designs, X-47B, and recently opened competition for the unmanned carrier-launched air surveillance and strike system (that awarded four $15 million contracts) show that the Navy is incrementally maturing the technology and concepts.[77] That service will soon have far more impressive UAVs than the Air Force. We might find ourselves right back in the days of acquiesc-

ing to the purchase and rebranding of a Navy plane, as with the F-4.[78] ✪

Notes

1. Air Combat Command's (ACC) strategic plan for 2012 omits the terms *UAV*, *UCAV*, *RPA*, or *unmanned* and includes only a single picture of an RQ-4 amidst a collage of other aircraft. Whatever the long-term intent, exclusion in the document reveals that this enterprise is not a first-order priority although the plan clearly states that ACC maintains lead integration responsibilities for global intelligence, surveillance, and reconnaissance and actively seeks to invest in recapitalization, a "Next-Gen fighter," and "a holistic set of game-changing capabilities and cross-cutting technologies" (12). The overall impression communicated is that ACC desires new technology, but it does not convey that remotely piloted systems represent the kind it seeks to develop. Air Combat Command, *2012 Air Combat Command Strategic Plan: Securing the High Ground* (Joint Base Langley–Eustis, VA: Air Combat Command, 2012), especially 3–15, http://www.acc.af.mil/shared/media/document/afd-120319-025.pdf.

2. The Air Force armed the RQ-1 with an AIM-92 Stinger missile in 2002 and fired on an Iraqi MiG that crossed into the no-fly zone but did not win the engagement. Allegedly, a guidance error within the missile prevented it from hitting the MiG. Bootie Cosgrove-Mather, "Pilotless Warriors Soar to Success," *CBS News*, 25 April 2003, http://www.cbsnews.com/news/pilotless-warriors-soar-to-success/.

3. R. A. Shelby, D. R. Smith, and S. Schultz, "Experimental Verification of a Negative Index of Refraction," *Science* 292, no. 5514 (6 April 2001): 77–79, http://www.sciencemag.org/content/292/5514/77; C. G. Parazzoli et al., "Experimental Verification and Simulation of Negative Index of Refraction Using Snell's Law," *Physical Review Letters* 90, no. 10 (14 March 2003): 1–4, http://prl.aps.org/abstract/PRL/v90/i10/e107401; Henri J. Lezec, Jennifer A. Dionne, and Harry A. Atwater, "Negative Refraction at Visible Frequencies," *Science* 316, no. 5823 (20 April 2007): 430–32, http://www.sciencemag.org/content/316/5823/430.abstract; and Debashis Chanda et al., "Large-Area Flexible 3D Optical Negative Index Metamaterial Formed by Nanotransfer Printing," *Nature Nanotechnology* 6, no. 7 (July 2011): 402–7, http://www.nature.com/nnano/journal/v6/n7/full/nnano.2011.82.html.

4. T. Xu et al., "Perfect Invisibility Cloaking by Isotropic Media," *Physical Review A* 86, no. 4-B (October 2012): 1–5, http://link.aps.org/doi/10.1103/PhysRevA.86.043827.

5. AIM-9X (acknowledged) contracts commit to delivery of 10,142 missiles at a cost of $3 billion. "AIM-9X Sidewinder," Deagel.com, 13 November 2013, http://www.deagel.com/Air-to-Air-Missiles/AIM-9X-Sidewinder_a001166003.aspx. AIM-120 AMRAAM program costs exceed $20 billion. "AIM-120D AMRAAM," Deagel.com, 13 November 2013, http://www.deagel.com/Air-to-Air-Missiles/AIM-120D-AMRAAM_a001164006.aspx. Legacy AIM-7 missiles have an advertised unit cost of $125,000. "AIM-7 Sparrow," fact sheet, US Air Force, 1 October 2003, http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104575/aim-7-sparrow.aspx.

6. "High Energy Liquid Laser Area Defense System (HELLADS)," Defense Advanced Research Projects Agency (DARPA) Strategic Technology Office, accessed 24 August 2013, http://www.darpa.mil/Our_Work/STO/Programs/High_Energy_Liquid_Laser_Area_Defense_System_(HELLADS).aspx.

7. George W. Stimson, *Introduction to Airborne Radar*, 2nd ed. (Mendham, NJ: SciTech Publishing, 1998), 525–34.

8. Ibid., 503.

9. Ibid., 535.

10. Ibid.

11. "CUFFT [CUDA Fast Fourier Transform Library]," nVidia Corporation, accessed 8 August 2013, https://developer.nvidia.com/cufft; and Jimmy Pettersson and Ian Wainwright, *Radar Signal Processing with Graphics Processors (GPUs)* (Uppsala: Uppsala Universitet, February 2010), http://uu.diva-portal.org/smash/get/diva2:292558/FULLTEXT01.pdf.

12. Marc Monthioux and Vladimir L. Kuznetsov, "Who Should Be Given the Credit for the Discovery of Carbon Nanotubes?," *Carbon* 44, no. 9 (19 March 2006): 1621–23, http://nanotube.msu.edu/HSS/2006/1/2006-1.pdf.

13. X. Wang et al., "Ultrastrong, Stiff and Multifunctional Carbon Nanotube Composites," *Materials Research Letters* 1, no. 1 (2013): 19–25, http://www.tandfonline.com/doi/pdf/10.1080/21663831.2012.686586.

14. Josh Lowensohn, "Google Snaps Up Object Recognition Startup DNNresearch," CNet, 12 March 2013, http://news.cnet.com/8301-1023_3-57573953-93/google-snaps-up-object-recognition-startup-dnnresearch/.

15. "About," OpenCV, accessed 24 July 2013, http://opencv.org/about.html.

16. "OpenCV," nVidia Developer Zone, accessed 4 August 2013, https://developer.nvidia.com/opencv.

17. The kind of gun targeting system proposed herein would represent the most difficult design challenge after the core artificial intelligence (AI), and it would represent the highest risk item to project success. If the AI fails to meet expectations, the technology might still be transferrable for other less-challenging projects. However, if high-resolution air-to-air gun targeting proves too difficult a problem to solve, then the entire asset must be redesigned to accommodate a different operational construct (e.g., small short-range missiles or a return to conventional radar-guided missiles already in inventory), which may still offer value or may diminish the value proposition substantially. Lessons learned from the software-engineering industry suggest tackling the highest-risk segments of software-intensive systems first through controlled experiments rather than launching into a project via the easiest tasks and later becoming stuck at a point where costs and pressure on the industry team begin to mount. Anthony J. Lattanze, "Architecture Centric Design Method: A Practical Architectural Design Method for Software Intensive Systems," Carnegie Mellon University, Institute for Software Research, accessed 18 January 2014, http://anthonylattanze.com/acdm.php.

18. Gulshan Luthra, "IAF Decides on 144 Fifth Generation Fighters," India Strategic, October 2012, http://www.indiastrategic.in/topstories1766_IAF_decides_144_fifth_generation_fighters.htm.

19. Ajai Shukla, "Delays and Challenges for Indo-Russian Fighter," *Business Standard*, 15 May 2012, http://www.business-standard.com/article/economy-policy/delays-and-challenges-for-indo-russian-fighter-112051502009_1.html.

20. Department of the Air Force, *United States Air Force FY 2011 Budget Estimates,* vol. 1, *Air Force Procurement, Air Force* (Washington, DC: Department of the Air Force, February 2010), 1–15, http://www.saffm.hq.af.mil/shared/media/document/AFD-100128-072.pdf; and Michael Hoffman, "UAV Pilot Career Field Could Save $1.5B," *Air Force Times*, 1 March 2009, http://www.airforcetimes.com/article/20090301/NEWS/903010326/UAV-pilot-career-field-could-save-1-5B.

21. Three billion dollars divided by 10,142 missiles equals approximately $300,000. "AIM-9X Sidewinder."

22. The cost estimate of $9.39 per unit for the PGU-28/B 20 mm semi-armor-piercing high-explosive incendiary round is derived from contract lot size and reported costs. "PGU-27A/B TP/ PGU-28A/B SAPHEI / PGU-30A/B TP-T," GlobalSecurity.org, accessed 31 July 2013, http://www.globalsecurity.org/military/systems/munitions/pgu-28.htm.

23. *The United States Strategic Bombing Surveys (European War) (Pacific War)* (30 September 1945, 1 July 1946; repr. Maxwell AFB, AL: Air University Press, October 1987), 6, 68, http://aupress.au.af.mil/digital/pdf/book/b_0020_spangrud_strategic_bombing_surveys.pdf.

24. Briefing, Col Gary Crowder, subject: Effects-Based Operations, slide 4, "Precision Redefines the Concept of Mass," 19 March 2003, http://www.au.af.mil/au/awc/awcgate/dod/ebo_slides/ebo_slides.htm. In light of deep defense-budget cuts, Hon. Chuck Hagel, the current secretary of defense, observed that the Department of Defense stands again at a crossroads in terms of selecting a small, lean, high-tech force or a larger one that could not afford modernization. Secretary of Defense Chuck Hagel, "Statement on Strategic Choices and Management Review" (speech, Pentagon Press Briefing Room, 31 July 2013), http://www.defense.gov/speeches/speech.aspx?speechid=1798.

25. Richard Fisher, "Deterring China's Fighter Buildup," *Defense News*, 19 November 2012, http://www.defensenews.com/article/20121119/DEFFEAT05/311190005/Deterring-China-8217-s-Fighter-Buildup.

26. John A. Tirpak, "The Sixth Generation Fighter," *Air Force Magazine* 92, no. 10 (October 2009): 38–42, http://www.airforcemag.com/MagazineArchive/Documents/2009/October%202009/1009fighter.pdf.

27. Maj Houston Cantwell analyzed the attitudes of Air Force pilots toward RPAs, finding a significant negative stigma surrounding them. Many pilots appear to love the act of flying more than the leveraging of aircraft to produce military effects. Maj Houston Cantwell, "Beyond Butterflies: Predator and the Evolution of Unmanned Aerial Vehicles in Air Force Culture" (thesis, School of Advanced Air and Space Studies, Maxwell AFB, AL, 2007), 81–85.

28. Corey Sandler, "IBM: Colossus of Armonk," *Creative Computing* 10, no. 11 (November 1984): 298, http://www.atarimagazines.com/creative/v10n11/298_IBM_colossus_of_Armonk.php.

29. Stuart J. Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd ed. (Upper Saddle River, NJ: Prentice Hall, 2010), 695.

30. This article restricts the discussion to air-to-air applications because they present an extremely sterile environment compared to the air-to-ground (surface attack) domain. Acquiring and processing sensor data against a relatively empty background are far simpler than doing so against a cluttered backdrop of Earth's surface and all of the natural and man-made objects layered upon it. Surface attack is also extremely context dependent whereas air-to-air combat follows a more streamlined set of rules regarding electronic and visual identification measures and reconciliation against published rules of engagement. Christo-

pher D. Wickens, "Multiple Resources and Performance Prediction," *Theoretical Issues in Ergonomics Science* 3, no. 2 (April 2002): 168–69, http://www.tandfonline.com/doi/abs/10.1080/14639220210123806.

31. Robert J. Kosinski, "A Literature Review on Reaction Time," Clemson University, September 2013, http://biae.clemson.edu/bpc/bp/Lab/110/reaction.htm; and Andrew G. Barto, Steven J. Bradtke, and Satinder P. Singh, "Learning to Act Using Real-Time Dynamic Programming," *Artificial Intelligence* 72, nos. 1–2 (January 1995): 116–27, http://www.sciencedirect.com/science/article/pii/000437029400011O.

32. During refinement of the concept for this article, Capt Steve Christopher contributed this thought about the sharp contrast between machine preservation of capability and a human's natural tendency to get out of practice without perpetual reinforcement and challenge.

33. Brian Everstine and Marcus Weisgerber, "Reduced Flying Hours Forces [*sic*] Grounding of 17 USAF Combat Air Squadrons," *Air Force Times*, 8 April 2013, http://www.airforcetimes.com/article/20130408/NEWS/304080035/Reduced-flying-hours-forces-grounding-17-USAF-combat-air-squadrons.

34. Col James Jinnette, "Unmanned Limits: Robotic Systems Can't Replace a Pilot's Gut Instinct," *Armed Forces Journal* 147, no. 4 (November 2009): 30–32, http://www.armedforcesjournal.com/unmanned-limits/.

35. Ibid.

36. Defense Science Board, *Task Force Report: The Role of Autonomy in DoD Systems* (Washington DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, July 2012), 33–45, http://www.acq.osd.mil/dsb/reports/AutonomyReport.pdf.

37. James S. McGrew et al., "Air Combat Strategy Using Approximate Dynamic Programming," *Journal of Guidance, Control, and Dynamics* 33, no. 5 (September–October 2010): 1641–54. See also James S. McGrew, "Real-Time Maneuvering Decisions for Autonomous Air Combat" (master's thesis, Massachusetts Institute of Technology, June 2008), 63–86, http://dspace.mit.edu/bitstream/handle/1721.1/44927/309353804.pdf?sequence=1.

38. The current level of maturity supports a Department of Defense Technology Readiness Level (TRL) of three. Assistant Secretary of Defense for Research and Engineering, *Technology Readiness Assessment (TRA) Guidance* (Washington, DC: Assistant Secretary of Defense for Research and Engineering, April 2011), 2–13, http://www.acq.osd.mil/chieftechnologist/publications/docs/TRA2011.pdf.

39. "Microchips That Mimic the Brain: Novel Microchips Imitate the Brain's Information Processing in Real Time," *Science Daily*, 22 July 2013, http://www.sciencedaily.com/releases/2013/07/130722152705.htm.

40. Emre Neftci et al., "Synthesizing Cognition in Neuromorphic Electronic Systems," *Proceedings of the National Academy of Sciences of the United States of America*, 22 July 2013, http://www.pnas.org/content/early/2013/07/17/1212083110.

41. Maj Rene F. Romero, "The Origin of Centralized Control and Decentralized Execution" (thesis, US Army Command and General Staff College, 2003), 58–84, http://www.au.af.mil/au/awc/awcgate/army/romero.pdf.

42. From the author's personal experience and the experience of numerous RPA pilots. Flying the Predator and having the combined force air component commander relay direction to the crew via text chat occurred repeatedly during Operation Unified Protector.

43. Defense Science Board, *Task Force Report*, 1–3.

44. For an article that exemplifies this viewpoint, see Brian E. Finch, "Anything and Everything Can Be Hacked," *Huffington Post*, 15 August 2013, http://www.huffingtonpost.com/brian-e-finch/caveat-cyber-emptor_b_3748602.html.

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correspondence, 18 August 2013. Captain Wilson predicts that the Air Force, strained by severe budget limitations and frustrated in its attempts to innovate amidst high operations tempo, will likely accept the US Navy's lead on RPAs in the short term.

Capt Michael W. Byrnes, USAF

Captain Byrnes (USAFA; MS, Carnegie Mellon University) recently arrived at the 29th Attack Squadron, Holloman AFB, New Mexico, to serve as an MQ-9 Formal Training Unit instructor pilot. Previously, he was a dual-qualified MQ-1B pilot and an MQ-9 instructor pilot working in the weapons and tactics section of his last squadron at Creech AFB, Nevada. He has flown more than 2,000 hours of diverse mission sets in the MQ-1 and MQ-9 in support of worldwide contingency operations. A graduate of the Euro-NATO Joint Jet Pilot Training Program and a distinguished graduate of the Air Force Academy, Captain Byrnes served as an enlisted avionics-sensor-maintenance journeyman prior to commissioning.

"Finnishing" the Force

Achieving True Flexibility for the Joint Force Commander

Lt Col Matt J. Martin, USAF
CDR Brian Rivera, USNR
Maj Jussi Toivanen, Finnish Army

As opposed to finding independent solutions, we are trying to find joint, collaborative solutions that best support the joint warfighter in any spectrum of war.

—Gen John Corley, USAF, Retired
Commander, Air Combat Command

The US military has never been more capable. In the past, we found sophisticated jammers, sensors, and command and control (C2) systems only at the operational level of war (typically

as part of the air or maritime components). Today they appear in the backpacks and vehicles of frontline troops. Similarly, although the highest-end capabilities were once tasked only against strategic objectives, today's C2 and data-distribution systems allow operational-level capabilities to provide direct support to ground troops. Even though these capabilities permit unprecedented joint flexibility and recent changes in joint doctrine make possible the joint tasking of tactical assets, many of the latest capabilities remain organized and controlled as if they can support merely a single component.[1] Key examples include ground-based signals intelligence sensors and organic airborne reconnaissance assets not organized, trained, or equipped for independent availability to the joint force. As we will see below, such assets as the Army's MQ-1C Gray Eagle or man-portable electronic jammers are intended to deploy as part of a larger single-component force, with little consideration given to their overall joint utility.

But what if things were different? What if the joint force commander (JFC) had not only knowledge—based on the expertise and experience of joint planners—of the capabilities of all our tactical and operational systems but also the tasking tools and authority to incorporate specific capabilities into the operational design of a joint campaign? Conversely, what if tactical commanders enjoyed the same fidelity of tactical control over joint assets as they do with their own organic assets? (The joint assets would include not just traditional, direct-support assets such as close air support [CAS] but the full range of joint capabilities.)

We face a future of severe fiscal constraints, rapidly emerging regional conflicts (consisting of both asymmetric and near-peer foes), and the likely need for both joint and coalition partnerships in any operation. Consequently, professional joint planners must seek new ways to take advantage of all existing US capabilities—regardless of echelon or service—and increase flexibility for the JFC. Many smaller Western nations are familiar with this problem, one born of limited forces that must fill multiple joint requirements. Finland is one such country, and Finnish operational thinking may prove instructive. This

article uses the Finnish model as a case study to support three key reforms to traditional US force presentation towards a more capable joint task force (JTF): (1) enabling JTF planners to take a capabilities-based approach to requesting forces, (2) making it possible to separate traditionally organic forces from their parent units for small-scale deployment and employment, and (3) increasing the flexibility of joint-relevant forces (the use of both operational forces that do not normally provide direct support to tactical units and traditionally tactical units as operational assets) by increasing their connectivity to make them more supportive of and responsive to the full spectrum of joint C2.

The Joint Relevance of New Tactical Capabilities

Recent years have seen a tremendous increase in sophisticated capabilities fielded at the tactical level. Take, for example, the ITT Electronic Systems Counter Radio-Controlled IED [improvised explosive device] Electronic Warfare (CREW) 2.1 vehicle-mounted jammer (up to 25,000 of which are on contract for purchase by the US Army). It uses a digitally controlled, 30-watt transmitter that can cover the entire HF/VHF/UHF spectrum, jam multiple frequencies simultaneously, and cover both broad areas and spot targets.[2] In situations involving asymmetric targets near a border or those in which the JFC possesses insufficient electronic warfare (EW) capability at the joint level to attain the desired effects, these types of systems could act as key gap-fillers in a joint operational plan. They also pose problems for joint planners in terms of electronic deconfliction and fratricide.

Marine carrying a Thor II backpack-mounted counter IED jammer. (Reprinted from "Marine Corps Photos," US Marine Corps, 13 February 2012, http://www.marines.mil/Photos.aspx?igphoto=768.)

Tactical intelligence, surveillance, and reconnaissance (ISR) has also seen huge advances in miniaturized capabilities. For instance, the AN/MLQ-40 vehicle-borne multisensor signals intelligence system can "detect, monitor, identify and selectively exploit Radio Frequency (RF) Signals for Intelligence information providing situational awareness and potential targets for Tactical Commanders. The exploited signal data can be relayed via voice or data through the organic Wideband Beyond Line of Sight (WBLOS) SATCOM communications system."[3] With both wide-area coverage and the ability to distribute data to joint exploitation centers, these ground-based sensors could significantly add to the JFC's collection capabilities. The joint use of such a system, however, would require distribution of ISR data to the joint and opera-

tional levels as well as the traditional tactical level. Operational C2 mechanisms must also be in place to task these systems as joint assets.

US Army photo

AN/MLQ-40 Prophet

Perhaps the most capable system fielded at the tactical level is the US Army's MQ-1C Gray Eagle. A variant of the General Atomics MQ-1 Predator, the Gray Eagle is a 3,600-pound airplane with a 56-foot wingspan, a 25,000-foot service ceiling, and a payload of up to 400 pounds of external stores. The Army has a long-term plan to equip each of its divisions with a company of 12 Gray Eagles.[4] Ultimately, these aircraft achieve a true multirole operational capability, including air-to-ground fires, ISR, and EW.[5] The Army plans to procure and field this capability as an aviation support element for use as an organic asset. Despite efforts to make this platform available for joint use (see the section on Task no. 11, below), it is not yet available to the JFC as a separate, taskable capability. Since the Gray Eagle flies above the coordinating altitude in joint airspace, we already face the problem of incorporating it into the joint airspace planning process. Tasking the Gray Eagle as a joint operational asset will require putting in place the same type of tasking and C2 tools that already exist for Marine Corps and Navy aviation (more on that later).

US Army photo

MQ-1C Gray Eagle

Recent Conflicts and the Need for Joint Flexibility

The recent operation in Libya or the ongoing North Atlantic Treaty Organization (NATO) operations in Afghanistan are the types of scenarios in which these capabilities could prove useful at the joint level. In Operation Unified Protector, for example, during enforcement of the no-fly zone over Libya, the US Navy and other NATO maritime forces supported the air component even as they carried out their own maritime tasks. This support included supplying C2 for tactical air assets and conducting surveillance missions with tactical unmanned aircraft.[6] However, since neither US nor NATO doctrine specifies a mechanism for either the JTF headquarters or a supported component to incorporate these capabilities into joint-level plans, key joint tasks tend to go to components that will address them with single-domain solutions.[7] Although a few areas of traditional joint integration (such as CAS and tactical mobility) have mature tactics, techniques, and procedures (TTP) and liaison structures for effective integration, other areas such

as ISR, EW, and multiechelon communications do not. Therefore, joint support at the tactical level in these areas tends to occur on an ad hoc basis with less-than-optimal coordination. Opportunities to plan for joint cross-cue, provide a mechanism for dynamic joint retasking, or simply synchronize joint operations and increase efficiency can be lost.

Another example of the need for greater joint flexibility at the tactical level took place during surge operations in Operation Iraqi Freedom. This period focused on classic counterinsurgency operations instead of corps-level planning. Every battalion commander needed the ability to plan and execute operations independently—tasks that often depended on the predictable availability of operational-level capabilities, regardless of the priority of that particular action in the overall scheme of maneuver.[8] Maintaining the integrity of tactical-level operations and ensuring that joint-level assets promised during the planning phase remain available for execution, regardless of changes in the operational picture, were more important to the overall success of a counterinsurgency campaign than constantly shifting assets to meet perceived operational priorities. Future counterinsurgency JFCs might therefore be willing to risk inefficiency at the operational level rather than pull promised joint assets from tactical commanders just when they need them most.

Thus, in Iraqi Freedom, the traditional model was inappropriate to the new fight. Not only did tactical commanders have difficulty planning their operations 72 hours or more in advance (to comply with the doctrinal 72-hour air tasking order [ATO] cycle) but also the sudden removal of a capability in favor of higher priorities could make it impossible for tactical commanders to carry out their operations.[9] Ad hoc solutions were created to overcome doctrinal deficiencies in Operations Iraqi Freedom and Enduring Freedom, but the doctrinal model remains the same. Moreover, since the joint force air component commander (JFACC) had no visibility on the operations conducted at the battalion level—and no mechanism to understand the real-time ISR

needs of tactical commanders—he could not respond to emerging ISR requirements.[10] The traditional liaison elements in place (e.g., air liaison officers [ALO], an air component coordinating element at the corps level, and a battlefield coordination detachment at the combined air and space operations center [CAOC]) concentrate for the most part on translating apportionment into allocation—primarily to provide CAS to the Army. They are neither set up nor intended to offer real-time coordination of joint ISR, EW, and C2.

Similarly, the fact that tactical commanders had no real-time visibility on the status of operational ISR assets, even when those assets were in the local area, meant that they would have no warning prior to reallocation and no way to fill that gap with other available assets. Joint doctrine gives tactical commanders a means of accessing the full range of joint fires, but for ISR, communications relay, and EW, a doctrinal or procedural solution remains elusive although ad hoc solutions were devised during Iraqi Freedom (see the section on intelligence liaison officers [ILO], below).

Expanding Traditional Joint Air Tasking to Include New Tactical Capabilities

In traditional joint operations, during which a component commander has organic air assets not needed for organic tasking, those assets are typically made available to the JFC. In fact, according to Joint Publication 3-30, *Command and Control for Joint Air Operations*, the JFC has the authority to make available components' organic air forces for joint tasking. To determine which ones to provide for joint air operations, the JFC will consult with component commanders and identify excess air capabilities. Typically, the commander of Air Force forces is designated the JFACC and becomes the supported commander for strategic attack, air interdiction, and airborne ISR.[11] For instance, carrier strike group F-18s that belong to the joint force maritime component commander (JFMCC) would typically be "retained for employment in

support of the assigned joint maritime missions."[12] When the JFMCC has excess capabilities—F-18s not required for assigned joint missions or for fleet defense—he or she will give them to the JFACC via the joint air tasking process.[13]

The primary mission of the organic air capabilities of the Marine air-ground task force's (MAGTF) aviation combat element (ACE) is to support the task force's ground combat element. During joint operations, the MAGTF's aviation assets normally support its mission requirements, and these organic air requirements in support of subordinate elements within the task force are prioritized and scheduling conflicts are resolved by the MAGTF commander.[14] In the unlikely event the MAGTF has excess air capabilities, those assets will be given to the JFACC for theater air tasking, including air defense, long-range interdiction, and long-range reconnaissance.[15]

Once the components identify and provide excess air capabilities (including unmanned aircraft systems [UAS], typically identified as an ISR asset) to the JFC, the JFACC becomes the component responsible for planning, coordinating, allocating, and tasking. In accordance with JP 3-30, "the JAOC [joint air operations center] should request ISR support from the JFC or another component if available assets cannot fulfill specific airborne ISR requirements. It is imperative [that] the JFACC remains aware of all surveillance and reconnaissance capabilities that can be integrated into joint air operations."[16] But this does not necessarily mean that all resources are pooled for maximizing the JFC's theater-wide surveillance and reconnaissance effects. In the case of Marine UASs (as well as Army UASs), these are considered organic ISR assets—even if their parent unit is neither tasked nor deployed.[17] Indeed, given the existence of an identified best practice of pooling and optimizing the use of organic UASs to support Marine operations, the Marines do not extend this practice to the joint level. This is true even when Marine capability is present in a joint operations area but Marine ground operations have not yet commenced.[18] That is, even

though the MAGTF contains highly capable ISR assets, if it has not yet begun ground operations, those assets will sit idle.

Once operations begin, though, the Marine unmanned aerial vehicle squadron (VMU)—a UAS unit attached to the MAGTF—will provide, through the MAGTF's ACE, the task force commander with UAS capability in either a general or direct-support role. Under general support, the ACE commander will supply UASs to the force as a whole, ensuring that all MAGTF elements have the best access and that "priority of support to subordinate elements will likely go to the unit that is the main effort."[19] When the ACE and VMU operate in a direct-support role, UASs support a specific, designated unit.[20]

The Marines of the I Marine Expeditionary Force (Forward), for example, became both the MAGTF and Regional Command–Southwest during Enduring Freedom and faced an ISR resource-management challenge. The problem involved optimizing the use of ISR capabilities against coalition and NATO requirements. The solution included making organic aviation assets available to the priorities of required mission sets. Essentially, the Marines integrated air reconnaissance UASs in concert with other functions of aviation.[21]

Integrating Operational Capabilities at the Tactical Level—ALOs and ILOs

Another instance of increased flexibility came in the form of the ILO in Iraqi Freedom and Enduring Freedom. Beginning in 2006, the US Air Force began to deploy experienced ISR officers and noncommissioned officers to divisions and regional commands in Iraq and Afghanistan as part of the ALO contingents. Their purpose, although not yet enshrined in a joint doctrine document or tactics manual, was to improve the integration of the Air Force's ISR capabilities into Army and Marine tactical operations, assist with the planning of the use of those assets in ground operations, and optimize their employment

when tasked to provide direct support. According to Lt Gen David Deptula, former USAF/A2, this partnering brought about

> better understanding and results for the collection requirements of ground commanders; improved partnering between ground force intelligence staffs, CAOC ISR division analysts, and . . . [distributed] analysts to work time-sensitive analytical questions pertaining to current operations; and exceptional situational awareness for ISR crews regarding the details of current operations in which they will participate.[22]

During Iraqi Freedom and now in Afghanistan, the Air Force embedded ILOs within each deployed division as well as at key nodes such as the JTF headquarters and special operations forces headquarters—and with maneuver units engaged in high-priority operations. Typically, they were embedded in ground units as a means of better synchronizing operational ISR support with maneuver and fires. They also took advantage of the inherent ISR capabilities of joint-fires assets such as fighters with advanced targeting pods, incorporating them into the tactical-collection plans of ground units. This type of capability, which has come to be known as nontraditional ISR, supplied a key gap-filler for units engaged in ISR-intensive counterinsurgency operations.[23] However, the use of ILOs was never added to joint doctrine or sourced as part of ALO unit-manning plans. The utilization of ILOs in Iraqi Freedom and Enduring Freedom demonstrates that adding new capabilities is not enough to increase joint flexibility and effectiveness. Rather, we need a means—typically operator-centric—of planning for the use of these capabilities, leveraging them in complementary ways with other capabilities, and integrating them into dynamic operations.

The Finnish Model: An Example of Joint Flexibility

The main points in strategy for transformation of the Defense Forces are that the size of the Armed Forces must be equal with the tasks and budget, they must develop equal effectiveness with fewer resources, and they must build cooperation within the nation.

—Gen Ari Puheloinen
Commander, Finnish Defense Forces

In recent years, the Finnish Defense Forces (FDF) have faced wide structural transformation because of aging equipment, the high cost of modernization, and the expensive nature of crisis-management operations. To counter these issues, the FDF is making joint flexibility a primary consideration in the acquisition process, with the goal of moving away from dedicated service capabilities towards more commonality and better cost-effectiveness. In fact, joint operations have been at the heart of Finnish operational thinking since World War II. Central to the FDF are terms like "service shared operations" or "service shared fire."[24] Thus, "key areas of Finland are secured in all circumstances, aggression is defied and if needed combatted in a JOINT operation in order to accomplish the end state."[25] Figure 1 shows the C2 structure of the FDF along with the level of joint organization.[26]

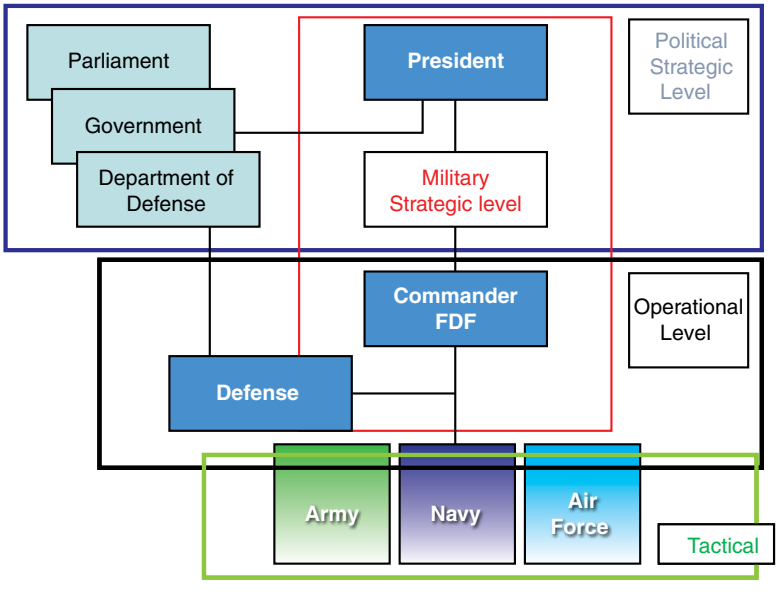


Figure 1. FDF structure. (From Col Pasi Kesseli, "Use of Common Capabilities in the Winter and Continuation War" [lecture presented at the Finnish National Defense University, 5 November 2012].)

The FDF leverages capabilities from the Army, Navy, and Air Force, as well as from a set common capabilities (fig. 2). These capabilities

(mainly joint fires, ISR, and EW), organized along component lines and considered common to joint operations, constitute the bulk of the FDF.

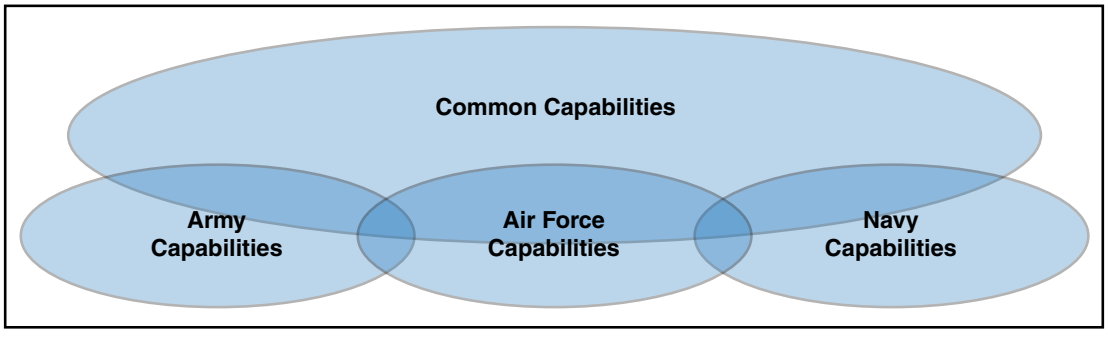


Figure 2. FDF capability organization. (From Kenttäohjesääntö, Yleinen osa, *Puolustusjärjestelmän Toiminnan Perusteet* [Field Manual, General Part, *Basic Structure of the Defense System*], 30.)

Common capabilities are allocated and assigned at the joint level, and the Defense Command plans their use—including service capabilities for use by the commander. Along with key enablers, the Finnish model prescribes joint integration based on a set of common principles for acquisition, training, and organization.[27] The key difference here between the US and the Finnish model is that although Finnish planners can reach down to the tactical level to pluck needed capabilities from larger parent units, the US planner cannot tap into something like the MQ-1C without tasking the entire division to which it belongs.

The Finnish service chiefs are generally responsible for planning the independent use of service (noncommon) forces. However, even these forces will be allocated to the Defense Command when needed. This would include any operation to "defend Finland and will be led by the Defense Command using the capabilities of the Army, the Navy and Air Force in addition to the common capabilities."[28]

Defense Command prioritizes the use of common capabilities in national/joint operations and returns any excess to the services or to the regional commands. In some cases, the command can delegate a task

to a service.[29] During joint operations, Defense Command will ensure a high level of situational awareness for all players by integrating the recognized air, land, and maritime pictures into a common operating picture (COP). The command will then either act as the JTF headquarters or allocate capabilities to operations led by the services. Doing so enables the FDF to mass Finland's limited combat power and concentrate it against the aggressor's most critical vulnerability or center of gravity. Defense Command will also use centralized control with a flat command structure to make decisions more rapidly than the aggressor and operate inside his decision-making cycle. Finnish joint operations are therefore task-oriented, using only those capabilities needed to reach culmination. Other capabilities are then returned to the supporting services.[30] In all cases, though, Defense Command will own and distribute the real-time COP and coordinate all operations.

A common Finnish scenario involves the need to move land forces along the coastline to assume an advantageous defensive position. In this case, Defense Command will delegate operational control to Army headquarters. In case of major maneuver, the command will use forces with common capabilities to support the maneuver and may also assume operational control of supporting forces (such as the Navy or Air Force) to support the Army. These would typically be key enablers such as joint fires, information warfare, or ISR.[31]

Admittedly, Finland is a small country with limited resources, and many people might argue that almost any organizational structure would work. However, since future Department of Defense (DOD) budgets will probably continue a downward trend, it is informative to examine smaller militaries and the way they maximize capability with limited resources. This is the primary driver behind the creation of joint "common capabilities." Strategically, Finland must be able to build up and employ joint forces rapidly against single tasks—even if those forces are normally organized at the tactical level or are otherwise organic to the service. Like Finland's Defense Command, the US DOD faces increasingly constrained budgets, smaller force structures,

and the need to organize joint and coalition task forces quickly to respond to small and often asymmetric crises. Thus, a JFC's ability to tap directly into tactical-level units—particularly when they possess key enabling capabilities such as C2, ISR, and EW—could be of key importance. The DOD may benefit greatly from the lessons of the Finnish model. In fact, the Army and Air Force have already given some thought to this type of arrangement for unmanned aircraft.

Task No. 11 and the Use of Organic Unmanned Aircraft Systems

On 30 June 2008, Gen John Corley, commander of US Air Combat Command, and Gen William Wallace, commander of US Army Training and Doctrine Command, agreed to a new concept for the employment of theater-capable multirole unmanned aircraft. This concept grew from an earlier task (no. 11) from the Army–Air Force Warfighters talks in which the chairman of the Joint Chiefs of Staff gave the two services the task of finding a better way to employ these highly capable systems in joint operations.[32] The concept called for doctrine, organization, and training, as well as material, leadership, and personnel changes to the Air Force MQ-1/MQ-9 and the Army MQ-1C programs. The goal called for all three platforms to function seamlessly as joint air assets controlled by the JFACC (when deemed necessary by the JFC) and as "near organic" systems when the JFC determined that a ground commander should receive direct support. Figure 3 identifies the data, TTPs, and C2 links needed to execute the concept.

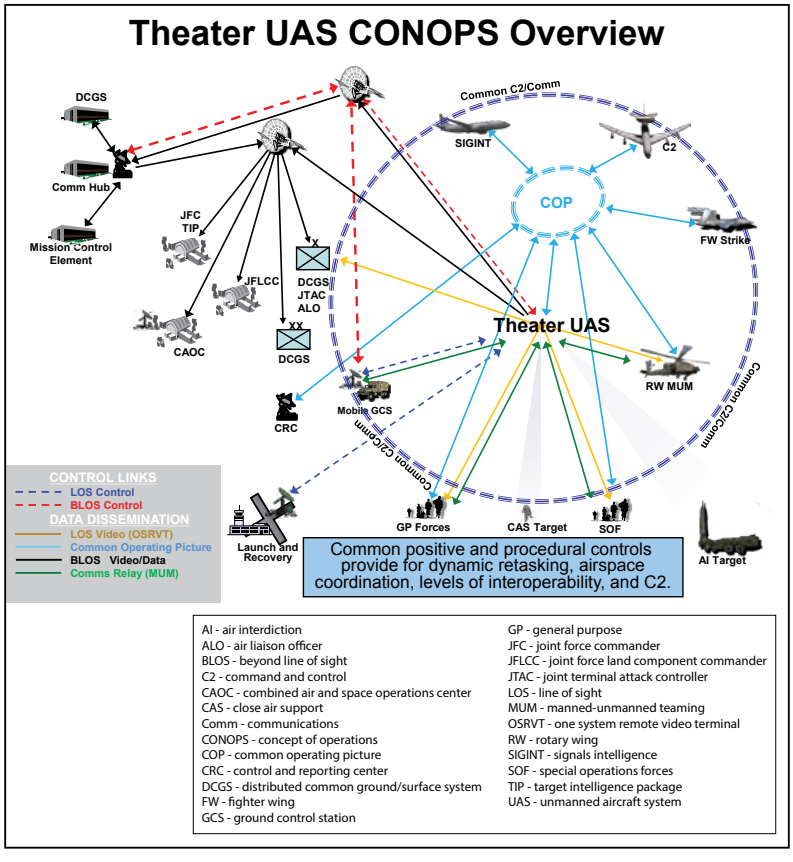


Figure 3. Task no. 11 operational view. (Reprinted from Air Combat Command and Training and Doctrine Command, *The Multi-Role, Theater-Capable, UAS Enabling Concept* [Hampton, VA: Air Combat Command, 2008], 4.)

The idea behind the concept entails building the maximum possible flexibility into these systems by ensuring that the ISR data they produce is compatible with both Army and Air Force ISR exploitation systems as well as Link-16 and Blue Force Tracker tactical data links. The systems should also be able to distribute their ISR data both locally and beyond line of sight. They should respond to both tactical and operational echelons of C2. Task no. 11 requires that operators of these systems be well versed in the joint TTPs and terminology needed for both joint and component integration.

The US Army and Air Force have since taken steps to implement the concept by making adjustments to their organize/train/equip efforts. Changes have been made to joint doctrine and TTPs (e.g., the procedures needed to incorporate Army assets into the JFACC ATO in the same manner as Navy and Marine air assets).[33] The Air Force has also taken advantage of this work to improve support provided to ground units in Afghanistan through habitual association with supported units as well as better visibility and understanding of tactical ground operations. The Army, however, has not yet had the opportunity to demonstrate joint integration of the MQ-1C and, therefore, has been able to test the concept only through war gaming.[34]

Recommendations: A Scheme for Greater Joint Flexibility (Plug and Play)

Obviously, the US military is much bigger and has much greater capacity than the FDF. Consequently, under what circumstances would the JFC need to tap into tactical capabilities? Consider the following three vignettes:

1. *A small, regional conflict that threatens a nonvital interest of the United States or its allies but for political reasons requires US involvement*. Operation Unified Protector in Libya offers one such example. In this case, it was politically unacceptable for the United States to take the lead with offensive forces or to introduce ground troops directly into the conflict, despite the fact that a US commander directed the main effort and that the vast majority of key enabling capabilities came from America.[35] According to Lt Gen Ralph Jodice, JFACC for Unified Protector, his operation suffered from gaps in ISR and EW due to the lack of the capacity of forces normally available in a large US operation (e.g., U-2s or RQ-4s). In the future, when high-level ISR assets are not available, having access to mitigating organic maritime or land-based capabilities for direct joint tasking could prove decisive.[36]

2. *The deterrence phase of what is expected to be a major US operation*. In this case, the United States may need to rapidly demonstrate its ability to respond to regional aggression with flexible deterrence operations while awaiting a larger deployed force. There simply may not be time for a JTF commander to wait for high-end operational capabilities to arrive on station. The JTF, therefore, would need to take maximum advantage of any capabilities that might already be in-theater to produce a decisive deterrent effect. As it stands, organic capability resident within a nontasked or not-yet-active parent unit is not directly available to the JFC.
3. *Simultaneous conflicts breaking out in different areas of responsibility*. In this case, one of the operations may have a lower priority and thus cannot gain access to a significant number of operational capabilities. As in vignette no. 2, the JTF commander of the lower-priority conflict would have to make the best use possible of whatever capabilities are on hand—such as tapping into tactical-level ISR or EW without tasking the parent unit.

To ease the leveraging of tactical capabilities to satisfy operational-level needs in these vignettes, one would have to make significant changes to joint planning doctrine, joint operational doctrine, and the manner in which those forces are made available to the JFC for tasking.

Reform No. 1: Capabilities-Based Planning

Currently, forces are identified for apportionment through their primary maneuver echelon. For example, a JTF planning staff might learn that a brigade combat team is on the apportionment list, but without amplifying information on the internal capabilities of that team, the JFC would have to rely on the knowledge and experience of the planning staff. That would work fine if an Army officer with appropriate experience happens to be on the team. If no such person is available, then those capabilities would remain invisible to the JTF planning staff. To correct this situation, we need to identify joint capabilities as part of their parent maneuver units during the apportion-

ment process. Thus, when a JTF's J-5 staff is planning an operation and receives global force management appendices with a list of apportioned forces, the appendix could be expanded to include detailed information about joint capabilities. This addition might take the form of another column with the relevant information (see the table below). J-5 planners would also need more training so they will understand the nature of these capabilities and include them in their plans.

Table. Hypothetical global force management appendix identifying joint capability

APPENDIX 1 (U.S. Army Apportionment Tables) to Section IV (Apportionment of Forces) to Global Force Management										
Service/Unit Type/Capability	Bin A			FMID	Bin B			FMID	Joint Capes	Notes
	Units	Eqmt	RLD		Units	Eqmt	RLD			
HQ's										
Corps HQ	1		N+4	5A1	1		N+4	5A2		
Division HQs	1		N+3	5A4	1		N+3	5A5		
	1		S+49	5A7	1		S+51	5A6		
BCT's										
Armored Brigade Combat Team (ABCT)	6		N+2	5B1	4		N+2	5B4	SIGINT	
			N+3	5B2			N+4	5B5	Electronic Attack	
			N+5	5B3			S+48	5BC		
			N+5	5B7			S+54	5BD		
			S+47	5BA						
			S+52	5B8						
Infantry BCT (IBCT)	5		N+2	5C2	4		N+2	5C1	FMV	One IBCT (5C1) is embarked on the Army Preposition ships along with a sustainment brigade, two Eng BN's, an early medical support element, and JTF-PO (SPOD) package
			N+2	5C3			S+43	5CC		
			N+4	5C4			S+44	5CD		
			S+44	5CA			S+47	5CE		
			S+45	5C8						
Infantry BCT (Air Assault [AASLT])	1		N+14	5C6	1		N+4	5C5		
Infantry BCT (Airborne [ABN])	1		N+1	5C8	1		N+2	5C7		
Striker BCT (SBCT)	1		S+44	5BF	1		N+3	5BE		
Tactical Combat Force (TCF) (BN)	2		S+20		1		S+20			These units are only infantry Bn's and cannot be combined into a IBCT.
			S+30							
Afloat Preposition Units										
										Unit includes equipment for an IBCT, sustainment Bde, 2 eng Bn's, 1 earmy medical support element, a JTF-PO package,

FMID - force management identifiers
FMV - full-motion video
JTF-PO (SPOD) - joint task force port opening seaport of debarkation
RLD - ready-to-load date

Reform No. 2: Independent Presentation of Small, Traditionally Organic Units

Currently, submaneuver units (i.e., those not presented as independently maneuverable) are bundled with their higher-echelon main-

maneuver unit. Consequently, a company equipped with tactical jammers would be presented only as part of a larger unit (brigade or division). If the JTF needs access just to the company equipped with jammers, then the force provider may have no mechanism to mobilize and deploy it independently of the parent unit. (This may be the case even though the company will not be called upon to maneuver independently of a larger force—if, for example, the company is needed at a coalition base on a border.) Since we routinely deploy and task small units with operational capabilities from all four services, this should simply be a matter of extending this ability to units that do not traditionally deploy on their own.

This would constitute a "plug-and-play" approach to joint capabilities. In the example of an infantry company with backpack jammers, the JFC will need to access that unit via the time-phased force and deployment data sourcing process in order to include it in the operational plan for purposes of C2, sustainment, and so forth. Then, as the JFC designs the overall C2 structure, the unit could be aligned with the appropriate tactical C2, basing, and sustainment elements—and included in the support plans of the units responsible for those basing locations.

Reform No. 3: Flat and Flexible Joint Command and Control

For maritime capabilities, we can expect a maritime component commander with associated tactical C2 of maritime forces. The maritime component, therefore, can assume the task of using maritime organic capability as a joint asset. But the JFACC should be able to control air assets normally organic to the land component—or do so in the absence of land forces that would exercise tactical C2. For example, as part of Task no. 11, the enabling concept specifies the need for an MQ-1C company to interface with a CAOC, integrate into the ATO and master air attack plan process, and receive those ATO instructions. The air component's tactical C2 elements would then control that company.[37] This process drives training and equipment as Gray Eagle companies take on the task of preparing to function as joint air assets.

For small land units that will deploy without their higher-echelon tactical C2, the issue becomes a bit trickier. They must either interface directly with the JTF headquarters or attach themselves to another component (perhaps special operations or the JFACC for ISR). In either case, they would need the connectivity to interface with the appropriate C2 network as well as training in the appropriate joint TTPs. In most cases, though, the TTPs already exist (e.g., joint CAS). So the main task amounts to training for units not previously trained to function as joint assets.

A practice of providing the JFC with daily status reports of high-demand, low-density organic assets already exists. For instance, each day the US Navy reports the status of SM-3 and Tomahawk land-attack missiles within the fleet to the Joint Staff and to the geographical combatant commanders. Without integrated solutions, this data has to be sent via PowerPoint briefs or Excel spreadsheets.[38] The commanders, therefore, are aware of the numbers and types of SM-3s and missiles aboard ships operating in their area of responsibility and have the means to task those weapons, but the information sharing is less than optimal. We need a better solution—the ability to inject data into the COP—to allow better JFC tracking and tasking.

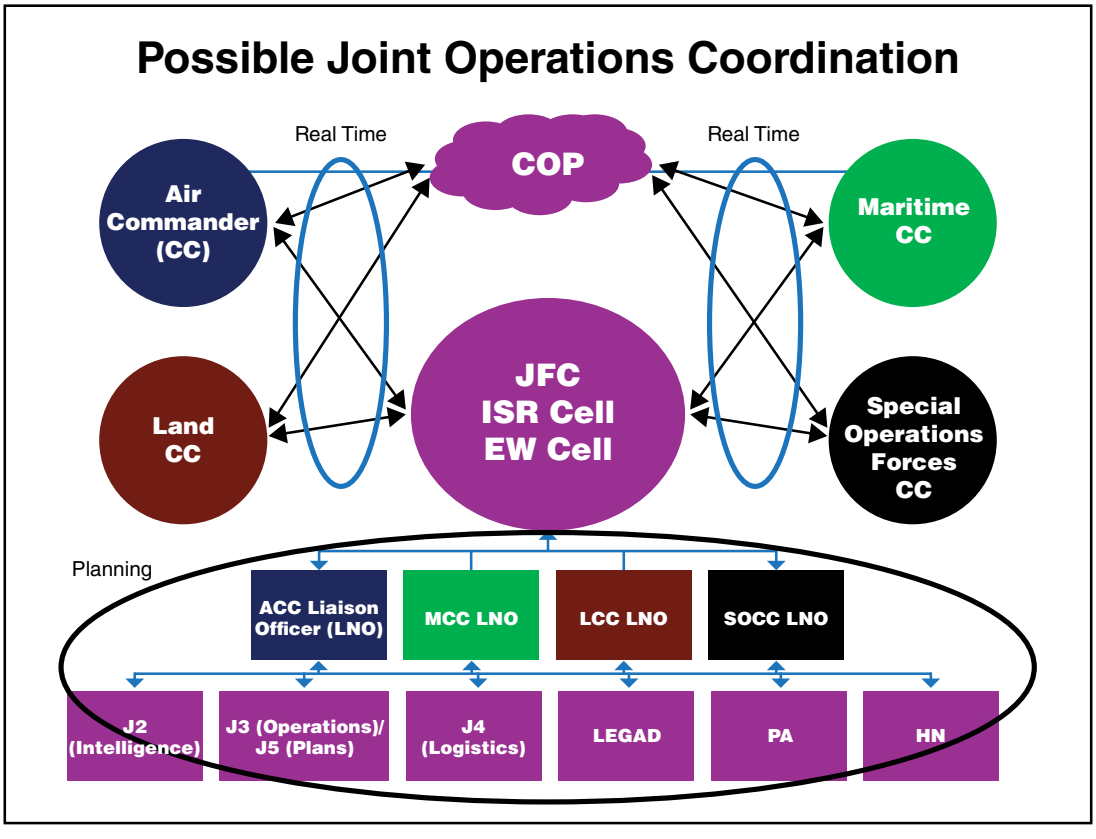
For the converse problem of better support to the tactical commander, the effectiveness of ILOs embedded with ground units has been well documented. We should expand this liaison presence to mirror the CAS approach, with liaisons at every echelon from division to battalion. These ILOs not only should be experts on operational ISR capabilities (both airborne and within other domains) but also should have the training and authority to match tactical ISR desired effects to available sensors and exploitation elements—and even exercise tactical (but not terminal) control over operational sensors, just as forward air controllers exercise tactical control over CAS assets. However, we would not expect ILOs to exercise air traffic control, as we do with forward air controllers.

If manning restrictions prevent the training and deployment of more ILOs, then the role of the joint terminal attack controller should be expanded to include ILO and EW liaison duties. Doing so would require both additional training and improved connectivity with ISR/EW collection platforms and their associated exploitation elements. These elements (i.e., the distributed common ground/surface systems) could then be leveraged to provide greater ISR fusion and analysis (as well as knowledge of sensor and platform capabilities) to the controllers in order to ease their burden and increase their capabilities. Finally, we need real-time coordination at the joint level in the form of ISR and EW coordination cells that perform a number of functions:

- Provide real-time joint coordination to mass joint sensors and jammers on specific objectives.
- Facilitate cross-cueing of joint ISR and EW.
- Offer real-time guidance to components to change the weight of effort against dynamic targets inside the execution phase.
- Analyze component ISR products to arrive at fused, joint intelligence assessments and feed the decision-making process.
- Ensure that all players tasked against joint objectives maintain and facilitate a high level of situational awareness.
- Assist the J-3 and J-5 staffs with planning for the use of joint capabilities.

Figure 4 shows a possible coordination scheme among joint-level execution, planning, and the various components. We should note that coordination cells at the joint level will not act as tactical C2 agencies, nor will they provide guidance directly to tactical units. The components will still fill those roles. Rather, joint cells will coordinate with ISR and EW cells within the component headquarters to conduct the above functions. Similarly, large-scale operations with sufficient forces to obviate the need to tap into tactical-level forces for joint tasks may not need these cells. For smaller-scale operations described in the three vignettes, however, small coordination cells on the JTF level will

be in the best position to derive maximum efficiency and flexibility of joint forces.



ACC - air component command
HN - host nation
LCC - land component command
LEGAD - legal adviser
MCC - maritime component command
PA - public affairs
SOCC - special operations component command

Figure 4. A possible scheme for small JTF coordination

The Life You Save Could Be Your Own

The United States and its allies face uncertain times—those marked by pop-up regional conflicts, shrinking defense budgets, and insufficient forces to carry out assigned tasks. We may no longer be able to afford the luxury of retaining our most sophisticated capabilities as organic elements of a component or maneuver unit. At times, for reasons of politics, finances, or simple priority, a JTF commander will need access (i.e., visibility during the planning process, the ability to task tactical units independently of their parent maneuver units, and operational C2 of traditionally tactical assets) to the full capabilities of all assigned forces. As a steward of our national resources, the joint force would be remiss if it did not explore every possibility to provide just that. As a result, joint capabilities must be available not only for joint planning purposes but also for joint tasking, even in the absence of their parent maneuver units in a traditional C2 architecture.

At the same time, we must make sure that the tactical commander has access to the most sophisticated operational capabilities when appropriate and available. Doing so will involve not only simple connectivity but also liaisons and forward controllers who are experts in the application of joint military power—individuals who have the visibility and authority to leverage high-end joint capabilities to great tactical effect. Perhaps we cannot predict the next conflict, but we can build maximum flexibility within the joint force to fight it. ✪

Notes

1. For example, according to the latest version of Joint Publication (JP) 3-30, *Command and Control of Joint Air Operations*, 10 February 2014, http://www.dtic.mil/doctrine/new_pubs/jp3_30.pdf, "Theater-capable UASs . . . can be used to support the JFC" (III-32). Furthermore, JP 3-32, *Command and Control for Joint Maritime Operations*, 7 August 2013, http://www.dtic.mil/doctrine/new_pubs/jp3_32.pdf, notes that "the JFMCC [joint force maritime component commander] provides a unique complement of sensors and sensor fusion capability to support joint requirements and advocates for the use of other component and national assets to provide optimum support to maritime operations. Sonar capabilities and the

ability to relocate surveillance and reconnaissance assets may provide additional options to the JFC. Close coordination with other component commanders and the communications system directorate of a joint staff (J-6) early in joint planning is essential to aligning architectures with platform and sensor employment plans to optimize intelligence, surveillance, reconnaissance, and associated processing, exploitation, and dissemination systems throughout the joint force" (II-7).

2. "JCREW: ITT Wins Contracts for Land Mine Jammers," *Defense Industry Daily*, 3 October 2011, http://www.defenseindustrydaily.com/edo-wins-88m-contract-for-land-mine-jammers-03196/; and "CREW Vehicle Receiver/Jammer (CVRJ): Roadmap to Capabilities," Exelis, accessed 2 June 2013, http://www.exelisinc.com/solutions/CREW-Vehicle-Receiver-Jammer/Pages/default.aspx.

3. "AN/MLQ-40(V)4 Prophet Spiral 1+," L-3 Communications, Linkabit Division, n.d., accessed 21 May 2013, http://www2.l-3com.com/linkabit/products/.

4. Kris Osborn, "Army Expanding, Upgrading Gray Eagle Fleet," US Army, 28 June 2012, http://www.army.mil/article/82790.

5. "ER/MP Gray Eagle: Enhanced MQ-1C Predators for the Army," *Defense Industry Daily*, 16 December 2013, https://www.defenseindustrydaily.com/warrior-ermp-an-enhanced-predator-for-the-army-03056/.

6. "Insitu ScanEagle Works with NATO on Libyan Missions," *Defense Daily* 251, no. 32 (16 August 2011), http://www.defensedaily.com/Assets/File/txt/DD_2011-08-15_17-31.txt.

7. "The JFC should attempt to meet the organic needs of the component commanders, while ensuring the JFACC has the assets available to execute JFC assigned JOA [joint operations area]-wide operations. These decisions will typically change as the phase of an operation changes. As with any joint capable asset, the JFC retains the authority to use any UAS asset to meet the needs of the JFC mission. How theater-capable UAS operations are managed and planned will vary based on the type and phase of an operation." JP 3-30, *Command and Control of Joint Air Operations*, III-32. Also, "sensor capability resident in the joint maritime force may support the joint force collection plan and may be integrated into the joint data network. Sensor tasking procedures, allocation of collection assets, and product dissemination should be determined early in the planning process." JP 3-32, *Command and Control for Joint Maritime Operations*, III-11. The following guidance is provided to joint-level collection managers with regard to tasking joint ISR assets: "The list of viable collection disciplines, systems, and sensors is reviewed for current availability (to include estimated downtime if not available) and the addition or deletion of capabilities. Coordination with adjacent and higher HQ and national agencies will determine the availability of theater and national resources." JP 2-01, *Joint and National Intelligence Support to Military Operations*, 5 January 2012, III-24, http://www.dtic.mil/doctrine/new_pubs/jp2_01.pdf. Typically, joint-level collection managers constrain themselves to operational-level ISR assets to collect against joint targets rather than trying to task an organic asset directly.

8. Lt Col Michael L. Downs, "Rethinking the Combined Force Air Component Commander's Intelligence, Surveillance, and Reconnaissance Approach to Counterinsurgency," *Air and Space Power Journal* 22, no. 3 (Fall 2008): 70.

9. Ibid., 72.

10. Col James M. Waring, Lt Col Carl L. Giles, and CW3 John A. Robinson, "The 19th BCD in Counterinsurgency Operations," *Field Artillery*, July–August 2005, 17.

11. JP 3-30, *Command and Control of Joint Air Operations*, II-2.

12. Ibid., II-17.
13. Ibid.
14. Marine Corps Warfighting Publication (MCWP) 3-42.1, *Unmanned Aerial Vehicle Operations*, 14 August 2003, 2-2, http://www.marines.mil/Portals/59/Publications/MCWP%203-42.1%20Unmanned%20Aerial%20Vehicle%20Operations.pdf.
15. JP 3-30, *Command and Control of Joint Air Operations*, II-16.
16. Ibid., III-27.
17. Anthony C. Bolden, Lt Col George J. David, and Brian R. Mahoney, "Airborne ISR: A New Way to Command and Control Organic Assets," *Marine Corps Gazette* issue 95, no. 8 (August 2011): 45–48.
18. Ibid., 46, 47.
19. MCWP 3-42.1, *Unmanned Aerial Vehicle Operations*, 2-2.
20. Ibid.
21. Bolden, David, and Mahoney, "Airborne ISR," 47.
22. David A. Deptula and James R. Marrs, "Global Distributed ISR Operations: The Changing Face of Warfare," *Joint Force Quarterly* 54 (3rd Quarter 2009): 113.
23. Capt Kevin Pratte, "Sensor Packaging—Making the Most of NTISR," *Air Land and Sea Bulletin* issue 2007-03 (September 2007): 13.
24. Lt Cdr Ville Vanska, "JOINT Operations in Finnish Operational Art" (predoctoral thesis, Finnish National Defense University, 2011), 2.
25. Translated from Kenttäohjesääntö, Yleinen osa, *Puolustusjärjestelmän Toiminnan Perusteet* (Helsinki: Suunnitteluosasto, Pääesikunta, Edita Prima Oy, 2008), 73, 95. [Field Manual, General Part, *Basic Structure of the Defense System*, J-5 Defence Command.]
26. Col Pasi Kesseli, "Use of Common Capabilities in the Winter and Continuation War" (lecture presented at the Finnish National Defense University, 5 November 2012).
27. Kenttäohjesääntö, Yleinen osa, *Puolustusjärjestelmän Toiminnan Perusteet*, 31.
28. Ibid., 109.
29. Ibid., 29–32, 35–36, 38.
30. Vanska, "JOINT Operations," 16.
31. Ibid., 72.
32. Paul Boyce, "Air Force, Army Leaders Discuss New UAS Concept of Operations," US Army, 2 July 2008, http://www.army.mil/article/10570/Air_Force__Army_leaders_discuss_new_UAS_concept_of_operations/.
33. See JP 3-30, *Command and Control of Joint Air Operations*, III-32 through III-34.
34. Mr. Anthony Parlati (formerly of the Air Combat Command Predator/Reaper Operations Branch), telephone interview by Lt Col Matt Martin, 30 May 2013.
35. Ian Brzezinski, "Lesson from Libya: NATO Alliance Remains Relevant," *National Defense Magazine*, November 2011, http://www.nationaldefensemagazine.org/archive/2011/November/Pages/LessonFromLibyaNATOAllianceRemainsRelevant.aspx.
36. Lt Gen Ralph Jodice, Skype interview by Lt Col Matt Martin, 29 May 2013.
37. See USAF Air Combat Command and USA Training and Doctrine Command, "The Army–Air Force Multi-Role, Theater-Capable, UAS Enabling Concept," USAF Air Combat Command and USA Training and Doctrine Command, 2008.
38. Based on the authors' experience.

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The Air Force and Diversity

The Awkward Embrace

Col Suzanne M. Streeter, USAF*

We don't just celebrate diversity. . . . We embrace it!

—Gen Mark A. Welsh
Chief of Staff, US Air Force

The Air Force is pursuing diversity as a mission imperative, recognizing that individuals who think alike might not resolve future complex problem sets. These challenges range from unrav-

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eling an intelligence problem at the tactical level, through developing a campaign plan against a near-peer competitor at the operational level, to creating policies at the strategic level. Recent efforts have attempted to integrate diversity measures into Air Force culture, including Air Force instructions to codify "diversity [as] a military necessity."[1] Most Airmen, however, are more likely to view "diversity" as another top-down initiative accompanied by computer-based training, checklists, and rules-based compliance rather than recognizing it as a game changer for the Air Force. Even those who discern that diversity is important for the mission are often unable to articulate why this is so. The few who realize its importance or recognize groupthink in their inner circle often do so late in their careers.[2]

Discordance exists between Air Force intentions vis-à-vis diversity and any effective programs and policies to retain and develop a diverse cadre of senior leadership. Issues lie ahead for the service, from retaining key demographic populations to inculcating diversity's importance to mission success. This article addresses such a key demographic—active duty women officers—as an exemplar of the Air Force's retention challenges with diverse groups. Nevertheless, the data reflects that many of the conclusions are equally valid or comparable for other minority groups. Even though the service has initiated formal diversity efforts, recommended policy and development programs may help develop and retain competent officers across the board. Ultimately, building a diverse Air Force leadership team—including retention of its female officers—must be a persistent leadership effort.

The Air Force's Diversity Challenge

Groupthink is the worst thing you can have when you have a problem. . . . If there are all male Caucasians sitting around the table, you have groupthink.

—Gen Philip M. Breedlove, USAF

The Air Force proudly touts its diversity numbers, including the fact that 18.9 percent of the overall active duty force consists of women and that about 27 percent of its members derive from minority populations.[3] However, its long-term retention of minorities remains problematic; retaining female junior officers is emblematic of this systemic issue (see figs. 1–4). As of 2008, the Air Force's retention rate for women officers was about 50 percent around the seven-year mark, whereas the men met this milestone at about the 12-year mark; after 12 years of service, women's attrition rate was 70 percent (fig. 1).[4] Male officers do not reach this level of attrition until the 21-year mark. Female line-officer O-6s are conspicuously small in number (figs. 2 and 3) (line officers are the backbone of the Air Force's cadre of senior leadership as group and wing commanders, center directors, and general officers). The numbers are not that much better when combined with the non-line-officers (fig. 4). Finally, as of 2008, 85 percent of all general officers were white males (fig. 2).[5] These diversity imbalances in terms of gender and minorities at the senior leadership level have implications for the Air Force's long-term operational and overarching organizational success, as discussed later.

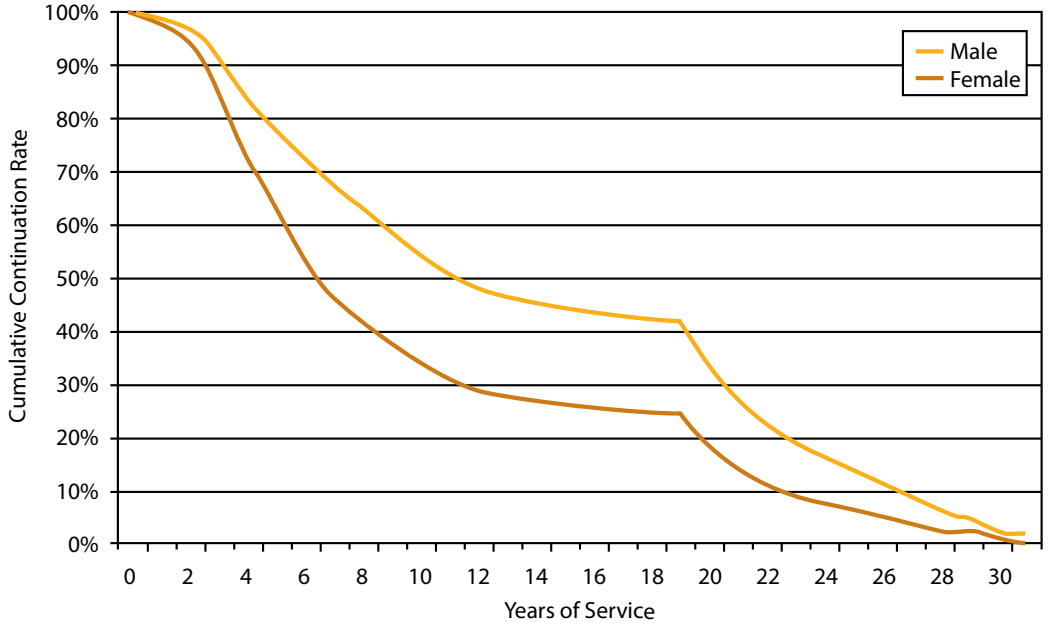

Figure 1. Attrition of Air Force officers. (Reprinted from Military Leadership Diversity Commission, *Officer Retention Rates across the Services by Gender and Race/Ethnicity*, Issue Paper no. 24 [Arlington, VA: Military Leadership Diversity Commission, March 2010], 4, http://www.hsdl.org/?view&did=716147.)

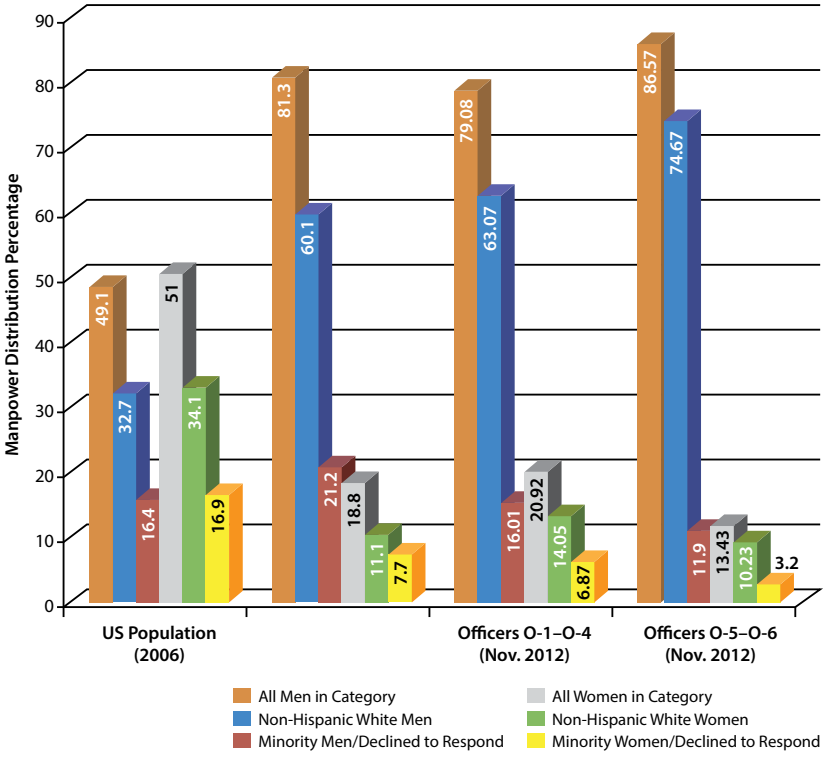

Figure 2. Gender and minority status distribution versus 85 percent of Air Force general officers as non-Hispanic white men. (Adapted from US Census Bureau, "Women and Men Population in the United States: 2006," accessed 10 December 2012, http://www.census.gov/population/www/socdemo/men_women_2006.html; and the author's compilation of data from the Air Force Personnel Center [AFPC] Interactive Demographic Analysis System [IDEAS] application, November 2012.)

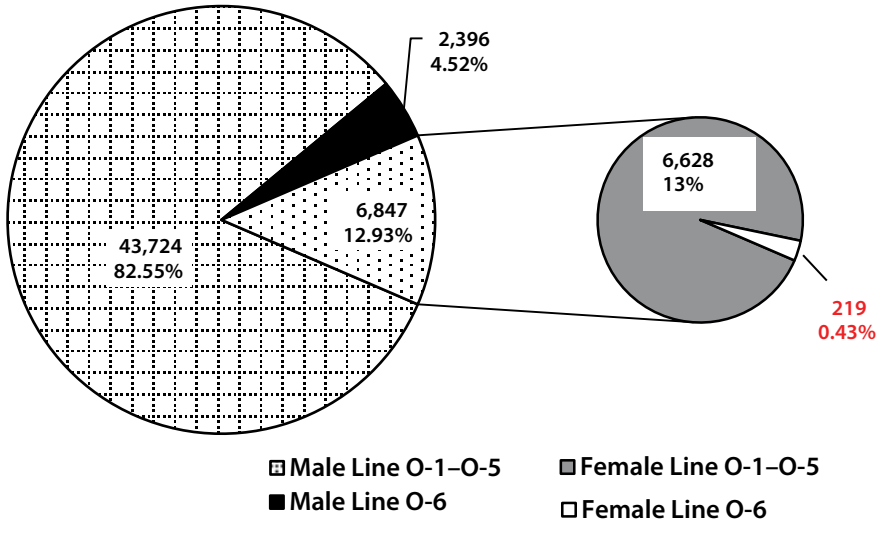

Figure 3. Line officers by gender (November 2012). (From the author's compilation of data from the AFPC IDEAS application, November 2012, end-of-month data extracted 11 December 2012.)

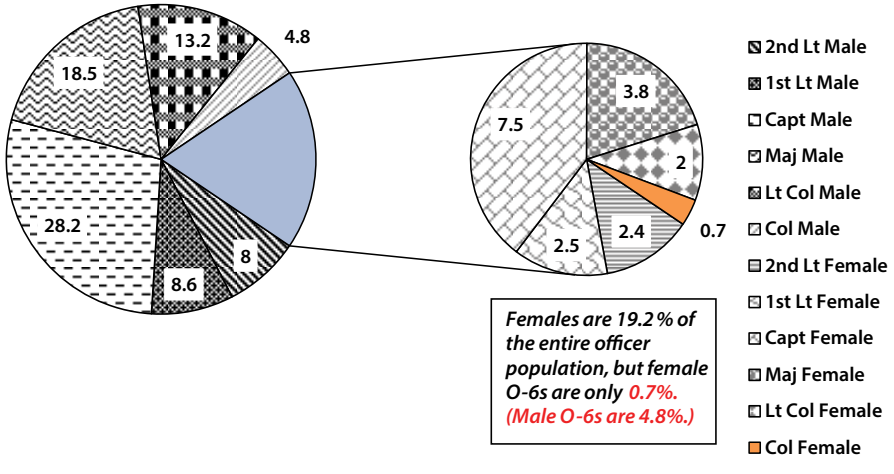

Figure 4. Percentage of the entire officer population (line/nonline) by rank and gender (September 2011 data). (Adapted from "The Air Force in Facts and Figures: 2012 Almanac," *Air Force Magazine* 95, no. 5 [May 2012]: 40, http://www.airforce-magazine.com/MagazineArchive/Magazine%20Documents/2012/May%202012/0512facts_figs.pdf.)

Diversity: Meaning and Importance

The Air Force has designated diversity as an institutional competency; in other words, it is "expected of all Airmen, throughout their careers, and will be . . . needed to operate successfully in the constantly changing environment in which they function."[6] This particular institutional competency is defined as "a composite of . . . personal life experiences, geographic background, socioeconomic background, cultural knowledge, educational background, work background, language abilities, physical abilities, philosophical/spiritual perspectives, age, race, ethnicity, and gender."[7] In July 2012, the Air Force acknowledged that "diversity is a leadership issue" and that leaders should develop "Airmen with different backgrounds and perspectives so [that] they continue to grow and thrive in the Air Force" because diversity "enhances mission readiness and is a national security imperative."[8] In July 2011, Gen Norton Schwartz, former chief of staff of the Air Force, asserted that "diversity should not be an end unto itself, but rather one of the means toward our broader desired state of enhanced effectiveness as an Air Force."[9] In spite of these strategic words, the service has not presented a clear case for how diversity improves mission readiness and national security, nor has it addressed how those at the operational and tactical levels should leverage diversity to enhance their mission success. Diversity is important to mission readiness and national security in terms of demographically representative leadership, enhanced civil-military relations with a diverse civil society, and the leveraging of diversity as a demographic mission necessity.

Representative Leadership

The Military Leadership Diversity Commission found that "officers were generally less demographically diverse than both the enlisted troops they led and the civilian population they served."[10] This situation could lead to "invisible privilege"—a condition in which a dominant group cannot comprehend those who do not fit the "norm" of that culture. A relatively homogeneous senior leadership cadre can

become prone to "blind spots" in their dealings with the diverse enlisted corps and relatively diverse junior officer corps—not fully understanding what will resonate with these populations.[11] For example, current efforts to develop retention policies for women that emphasize monetary carrots do not necessarily reflect measures that will entice them to stay. In fact, in a 2002 survey, "only 4 percent of the women said pay and allowances were a critical factor in their decision to separate from the active duty Air Force"; other reasons honed in on family and leadership issues.[12] The military is one of the few US workplaces where women receive the same compensation as their male counterparts for doing identical jobs.[13] This equal-pay factor might not cross the minds of senior leaders who focus primarily on fiscally oriented retention efforts.[14]

Civil-Military Relations

Relative homogeneity in the senior officer corps also has implications for civil-military relations with respect to political leadership and the broader civilian society. As former House Armed Services Committee chairman Ike Skelton (D-MO) warned, "Those who protect us are psychologically divorced from those who are being protected."[15] Throughout history, tension has existed between military and civilian leadership. Increasing divergence in the attitudes of the Air Force and political leadership is foreseeable if the service's senior leadership cadre stays mostly homogeneous (given the continuation of a reduced presence of lawmakers who are military veterans). This trend has ramifications not only for garnering support for Air Force program requirements within Congress but also for resonating with the general public when the Air Force articulates its raison d'être.

Diversity and Military Necessity

Diverse teams are better than homogeneous ones at solving complex problem sets and thus can lead to mission success.[16] Indeed, cognitive diversity—thinking differently—has enabled "diverse groups of prob-

lem solvers . . . [to have] consistently outperformed groups of the best and brightest."[17] Several studies of the civilian workforce suggest that gender diversity at the senior levels helps companies during a recession. One 2012 report that studied 2,360 worldwide companies from 2005 to 2011 demonstrated that "large-cap stock" companies (those making $10 billion annually) with at least one woman on their boards "outperformed those without women board members by 26%." It attributed this success to wide-ranging characteristics from "better mix of leadership skills" to "risk aversion," especially in a volatile market.[18] The benefits or success of gender diversity can be undermined by institutional biases or poorly implemented diversity programs.[19]

The military has no wide-range studies that examine whether diverse teams resolve complex problem sets better than nondiverse teams.[20] However, by concentrating on one segment of diversity—gender—one could make the case that women are increasingly necessary to conduct military missions. For example, male military personnel could not interact with Afghan women without violating cultural taboos. Marine Corps female engagement teams and special forces cultural support teams established in response to this matter produced unexpected benefits and valuable intelligence, including expanded impact since women "have considerable influence on their husbands, children and their community as a whole."[21] Gen Martin Dempsey, chairman of the Joint Chiefs of Staff, recognized this fact in January 2013 when he pushed for the lifting of the women's combat ban, assessing that "ultimately, we're acting to strengthen the joint force."[22] Not only have women been increasingly integrated in operations downrange but also a need exists for them to fill positions since fewer young people are available to meet military requirements. Specifically, only 15 percent of the US "youth population . . . is [eligible and] available to serve in the military."[23]

Moving toward Leadership Diversity

In her book *The Loudest Duck*, Laura Liswood asserts that "we need to get beyond the bricks and mortar of diversity as we know it—the committees, the employee networks, and the trainings. . . . These are all necessary, but not sufficient." She astutely observes that "diverse organizations require more sophisticated leadership . . . to reap the benefits of what true diversity can provide" and describes most corporations' approach to diversity as one of "Noah's Ark," whereby accession is the principal means of measuring diversity's success. However, there are often no effective programs to retain these minorities; even designed training can become counterproductive and the "unconscious handling of diversity can lead to diverse groups leaving."[24] As demonstrated below, this is the case for the Air Force as well.

The Air Force has directed much of its effort on gaining diversity via accession. In the case of gender diversity, female officer accession rates have averaged 24 percent (fiscal years 1997–2011).[25] However, the average percentage of females in the overall officer corps over the same time frame remained at 17.83 percent.[26] Disparities between accession and overall officer corps percentages for other minorities also exist. Given these facts, the article examines the Air Force's diversity efforts beyond accession, including three of the five priorities of the 2013 *United States Air Force Diversity Strategic Roadmap* that address the development and retention of a diverse force: "institutionalize diversity as necessary to mission success"; "develop a high-quality, talented and diverse total force (active duty, Guard, Reserve, and civilians)"; and "retain a high-quality, talented and diverse total force."[27] The planned actions to execute these goals have not gone far enough to ensure that Airmen understand how and why diversity is a critical part of solving complex problem sets.

The first priority is to "institutionalize diversity as necessary to mission success"—a multiyear and complex effort requiring persistent leadership efforts to communicate basic awareness (fig. 5). The next steps of influencing attitudes and changing beliefs—thereby evolving

Air Force culture—will call for even more dedicated attention and time. Efforts should include reviewing and changing policies to ensure the Air Force does not run "the risk of perpetuating the idea that organization members must always adjust to the organization, rather than the organization at non-mission-essential times adjusting to the diverse needs of its members."[28]

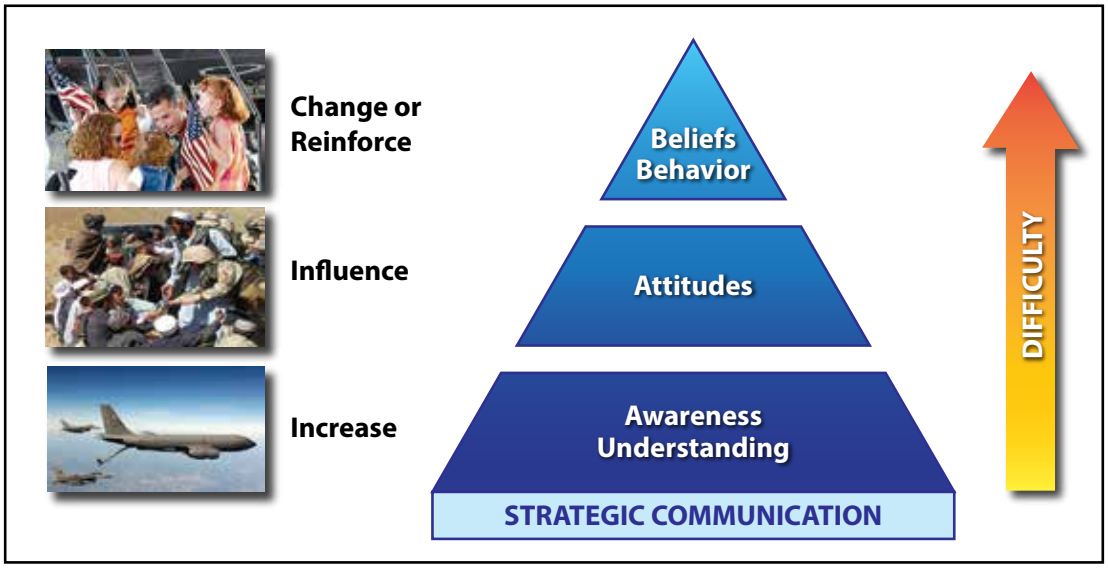

Figure 5. Desired effects of strategic communication. (Reprinted from USAF Public Affairs Center of Excellence, 2012.)

Current goals and actions mostly deal with Airmen feeling included instead of institutionalizing why and how diversity is necessary to mission success.[29] These actions include creating the Air Force Diversity Committee, major command–level diversity focus groups, and Air Force–wide guidance via the latest Air Force Instruction (AFI) 36-7001, *Diversity*, 20 July 2012.[30] Inclusion is important because "without an awareness of the cultural diversity of one's organization and the needs of different cultural groups, it is difficult to achieve an inclusive culture where members feel like they belong and believe they can succeed" (and stay).[31] Nevertheless, a backlash might emerge from the

dominant population if the Air Force overemphasizes inclusion rather than diversity's importance since "framing social inequalities only in the context of the disadvantaged outgroup encourages prejudicial attitudes by privileged group members."[32] Several examples of this kind of reaction within the Air Force fall under the realm of the Equal Opportunity (EO) Office.[33] If diversity is to succeed, it must "complement, but remain separate and distinct from, Air Force Equal Opportunity compliance programs and activities," as noted by AFI 36-7001.[34] Most people regard the EO office as a resource to use when inclusion (or one might say, "tolerance") fails; therefore, relating diversity to an office associated with social ills would inhibit its evolution into a value completely embraced by the Air Force.[35]

Regarding the 2013 *Air Force Diversity Strategic Roadmap*'s second priority of "develop[ing] a high-quality, talented and diverse total force (active duty, Guard, Reserve, and civilians)," that plan has the right view of assuring the infusion of diversity and inclusion into many avenues of training and education. As mentioned previously, diversity cannot be reduced to computer-based ancillary training that involves individuals quickly clicking through to obtain their annual certificate. Headquarters Air Force Global Diversity Division is researching ways to implement a new learning framework following the 70-20-10 model created by the Center for Creative Leadership and adapted by Princeton University.[36] This model proposes that only 10 percent of students learn from "formal training," that 70 percent learn "from real life and on-the-job experiences, tasks and problem solving," and that about 20 percent learn "from feedback and from observing and working with role models."[37] Squadron Officer College's Leadership Department is implementing a 70-20-10 approach via a leadership elective that leverages Second Life, an online avatar-based program that virtually immerses students in historical leadership situations, allowing them to better grasp leadership styles.[38] Avatar-based scenarios like this one should be expanded to realistic diversity education and training insofar as no Air Force professional education offerings for officers have fully developed diversity education programs based on the 70-20-10 model.[39]

The 2013 *Air Force Diversity Strategic Roadmap* advocates mentoring as a path to "effectively operate in a global environment."[40] The online mentoring program that the service has had since 2009 could be a significant complementary tool because it allows mentors to see their protégés' official personnel records but presupposes that mentors have access to the Air Force Portal and that protégés are comfortable asking a senior officer to serve as a mentor.[41] A 2011 report by Women in International Security observes a "direct correlation between mentorship and professional advancement" but indicates that most government agencies "do not devote enough resources toward ensuring that existing programs are effective."[42] Instead, the Air Force could consider something like the OfficerWomen eMentor Program, which develops female officers and veterans.[43] In this program, a female officer can seek out a specific mentor or join a forum to discuss such issues as dual-military couples, efficiently regaining flight qualifications after giving birth, lactation in the workplace, or general career advice.[44] OfficerWomen eMentor has produced measurable results with a sister service. The Navy contracted with AcademyWomen, the program's sponsor, for a three-year pilot eMentor program for all uniformed female Sailors (officers and enlisted). Eighty-two percent of survey participants who reached a retention decision while in the program elected to remain in uniform, and 67 percent of these retained members reported that program participation "positively impacted their decision" to stay in the service.[45] This latter group represented 45 enlisted and 15 female officers in the program who elected to stay, translating to an estimated savings of $4.35 million to the Navy.[46]

Informal mentoring is the more traditional route, whether at work or at events like the "Women in the Air Force" Symposium mentioned in the *Air Force Diversity Strategic Roadmap* of 2010.[47] Low-cost mentoring opportunities include women-specific quarterly lunches or webinars with senior Air Force women leaders; webinars are already an avenue for certain development teams to convey data to their career fields, so the foundation is already in place. Finally, the Air Force could include training for senior officers who mentor junior officers of different

races and genders. This training would not only address various approaches for interacting with and developing different personalities, genders, orientations, and cultures but also examine concerns that "those in the dominant group often fear that they will have to be politically correct, avoid giving critical feedback . . . [and] accept compromised performance."[48]

Regarding the third relevant priority of "retain[ing] a high-quality, talented and diverse total force," the service has taken concrete steps since the inaugural 2010 *Air Force Diversity Strategic Roadmap* to realize this goal.[49] Nevertheless, efforts to "achieve an inclusive environment that provides the total force with the opportunity to realize their full potential" should extend beyond surveys and tracking of quantitative performance measures.[50] It should also expand the Air Force culture to guarantee a well-rounded, mission-competent, diverse force, including a diverse senior leader cadre. The road map still contains too few measurable goals to indicate whether the Air Force is succeeding in this endeavor.[51] Indeed, as Steven Samuels and Dena Samuels point out,

> Even with the best of intentions, it is common to make surface-level, often cosmetic, changes in the hope of alleviating the problem. . . . Since leaders do not believe there is any underlying problem in situations like these, they see no need to make any underlying changes. Thus, they may release public statements pointing to successes they have accomplished in these domains, add a statement about being an equal-opportunity employer in their recruitment advertisements, or put women and people of color into their training films.[52]

The Air Force will stagnate in its diversity efforts without an in-depth review and overhaul of personnel policies and systems. Both the following recommendations and those mentioned above in the *Air Force Diversity Strategic Roadmap* indicate ways of making this document's aspirations a reality: policy transformation and program development leading to a stronger force.

Recommendations

Change Policy

Previous policy recommendations to mitigate issues concerning the retention of female officers include home basing, sabbatical programs, and a more flexible continuum of service (see the table below).[53] These recommendations, which remain valid, can be applied to a range of demographics, including men and women from the millennial generation, who tend to follow less linear career paths. However, the Air Force has not fully implemented these recommendations; they require action by the chief of staff of the Air Force and Congress. These programs would not only retain women but also promote key skill sets and cognitive diversity across the force.

Table. Reasons for leaving the Air Force (2002 data)

Reasons for Leaving the Air Force	*% Critical/Significant Factor*	*% Not a Factor*
Start a family	24	60
Stay home with children	27	61
Spend more time with family	41	40
Child care	8	80
Civilian jobs (more money)	12	67
Civilian jobs (more fulfilling work)	20	61
Civilian jobs (move ahead)	12	72
Civilian jobs (better cultural climate)	11	70
Geographic stability	41	42
Dissatisfied with Air Force leadership	27	42

Reprinted from Lt Col Laura A. H. DiSilverio, *Winning the Retention Wars: The Air Force, Women Officers, and the Need for Transformation*, Fairchild Paper (Maxwell AFB, AL: Air University Press, August 2003), 30.

The first proposed solution instituted home basing as an option, defined as "assigning a military member to the same base or location for an extended period of time."[54] In August 2001, the Government Accounting Office pointed out that more time between moves led to more likelihood of retention across the board—60–64 percent for three-plus-year tours as opposed to 46 percent for two-to-three-year tours (the average was two-year tours).[55] The Air Force slashed the number of moves in 2006 to conserve funds by keeping individuals on station for an average of four years (saving about $134 million annually).[56] An unimplemented proposal included more extensive home basing for officers—up to eight to 10 years. This initiative allowed junior officers "to develop roots in a community and a support network," minimizing the disruption of frequent moves.[57] Today a viable option entails expanding the current policy regarding permanent change of station, which allows selected enlisted members to volunteer for hard-to-fill spots via the Voluntary Stabilized Base Assignment Program for five years at a time.[58] For officers, a home-basing program is easier to implement in locations like Colorado Springs, San Antonio, or Washington, DC, because of the greater number of lateral and vertical openings. This initiative could retain individuals who otherwise would separate for reasons of geographic stability as well as reduce moving costs in this era of austerity. The AFPC would have to gauge the size of the program, but it could be lottery-based to keep the numbers at a manageable level and account for mission needs.

A second recommendation included a "non-punitive break in service option as a retention tool."[59] Earlier proposed, unimplemented solutions were a "one-year paid sabbatical" and a one-to-five-year unpaid break in service; each option would allow personnel to return as valued assets to the Air Force, saving training funds in the long run.[60] The National Defense Authorization Act (NDAA) of 2009 authorized each service to "carry out pilot programs under which officers and enlisted members of the regular components of the Armed Forces . . . may be inactivated from active duty in order to meet personal or professional needs and returned to active duty."[61] Congress authorized "20 officers

and 20 enlisted members of each Armed Force" per year, for a maximum of three years.[62] In the 2012 NDAA, Congress extended the program to the end of calendar year 2015.[63] However, the Navy has been the only Department of Defense service to take advantage of the Career Intermission Pilot Program, a once-in-a career initiative that includes full health care and a small stipend for participants.[64] The Air Force should follow the Navy's lead in establishing a career-intermission pilot program of its own. It is within the secretary of the Air Force's power to establish this program; in the long run, it would not be overly expensive to implement. The Air Force could also examine the Coast Guard's temporary separation program, activated since fiscal year 2001.[65] That service rededicated support to the program in September 2012 as a "retention tool" and an option for personnel making life-changing decisions.[66] Although the Coast Guard falls under Title 14 and as such is not bound by NDAA restrictions, the Air Force could still benchmark from some practices. If well integrated, a break in service would not prove punitive to an individual's career. There is no reason why a program participant should not attain senior officer status since his or her "outside" experience could inject even more cognitive diversity.[67]

A third recommendation includes increasing the "permeability of [the] active-reserve barrier."[68] This kind of policy change is needed more than ever. The Air Force designed the 3-1 Integration Plan to allow the three components of the Air Force to combine their personnel systems, thus allowing for a true continuum of service, but it was shelved for reasons unknown to the author.[69] The fact that the Army initiated its continuum of service program in 2012, though, shows great promise. According to the *Army Reserve 2012 Posture Statement*, the goal is to "inspire Soldiers to a lifetime of military service, which includes seamless transitions between active and Reserve statuses."[70] If the plan unfolds as intended, a Soldier could take several paths, including a mix of reserve status and active-reserve.[71] It behooves the Air Force to track the outcome of the Army program and reconsider the shelved 3-1 Integration Plan.

Develop a Diverse Force

The Air Force should create solid development programs to inculcate diversity as a force multiplier; pursuing surface-level diversity can be counterproductive. If women and minorities are put into key positions based solely on gender or their minority status rather than on training or competence, they may be more likely to fail and either create or reinforce negative perceptions. Furthermore, these individuals would not receive the critical feedback they need to grow as leaders. Action plans should be sensitive to these factors and prepare leaders to develop their entire officer corps's core competencies so that, when chosen, everyone can step up confidently to leadership positions.

Intervention to inculcate diversity into the Air Force culture should be implemented incrementally. One approach to the 2013 *Air Force Diversity Strategic Roadmap*'s institutionalization priority involves linking diversity to mission effectiveness at every turn in the field. This reinforcement could be woven into opportunities found in mentoring, professional development sessions for officers, and wingman days. An initial focus, for example, would call for Airmen to uncover their own misperceptions or implicit biases about women officers (or minorities).[72] Free surveys are available, such as the Harvard Implicit Association Test, which measures subconscious biases via a simple online test.[73] Other activities could leverage case studies from free websites like the Stanford Graduate School of Business's "Leadership in Focus."[74] These programs could include a concerted effort to develop technical and leadership competencies in all Airmen.[75]

Conduct Surveys

The Air Force is on the right track with future survey topics, such as an upcoming one concerning women's reasons for leaving active duty.[76] However, this effort could expand to include crowdsourcing techniques. That is, instead of obtaining a snapshot of quantitative data, the Air Force could opt for a living source in which members provide reasons that women officers leave as well as possible solutions.

Not all reasons would be actionable, but the information would widen the aperture for senior leadership to develop better retention policies.

Additional data snapshots would also prove useful, such as expanding the 2013 *Air Force Diversity Strategic Roadmap*'s performance measurement of "track[ing] the number/percentage of supervisory total force personnel who indicate . . . they are serving as a mentor" to include questions about who they are mentoring and why.[77] The survey could include a hyperlink to mentoring resources. Another method for capturing the incorporation of diversity into the culture might entail using questions on diversity as it relates to mission effectiveness in unit climate-assessment surveys since current questions dealing with interrelationships tend to emphasize EO-related issues. The Air Force should also consider publicly tracking attrition rates of stressed career fields such as intelligence or cyber. At this time, the service publishes a thorough analysis of the attrition rates of pilots, navigators, and air battle managers only in its annual analysis of rated officer retention; it is difficult to understand why individuals are leaving if the numbers are not analyzed and published.

Use Avatars

The work started by the Squadron Officer College's use of avatars could grow to introduce diversity in a way that reaches the younger generation. Imagine a simulation in which an officer role-plays a minority or a woman via an online avatar, encountering some of the implicit biases or challenges. This will not necessarily change attitudes immediately but could plant some seeds of empathy. Another option with this technology would involve developing scenarios in which players encounter realistic, complex problems that can be solved only by a diverse virtual team.[78]

Conclusions and Areas for Future Research

This article has addressed the Air Force's recognition of diversity as a critical mission element and has expanded upon why and how divergence exists between policy and reality when it comes to the retention of women officers. First, many Air Force people do not consider diversity as a factor when they create operational teams or solve complex problems, no matter the findings of surveys regarding how Airmen recognize the importance of diversity.[79] Second, current personnel policies are not necessarily conducive to retention. The 2013 *Air Force Diversity Strategic Roadmap* recognizes this fact and has outlined actions to accommodate these values. Third, although the service has created groups to discuss diversity, programs that develop a diverse force are limited, especially in the education and mentoring fields. The Air Force should consider strategic-level tracks to close this gap in the retention of women officers—first, by pursuing policy changes at the Headquarters Air Force and congressional levels and second (and probably more time consuming and leadership intensive), by moving beyond rhetoric and a culture in which women-officer leaders are a normative part of achieving mission success.

Headquarters Air Force Global Diversity Division, charged with developing diversity policy and programs, is committed to resolving the aforementioned challenges. However, a small office of five permanent-party members is not enough to turn the tide of Air Force culture. Its personnel need assistance both from the service's senior leadership and from the field to create excitement about diversity.

Developing effective programs needs the most research and work. The objective is to move the Air Force beyond the guidance, talking points, and static websites, all of which operate via a pull versus a push methodology. Furthermore, it is not clear how the numerous speeches by senior leaders to niche audiences like the National Association for the Advancement of Colored People or Congress are translated to action. These programs should not only focus on those in the field but also reiterate the lessons at every educational opportunity,

from accession programs to professional military education. Another area for further research, the introduction of leadership from the middle, would train a specific cadre of individuals on diversity to develop a peer cadre—much like the Air Force does now for resiliency.[80] Finally, as Samuels and Samuels recommend, "a framework is needed to help leaders become more culturally aware of other organizational members' experiences and needs . . . to highlight the manner in which the statuses of leaders might serve as blinders and even inhibitors to creating a diverse and inclusive workplace."[81]

Transforming culture is a difficult endeavor. Although the Air Force has taken great strides to initiate this change, it will require at least a generation of consistent involvement on the part of senior leadership as well as purposeful policies and programs to make diversity a true Air Force competency. The steps that the service takes in the next few years will make all the difference for the retention and development of diverse individuals. More important, however, is the goal of changing the attitude of the entire force to truly embrace diversity as a force multiplier in dealing with increasingly complex problems. ✪

Notes

1. Air Force Instruction (AFI) 1-1, Air *Force Culture*, 7 August 2012, 11, http://static.e-publishing.af.mil/production/1/af_cc/publication/afi1-1/afi1-1.pdf.

2. The 2011 report of the Military Leadership Diversity Commission (MLDC) stated that "there are potential perceptual barriers that prevent racial/ethnic minorities and women from obtaining key assignments, such as command. In particular, . . . [they] may lack sufficient knowledge about key assignment opportunities, perhaps because . . . [they] do not receive the same counseling or mentoring about key assignments as their white male counterparts." MLDC, *From Representation to Inclusion: Diversity Leadership for the 21st-Century; Final Report* (Arlington, VA: MLDC, March 2011), 68, http://diversity.defense.gov/Portals/51/Documents/Special%20Feature/MLDC_Final_Report.pdf.

3. "Air Force Personnel Demographics," Air Force Personnel Center, accessed 28 October 2012, http://www.afpc.af.mil/library/airforcepersonneldemographics.asp.

4. MLDC, *Officer Retention Rates across the Services by Gender and Race/Ethnicity*, Issue Paper no. 24 (Arlington, VA: MLDC, March 2010), 4, http://www.hsdl.rg/?view&did=716147.

5. The MLDC's report makes this particular point via its charts. Military Leadership Diversity Commission, *From Representation to Inclusion*, 43.

6. Air Force Policy Directive 36-26, *Total Force Development*, 27 September 2011, 9, http://static.e-publishing.af.mil/production/1/af_a1/publication/afpd36-26/afpd_36-26.pdf; and Col Harry Lane, chief, Headquarters Air Force Global Diversity Division, Pentagon, to the author, e-mail, 10 October 2012.

7. "Air Force Diversity," US Air Force, accessed 25 September 2012, http://www.af.mil/Diversity.aspx.

8. Air Force Document (AFD) 120716-024, "US Air Force Key Talking Points, June 2012 Special Edition: Diversity," 16 July 2012, http://www.af.mil/Portals/1/documents/diversity/2012-diversity-talking-points.pdf.

9. Gen Norton Schwartz (remarks, 102nd NAACP Annual Convention Military Awards Dinner, 26 July 2011).

10. MLDC, *From Representation to Inclusion*, 44.

11. Within the Air Force Academy, for example, the normative population is comprised of white Christian males. Anybody who does not fit into that category is not necessarily viewed as inherently belonging to that institution and often has to go above and beyond simply to justify his or her membership. Without conscious effort or education, dominant groups simply do not realize that others have a different experience or outlook than their own. As Steven Samuels and Dena Samuels remark, "When privilege is normalized, those in dominant positions tend not to see themselves as privileged and thus run the risk of ignoring their own role in perpetuating inequalities" or inadvertently "distance themselves from their goals." Steven M. Samuels and Dena R. Samuels, "Incorporating the Concept of Privilege into Policy and Practice," in *Attitudes Aren't Free: Thinking Deeply about Diversity in the US Armed Forces*, ed. James E. Parco and David Levy (Maxwell AFB, AL: Air University Press, February 2010), 326.

12. Lt Col Laura A. H. DiSilverio, *Winning the Retention Wars: The Air Force, Women Officers, and the Need for Transformation*, Fairchild Paper (Maxwell AFB, AL: Air University Press, August 2003), 36. In 2002 Lieutenant Colonel DiSilverio conducted a survey for her Air War College research paper that included this data. She observed that "the Air Force can focus its retention efforts on decreasing the conflict between having/caring for families and fulfilling military duties rather than on making the military look attractive in comparison to civilian opportunities. The Air Force has historically been focused on the latter" (ibid.).

13. This is not to say that women are promoted at the same rate. The MLDC made clear the existence of a gap, especially in the Coast Guard and Navy, due to any number of potential reasons. The latter include performance reports that are not competitively written and assignment matching. Promotion boards are not necessarily one of the reasons because they work under very clear direction regarding what is expected. MLDC, *From Representation to Inclusion*, 76–78.

14. With the millennial generation forming the junior officer ranks, monetary reasons are not necessarily incentives to stay. A 2011 survey of 250 junior officers (mostly Marines and Army and 86 percent male) noted that 75 percent of those surveyed claimed "personnel management issues" and that 57 percent cited "the limited ability to control their own careers" as reasons for leaving the military. Though only 4 percent of them were in the Air Force, the generational tendencies are probably similar. Sayce Falk and Sasha Rogers, "Ju-

nior Military Officer Retention: Challenges & Opportunities" (master's thesis, John F. Kennedy School of Government, March 2011), 11, 53.

15. Philip Ewing, "Defense Leaders Fear Military-Civilian 'Disconnect,'" Politico.com, 20 February 2011, http://www.politico.com/news/stories/0211/49838.html.

16. Several examples exist in the civilian world, such as computer gamers who mapped the complex molecular structure of a retrovirus enzyme that perplexed trained scientists for years. University of Washington, "Gamers Succeed Where Scientists Fail: Molecular Structure of Retrovirus Enzyme Solved, Doors Open to New AIDS Drug Design," *ScienceDaily*, 19 September 2011, http://www.sciencedaily.com/releases/2011/09/110918144955.htm.

17. Scott E. Page, *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies* (Princeton, NJ: Princeton University Press, 2007), xxv. For this article, cognitive diversity includes identity diversity. That is, the socialization of US society (especially the military) fits firmly into the masculine quadrant of any chart made by Geert Hofstede, Gert Jan Hofstede, and Michael Minkov. In a masculine society, male and female "emotional gender roles are clearly distinct"; masculine values such as work earnings and recognition are more esteemed than values found in feminine society, such as the importance of "relationships and quality of life." Due to this typical socialization in American society, women also tend to be cognitively diverse (they think differently) due to their identity diversity. Geert Hofstede, Gert Jan Hofstede, and Michael Minkov, *Cultures and Organizations: Software of the Mind* (New York: McGraw Hill, 2010), 140–41,151–52, 155. Alluding to organizational theorist I. D. Steiner, Dr. Scott Page notes that diversity is necessary for "*conjunctive tasks*, those in which everyone's contribution is critical" (emphasis in original). He also remarks that although identity diversity does not automatically translate to success, when it is linked to cognitive diversity and issues that require diverse thought, "identity diversity produces better outcomes indirectly." One could argue that this holds especially true in the case of the military since its leaders and many junior officers are tasked to resolve complex problems that need innovative solutions. Page, *Difference*, xv, xxv–xxvi, 13.

18. Credit Suisse Research, *Gender Diversity and Corporate Performance* (Zurich: Credit Suisse, August 2012), 12, 18, 19.

19. According to Frank Dobbin and Jiwook Jung, "The fact that board diversity has no effect on profits, but a negative effect on stock price, lends support to our thesis that institutional investors may sell the stock of firms that appoint women to their boards—not because profits suffer, but because they are biased against women." Frank Dobbin and Jiwook Jung, "Corporate Board Gender Diversity and Stock Performance: The Competence Gap or Institutional Investor Bias?," *North Carolina Law Review* 89, no. 3 (March 2011): 828, http://www.wjh.harvard.edu/~dobbin/cv/articles/2011_NCLR_Dobbin_Jung.pdf. The MLDC notes that "if it is not managed effectively, diversity . . . can actually reduce capability, most frequently through the decreased communication and/or increased conflict that result when some people are (or feel) excluded." MLDC, *Decision Paper no. 6: Diversity Leadership* (Arlington, VA: MLDC, February 2011), 6.

20. This topic should be considered for future research.

21. Sgt Christopher McCullough, "Female Engagement Teams: Who They Are and Why They Do It," *Defense Video & Imagery Distribution System*, 1 August 2012, http://www.dvidshub.net/news/92477/female-engagement-teams-who-they-and-why-they-do#.UI3rBYbuhTw#ixzz2AeSqGXsr. See also "About the Cultural Support Program," US

Army John F. Kennedy Special Warfare Center and School, accessed 4 February 2013, http://www.soc.mil/swcs/cst/about.html.

22. Cheryl Pellerin, "Dempsey: Allowing Women in Combat Strengthens Joint Force," US Department of Defense, 24 January 2013, http://www.defense.gov/news/newsarticle.aspx?id=119100.

23. US Department of Defense, *Population Representation in the Military Services: Fiscal Year 2011* (Washington, DC: Office of the Under Secretary of Defense [Personnel and Readiness], 2011), 2.

24. Laura Liswood, *The Loudest Duck: Moving beyond Diversity While Embracing Differences to Achieve Success at Work* (Hoboken, NJ: John Wiley & Sons, 2010), xix–xx, xxvii, 1–2, 4, 82.

25. This 15-year average raises the question as to why overall female accession rates have hovered at 24 percent (with many ups and downs). We need further research on expanding the Air Force message to attract more women for the health of the force.

26. Department of Defense, *Population Representation*, D-20, 23.

27. Air Force Global Diversity Division, *United States Air Force Diversity Strategic Roadmap* (Washington, DC: Air Force Global Diversity Division, AF/A1DV, 12 March 2013), 9, 14, 15, http://www.af.mil/Portals/1/documents/diversity/diversity-strategic-roadmap.pdf.

28. Samuels and Samuels, "Incorporating the Concept of Privilege," 322.

29. Air Force Global Diversity Division, *Diversity Strategic Roadmap*, 9–10.

30. Air Force Diversity Operations, *United States Air Force Diversity Strategic Roadmap: A Journey to Excellence* (Washington, DC: Air Force Diversity Operations, AF/A1DV, 19 October 2010), 5, 7, http://www.af.mil/shared/media/document/AFD-101117-010.pdf; Lane to the author, e-mail; and Lt Col John Yourse, Headquarters Air Force Global Diversity Division, Pentagon, to the author, e-mail, 5 November 2012.

31. Samuels and Samuels, "Incorporating the Concept of Privilege," 322.

32. Ibid., 327.

33. The most recent example occurred when General Welsh, the chief of staff of the Air Force, issued an edict to conduct "health and welfare" checks in December 2012 to ensure that workspaces were professional. These checks were depicted as a "witch hunt" against the fighter pilot culture. General Welsh countered vehemently, stating that certain traditions had no place in today's Air Force. Nevertheless, discussions regarding witch hunts are still alive in the blogosphere and workspaces. Gen Mark A. Welsh III, "CSAF January Letter to Airmen—Happy New Year," 2 January 2013, http://www.301fw.afrc.af.mil/news/story.asp?id=123331351.

34. AFI 36-7001, *Diversity*, 20 July 2012, 4.

35. Regarding the repeal of the "Don't Ask, Don't Tell" policy, Steven Samuels and Col Gary Packard declared in February 2012 that "our Oath of Office demands that we support our nation's laws; thus, under repeal, toleration is the minimum behavioral expectation of every service member. However, military strength is not built on toleration. Strength requires acceptance and, ultimately, respect and inclusiveness for all who volunteer to serve. We must value our colleagues for who they are and not who we want them to be." Steven M. Samuels and Col Gary A. Packard, "Repeal of DADT Makes the Military Stronger," *Air Force Times*, 6 February 2012, 24; and Dr. Steven Samuels (USAFA professor, Department of Behavioral Sciences and Leadership), interview by the author, 17 November 2012.

36. Yourse to the author, e-mail.

37. "Learning Philosophy," Princeton University Office of Human Resources, 21 June 2011, http://www.princeton.edu/hr/learning/philosophy/. From the Center for Creative Leadership, this model is "a research-based, time-tested guideline for developing managers [that] proposes engaging them with three clusters of experience, using a 70-20-10 ratio: challenging assignments (70%), developmental relationships (20%), and coursework and training (10%). Despite the popularity of the 70-20-10 rule, most organizations are still not systematic or intentional about using a synergistic combination of assignments-relationships-coursework to groom future leaders." Meena Surie Wilson et al., *Grooming Top Leaders: Cultural Perspectives from China, India, Singapore and the United States* (Greensboro, NC: Center for Creative Leadership, September 2011), 4, http://www.ccl.org/leadership/pdf/research/GroomingTopLeaders.pdf.

38. Dr. Fil J. Arenas (associate professor, Organizational Leadership Studies, Squadron Officer College), interviews by the author, 11 October 2012 and 14 December 2012.

39. Training and education are included as key parts of the development priority mentioned in the 2013 *Air Force Diversity Strategic Roadmap*. Work remains, despite the progress made in introducing diversity at various levels of accession and professional military education (PME) programs. Training and education should go beyond these efforts and should be emphasized at every opportunity to link with mission needs. Increasing awareness and influencing attitudes vis-à-vis diversity starts with officer accession programs. Solid efforts have begun at the Jeanne M. Holm Center for Officer Accessions and Citizen Development, which oversees all officer accession programs with the exception of those at the United States Air Force Academy (USAFA). The Holm Center introduces the diversity concept to its cadets and officer trainees, specifically via a two-hour lesson entitled "Managing Diversity," which utilizes team-building exercises to cover the elements and challenges of leading a diverse force. The USAFA has been most holistic and dedicated in its approach to diversity. Though the academy's focus remains on accessing a more diverse force, it has recognized the need to develop solid action plans not only to diversify its teaching cadre but also to train it, expand opportunities for retention, and put resources behind its efforts. Of the three main Air Force officer PME programs, the one geared toward junior officers (Squadron Officer School) has the most developed program to comply with the Air Staff's direction. A 50-minute in-class course introduces the Air Force's emphasis on diversity, and a 90-minute team-building exercise touches on diversity as a consideration for building a team. The Air Command and Staff College, geared toward majors, has some diversity elements in its curricula, including an elective historical survey of women in the military; however, only 12 of 485 students were enrolled in this particular course. At this time, the Air War College does not have any topics on diversity in its curricula. Nevertheless, the Leadership Department is looking into ways to interweave diversity into its Joint Strategic Leadership course as well as its 360 leadership survey for Annual Year 2014's class; this effort would include administrating the Harvard Implicit Bias test. See Air Force Global Diversity Division, *Air Force Diversity Strategic Roadmap* (2013), 14; Dr. Charles Nath III (director of curriculum, Holm Center), interview by the author, 19 October 2012; *USAFA Diversity Plan* (Colorado Springs, CO: USAFA Diversity Office, June 2009), 2–3, 14, http://www.usafa.edu/superintendent/diversityoffice/links/AFD-110316-012.pdf; Arenas, interview, 11 October 2012; Dr. Mary N. Hampton (associate dean for academics, Air Command and Staff College / DEA), interview by the author, 1 November 2012; and COL Gene Kamena, USAF, retired (former deputy department

chair, Air War College Department of Leadership and Warfighting), interview by the author, 5 November 2012.

40. Air Force Global Diversity Division, *Air Force Diversity Strategic Roadmap* (2013), 14.

41. The mentoring programs can be found on the MyEDP, MyODP, or MyCDP, via the Air Force Portal. AFI 36-3401, *Air Force Mentoring*, 1 June 2000, took 13 years to replace; Air Force Manual 36-2643, *Air Force Mentoring Program*, was issued on 1 May 2013.

42. Jolynn Shoemaker and Jennifer Park, *Progress Report on Women in Peace & Security Careers: US Executive Branch*, WIIS Leadership Series (Washington, DC: Women in International Security, [2011]), 4, http://csis.org/files/publication/110726_WIIS_ProgressReport_ExecBranch_fnl.pdf.

43. In the interest of full disclosure, note that the author is a board member of AcademyWomen, the sponsoring vehicle. AcademyWomen also sponsors e-Mentoring leadership programs for female cadets and midshipmen, male and female veterans, and military spouses.

44. These individuals meet virtually, via telephone/e-mail/Skype or in person. At this time, the program is mostly restricted to women mentoring women with some inclusion of senior male mentors (O-4 commanders and above). "Our eMentor Programs," E-Mentor, accessed 12 November 2012, http://www.ementorprogram.org/pages/programs; and Stefanie Goebel, eMentor Leadership Program director, to the author, e-mail, 27 November 2012.

45. *NavyWomen eMentor Leadership Program: Year 3; Year End Assessment Report, 2010–2011* (Washington, DC: Department of the Navy, n.d.), 8. Data prepared by Magnolia, Inc., as a third-party evaluation of AcademyWomen services, AcademyWomen Archives.

46. When extrapolated to the entire population of program participants, the 12 individuals who stated in the survey that the program "positively impacted their decision to remain in uniform" represent 60 program participants. Retaining these 60 members would translate to a total $4.35 million return on investment (the program costs approximately $200,000) when one considers replacement costs such as recruitment and training. *NavyWomen eMentor Leadership Program*, 22, 27; and Stefanie Goebel, eMentor Leadership Program director, to the author, e-mail, 29 January 2013.

47. Air Force Diversity Operations, *Air Force Diversity Strategic Roadmap* (2010), 14.

48. Liswood, *Loudest Duck*, 27.

49. The Air Force Diversity Committee formed in December 2010. A quarterly session is cochaired by the secretary of the Air Force and the chief of the Air Force's human resources staffs to "offer advice on major diversity policy issues and long-term strategic oversight and perspectives." Lane to the author, e-mail. Further, a chief diversity officer was hired at the US Air Force Academy in early 2011, and several surveys have been conducted or planned, including an Air Force Personnel Center (AFPC) Career Decision Survey in November 2011 to better understand why individuals leave/remain in the Air Force (results are pending) and a planned joint Air Force Public Affairs and AFPC survey to examine the specific issue of retaining women. Finally, in 2012 official guidance in the form of AFI 36-7001, *Diversity*, and AFI 1-1, *Air Force Culture*, was issued in summer 2012. Lane to the author, e-mail.

50. Air Force Global Diversity Division, *Air Force Diversity Strategic Roadmap* (2013), 15.

51. Air Force leaders should remain vigilant to the problem set of increasing diversity because resting on one's laurels could trigger inadvertent backsliding. Yourse, interview.

52. Samuels and Samuels, "Incorporating the Concept of Privilege," 323.

53. Lieutenant Colonel DiSilverio addressed three policy recommendations, including values identified by women, in her Fairchild Paper *Winning the Retention Wars*.

54. Ibid., 42.

55. US General Accounting Office, *Military Personnel: Longer Time between Moves Related to Higher Satisfaction and Retention*, GAO 01-841 (Washington, DC: US General Accounting Office, August 2001), 2, 17, http://www.gao.gov/new.items/d01841.pdf.

56. Erik Holmes, "Slowing PCS—Fewer Moves Will Save Millions, Boost Unit Efficiency, Leaders Say," *Air Force Times*, 23 October 2006.

57. DiSilverio, *Winning the Retention Wars*, 43. According to DiSilverio, "Of 3,795 officers completing a 1999 AFPC survey about home basing, 83 percent overwhelmingly liked the concept. The majority of personnel (76 percent of officers) would want to remain at a home-base location for 5–12 years" (ibid.).

58. AFI 36-2110, *Assignments*, 22 September 2009, 343.

59. DiSilverio, *Winning the Retention Wars*, 45.

60. Ibid., 46.

61. *Duncan Hunter National Defense Authorization Act for Fiscal Year 2009*, Public Law 110-417, 110th Cong., 2nd sess., 14 October 2008, sec. 533(a)(1).

62. Ibid., sec. 533(c).

63. *National Defense Authorization Act for Fiscal Year 2012*, Public Law 112–81, 112th Cong., 1st sess., 31 December 2011, sec. 531.

64. Specifically, the Navy indicated that "during the period of inactive duty in the IRR [Individual Ready Reserve], the member is provided full active duty TRICARE health benefits for themselves [*sic*] and their dependents, a monthly stipend of 2 times 1/30th of their basic pay, and a one-time move to a CONUS [continental United States] location of their choice for the duration of their participation in the pilot program. All program participants will return to active duty at the end of the period prescribed and will incur a two-month for every one-month of program participation obligated service (OBLISERVE) in addition to any existing OBLISERVE owed to the Navy." NAVADMIN 089/12, "Career Intermission Pilot Program Extension," 16 March 2012, http://www.public.navy.mil/bupers-npc/reference/messages/Documents/NAVADMINS/NAV2012/NAV12089.txt.

65. The Coast Guard program is open to men and women, officers and enlisted. Individuals can leave twice during their career for 24 months at a time without pay. These individuals choose either to affiliate with the Reserve or not affiliate, and returning to duty is a rather straightforward process. Initially a once-in-a-career opportunity, it was modified in 2009 to become available twice in a career. ALCOAST 299/09, "Update to Temporary Separation and Care of Newborn Children Policy," 19 May 2009, http://www.uscg.mil/announcements/ALCOAST/alcoast299-09.txt; and US Coast Guard, Commandant Instruction M1000.4, *Military Separations*, September 2011, 1-177–1-179.

66. About 407 Coast Guard officers (7.4 percent of the force) separate each year. Of these, about 125 are eligible for temporary separation (30.7 percent), and 59 of them (47.2 percent) took part. Neither the return rates for this program (about 17 percent of approximately 44 officer participants) nor the promotion rates have been high thus far, but the Coast Guard remains dedicated since even a small return rate offers a way to retain quality individuals. TempSepStats Excel Spreadsheet, LCDR Micah Acree, US Coast Guard Workforce Forecasting and Analysis (CG-12A) Officer Team, Washington, DC, to the author, e-mails, 23 and 25 October 2012.

67. Yourse, interview.

68. DiSilverio, *Winning the Retention Wars*, 49.

69. Michael Donley, secretary of the Air Force, "Rebalancing the Total Force: Leveraging Reserve Strengths for Changing Global Realities" (remarks at the 2011 AFRC Senior Leaders Conference, Washington, DC, 16 May 2011), http://european-security.com/n_index.php?id=6082.

70. US House and Senate, *The United States Army Reserve 2012 Posture Statement: An Enduring Operational Army Reserve; Providing Indispensable Capabilities to the Total Force*, 112th Cong., 2nd sess., March 2012, ii.

71. Ibid., 13.

72. Unconscious bias or "mind bugs" may influence the judgment of even the most well-intentioned officers. As psychologist Roger Shepard observes, "The intellect is completely powerless" when it comes to the fact that "unconscious judgments, may often be in error" in dealing with diversity. Corydon Ireland, "Mahzarin Banaji Looks at Biology of Bias," *Harvard Gazette*, 11 October 2007, http://news.harvard.edu/gazette/story/2007/10/mahzarin-banaji-looks-at-biology-of-bias/.

73. "Project Implicit," Harvard University, accessed 6 October 2012, https://implicit.harvard.edu/implicit/.

74. "Bringing Leadership Lessons to the Classroom . . . and the Boardroom," Stanford Graduate School of Business, accessed 6 October 2012, http://www.gsb.stanford.edu/cldr/teaching/leadershipinfocus.html.

75. Part of developing competency is ensuring that leaders are gender-neutral when it comes to selecting individuals for certain positions. One finds a powerful example of this principle enjoying success in the civilian world. For several decades now, orchestra audition panels have gone to great lengths to overcome gender bias. Panels considering future players will do so without initially seeing the candidates. They will go to such lengths as having men escort women candidates so that the candidate sounds like a man walking. Having leveled the playing field, the panel focuses solely on the quality of the music. According to the study, "Estimates based on the roster sample indicate that blind auditions may account for 25 percent of the increase in the percentage of orchestra musicians who are female." Claudia Goldin and Cecilia Rouse, "Orchestrating Impartiality: The Impact of 'Blind' Auditions on Female Musicians," *American Economic Review* 90, no. 4 (September 2000): 715–41.

76. Lane to author, e-mail.

77. Air Force Global Diversity Division, *Air Force Diversity Strategic Roadmap* (2013), 14.

78. Arenas, interview, 11 October 2012.

79. The "January 2012 Internal Communication Assessment Group Diversity Survey of Airmen [revealed that]: 86% believe the Air Force is doing a good/excellent job creating diversity throughout the Total Force; 75% agree that it is important for the Air Force to attract, recruit, develop and retain a diverse workforce; 61% think Air Force senior leaders are committed to improving diversity." The surveys do not demonstrate how the questions were framed, but more telling of the author's personal experience are the following statistics: "[Sixty-one percent] have not read or heard diversity initiatives discussed by senior leaders; 40% understand the Air Force definition of diversity." AFD 120716-024, "US Air Force Key Talking Points."

80. Many thanks to Kimberly Streeter for this idea.

81. Samuels and Samuels, "Incorporating the Concept of Privilege," 323.

Col Suzanne M. Streeter, USAF

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The Comanche and the Albatross

About Our Neck Was Hung

Col Michael W. Pietrucha, USAF

F-35. We have no other choice.

—Gen Mark A. Welsh III
Chief of Staff, US Air Force

The Air Force intended eventually to replace much of the post-Vietnam fighter fleet with the F-35A. This stealthy aircraft possessed advanced technology and was no more expensive than the aircraft it was designed to supplant. The Air Force sought to buy 1,763 F-35As—the number required to replace every F-16, A-10, and F-117 in service in 2001. Envisioned after the resounding success of the

F-117 in the Gulf War, the program placed high emphasis on the utility of low radar observability. Designed to provide combat aircraft for the Air Force, Navy, and Marine Corps as well as a host of allies worldwide, the Joint Strike Fighter (JSF) would usher in a revolutionary improvement in American airpower.

Instead, the program has been troubled, characterized by the Pentagon's acquisition chief as "acquisition malpractice," and finds itself well behind schedule and over budget.[1] Rather than an affordable, capable fighter aircraft, operational in large numbers by 2015, the F-35 continues to arrive late and cost more than anticipated.[2] Program delays, unmet performance requirements, and spiraling costs have recently run full tilt into an austere budgetary environment dictated by the Budget Control Act of 2011.[3] More significantly, the program emerged from decades of North Atlantic Treaty Organization (NATO)–centric Cold War experience; furthermore, the Air Force did not envision it either for the Pacific theater or for an adversary with China's air defense capabilities. In this light and despite more than a decade of development invested in the program, budgetary realities should serve as an impetus to reexamine the Air Force's participation in the F-35 program and the future of the fighter force.

We have choices—if we are willing to entertain them. The Army's treatment of the Comanche program offers an example of a bold move in aviation that allowed that service to both modernize and recapitalize. This example shows a potential way forward and should remind Airmen that the Air Force is essential for national security, that no individual aircraft has ever proven indispensable to national security, and that we should be wary of risking national airpower capabilities in our pursuit of a single type of platform. This article presents an alternative future structure designed to preserve the combat air forces (CAF) as an agile and combat-ready multipurpose force, restoring the "high-low" mix that the Air Force essentially abandoned in the 1990s.[4] It offers a future force, called here the "alternate force"—one more broadly capable and affordable than the force that the current path will produce.

The Comanche

At the heart of any JSF discussion lies the belief that the program cannot be cancelled—that any attempt is doomed to failure because of the spread of the program structure in the United States and internationally. Despite any great unwillingness to end the program, doing so is certainly not impossible. Clearly, the Army's experience with the Comanche is instructive.

In 2004 the RAH-66 Comanche had been in development for 22 years, most of that time as a major defense acquisition program. Two prototypes had been built, and the program was healthy. Yet, the Army terminated it due to questionable utility, expected unaffordability, and the presence of a credible alternative. Acting secretary of the Army Les Brownlee, along with Gen Peter Schoomaker, the Army chief of staff, announced the termination, explaining that

> we've examined closely our resourcing plans for aviation and concluded that some of the capabilities those funds would provide are no longer consistent with the changed operational environment. Therefore, General Schoomaker and I have recommended that the Comanche helicopter program be terminated and those resources reallocated to restructuring and revitalizing Army aviation. With the approval of the president and the Secretary of Defense, we began briefing key members of Congress this morning.[5]

Key to the arrangement that terminated the Comanche was repurposing of the programmed money entirely into Army aviation with Joint Staff and congressional consent. Today, the average age of the Army's rotary wing fleet is less than it was in 2004, the AH-64E is poised for the production line, the Army flies remotely piloted vehicles that it did not possess eight years ago, and the rotary transport fleet has been largely recapitalized—even in the Army Guard. In 2004 the Army courageously euthanized the program, and, despite fighting two wars in that time frame, its aviation arm benefited more than one would have expected had the Comanche continued in 2004.[6] The Army managed the termination so astutely that it became a nonevent,

both politically and financially. Redirected into other Army aviation programs, the money largely went to the same contractors in the same districts that would have received the Comanche funding.

Admittedly, the parallels go only so far. The JSF program, which is much larger and currently produces aircraft, involves a number of international partners who have invested in the program at varying levels. However, the rationale for terminating the F-35 programming to allow a redesign of the tactical air (TACAIR) enterprise remains the same: s*ome of the capabilities those funds would provide are no longer consistent with the changed operational environment, and it does not serve either the United States or our partner nations to continue on the current path*.

The Challenges

Even if funding were unlimited, reasons might still exist for terminating the F-35. Specifically, its performance has not met initial requirements, its payload is low, its range is short, and espionage efforts by the People's Republic of China (PRC) may have compromised the aircraft long in advance of its introduction.[7] Our assumptions about the operational environment, made more than a decade ago, do not match current reality with respect to either the threat (worse) or the potential adversaries (more diverse). The mission of the aircraft—to penetrate the most advanced air defenses and drop precision-guided munitions on critical targets of a peer adversary—remains questionable at best, especially if that peer is located in the Indo-Asia-Pacific region, where basing is limited, ranges are long, and potential adversaries have logistical advantages. Despite official pronouncements in support of the F-35 program, the Air Force must remember that its contribution to the nation is fundamentally more about *airpower* than about any particular aircraft. In a resource-constrained environment, commitment to the F-35 must be considered secondary in importance to the joint requirement for TACAIR.

A number of related challenges are associated with the future of the CAF. These problems are not limited to insufficient training resources; rather, they derive from a force-structure shrinkage that has continued for two decades. Financial imperatives that led to a force-structure drawdown in the first place have not gone away, leaving us with a number of critical hurdles to clear before the end of the decade:

1. The Air Force's capability for suppression of enemy air defenses (SEAD) has dwindled in the almost 20 years since retirement of the EF-111A and F-4G. The Air Force has not replaced either the aircraft or, critically, the trained aircrews (unlike the Navy, which has a growing force of EA-18G Growlers). The F-22, F-35, and B-2 are shorn of support capabilities that might enhance their effectiveness and must rely on Navy support.
2. The Air Force possesses no affordable, deployable light attack / armed reconnaissance capability that it can use for irregular warfare. Particularly limiting is the fact that, with the sole exception of the A-10, the service has no capability to operate fighter/attack aircraft from airfields that are too short or rough to handle fast jets. This liability has become a problem of global reach in that the Air Force cannot provide persistent air cover with TACAIR to large portions of the globe, even with tanker support. Without a carrier air wing available to provide short-term coverage, there are few remaining options for CAF support to far-flung forces. Had the Soviets not built large airfields in both Iraq and Afghanistan, we might have faced this problem a decade ago.
3. Basing opportunities are limited, and the vast majority of airfields worldwide remain incapable of supporting legacy or future fighters. The Air Force is neither prepared nor equipped to operate small force packages from very austere bases by using thin logistical pipelines and relying on local support. Distributing single squadrons of easily supportable aircraft over multiple airfields could well deliver a very effective combat capability difficult to counter, particularly in South America, Africa, and the Pacific. In

the Asia-Pacific, the ability to operate from fields 6,000 feet long more than doubles the potential basing and provides opportunities on island bases that cannot accommodate a longer strip.

4. The lack of absorbable cockpits has already drawn the Air Force's inventory of fighter aviators to a point where demand exceeds inventory and is projected to do so well past 2024. Even this date may be a product of the width of the chart and not the result of a plan to make the demand and inventory lines congruent again. Without a rapid infusion of hardware and an increase in the pilot-training pipeline, we will not have the fighter/attack aviators necessary to fill the squadrons and carry out all of the associated tasks, including conducting tests, training pilots, attending professional military education institutions, and filling the rated staff.[8]
5. The Air Force has no practical ability to supply combat aircraft to the air forces of partner nations that cannot afford the F-16—a deficiency that poses particular difficulties in building or rebuilding such air forces, particularly in Asia and Africa. The significant obstacle of procuring light air support aircraft for the Afghan Air Force will be further compounded by the lack of tactics manuals; established tactics, techniques, and procedures; or experienced aircrews to train Afghan pilots.
6. The Air Force has spent significant time and effort over the last 10 years improving both its own ability and that of our NATO partners with respect to close air support (CAS). Given a shrinking pool of ground attack aircraft and the increasing cost to operate them, the service already has insufficient sorties available to support CAS training for joint terminal attack controllers.
7. Regarding homeland defense, no armed platform occupies a niche between Customs and Border Patrol / Coast Guard helicopters and fast jets, posing a mismatch of capabilities any time we need to intercept slow-moving aircraft.

8. The use of costly, aging F-15 and F-16 aircraft for air sovereignty alert (ASA) roles remains an expensive overmatch in capabilities that a modern, less expensive airframe could relieve. This challenge is particularly acute for the Air National Guard, which has faced continuous loss of frontline combat capability as legacy fighters and A-10s are removed from the force.

Commitment to the F-35 makes every one of these issues worse, not only because the aircraft itself will not fill these gaps but also because the required funding effectively deprives the Air Force of the resources demanded to address them. At the heart of the disconnect lie two decades of vision that emphasizes the "all-fifth-generation" fighter force that consists solely of advanced low-observable fighter aircraft.[9] This approach, which concentrates a notional future conflict against a peer adversary, relies heavily on the assumption that a fighter force designed for the most intense conflicts is automatically suitable for any contingency. The pursuit of this vision comes at a very high opportunity cost and invites a great deal of risk, both programmatic and operational.

Evaluating the Need for a Course Change

Pursuit of the full F-35 buy of 1,763 aircraft remains the articulated Air Force strategy—a plan that inflicts significant damage on the existing TACAIR fleet. Putting aside the impending loss of the newly upgraded A-10, the service has been engaging in an unprecedented force-structure drawdown throughout the total force, reducing fighter and attack strength across the board. In 2013, 17 fighter squadrons were grounded for lack of flying hours while the Air Force simultaneously attempted to increase the production rate of the F-35.[10] The drive for large numbers of increasingly expensive F-35s has taken its toll on flying hours and upgrades for both the legacy fleet and the F-22. Hours for fighter aviators are roughly half of what they were in the Gulf War, placing the service's aircrews in the unenviable position of flying less than the Chinese and some European allies.[11]

The "fighter redux" has severely affected the inventory of the Air National Guard and Air Force Reserve, with some fighter and attack units transitioning from the A-10/F-16 to airlift or remotely piloted aircraft and others losing their flying roles entirely.[12] Although it garners short-term savings, this approach alters the role of the Air Reserve Component (ARC) as a strategic reserve and as a second chance to "capture" active duty aviators and maintainers who are leaving the regular Air Force. The ARC should be postured to regain a broad spectrum of aviation capabilities, reequip for the ASA mission, and capitalize on existing locations in proximity to Army and Marine Corps bases and training areas. A recapitalized ARC would include the full range of capabilities from the upgraded fourth-generation fighters through the OA-X and FT-X.[13]

Even a reduced buy of F-35s is problematic because of the high cost of supporting a JSF fleet of any size, given the doubling of unit costs since 2001.[14] The test program for the aircraft remains about one-third complete, leaving the Air Force with quite limited visibility into the platform's actual costs and capabilities. At this writing, the aircraft has only recently employed its first weapons on a test range. In many respects, the F-35 is a difficult aircraft to argue against because its potential remains largely unknown and discussions tend to address what the aircraft "can" do despite the absence of operational test data that actually determines how an aircraft performs. In this context, what the aircraft "should" be able to do or "might" accomplish is treated as established fact despite the lack of either testing or verification.

The Air Force has proven consistent in the pursuit of "fifth generation" fighters as an essential war-fighting requirement. One of the key shortcomings of this presumption is that it is largely "faith-based" in two respects. Firstly, despite the history of the F-35 program, it presumes that the capabilities we expect will be delivered. Secondly, it is based on a belief that radar low observability will remain effective against future air defense threats. Notably, that presumption of stealthiness rests on shaky ground. Although true for the F-117 against Iraq's

Kari system in 1991, stealthiness is unlikely to remain so against an adversary that has two decades to prepare for US stealth fighters, which have much higher infrared, visual, and emitter signatures than did the F-117.[15] Only eight years later, the latter aircraft proved vulnerable to a surface-to-air-missile system that had reached initial operational capability in 1959, and we should not presume that Russian and Chinese radar developers have wasted the intervening decades since the Gulf War.

The argument for the F-35 rests heavily on a threat environment that is far from global. In reality only Russia and China can pose the kind of antiaccess, area denial (A2AD) environment that justifies a massive investment in stealth. Air Force leadership is rightly considering other possible adversary capabilities of the future, but in reality only one operator of a true stealth fighter exists—and that is the US Air Force.[16] That service has remained the sole operator of stealth fighters since the late 1980s. Even a decade from now, the F-22 inventory alone will likely outnumber all other models of foreign fifth-generation fighters combined.

The Air Force has not lost a plane to a hostile aircraft since the Vietnam War. The ground-based air defense threat has advanced significantly in the past two decades, but even though some extremely capable systems are available to potential adversaries, the number of nations able to purchase and operate them is quite limited. Outside China and Russia, no massive threat from an advanced integrated air defense system exists. Moreover, China is a poor example of a threat to cite if someone is trying to justify a short-ranged fighter with limited payload flown from island bases within range of overwhelming missile attack.

These facts make the risk calculation involved with prioritizing stealth over performance, range, and weapons loadout inherently suspect—and the F-35 might well be the first modern fighter to have substantially less performance than its predecessors. Admittedly, the classified status of many of its capabilities prevents full disclosure or public debate regarding this point. However, if we prioritize radar low observability as the primary consideration at the cost of many other at-

tributes necessary in a fighter, the stealth-based paths become stealth-limited paths. This priority may indeed sacrifice readiness, force size, magazine depth (ammunition supply), and other force structure to build and maintain a fleet of aircraft that has limited utility against the majority of TACAIR challenges worldwide, not to mention questionable capability in the A2AD environment of the Western Pacific.

A strategy based on the presumed ability to penetrate advanced air defenses is viable only if it does not prevent the pursuit of other strategies. If the force design is instead a niche capability usable only against certain adversaries under favorable conditions and only if that strategy is pursued, then we have significantly reduced our flexibility and have taken immediate airpower options off the table for the promise of a single new capability that is still more than a decade away. Pursuit of an expensive, modern, cutting-edge force has already cost us in terms of force size, structure, flying hours, and entire areas of expertise that we no longer have. In its quest of the F-22 and now the F-35, the Air Force has traded away its dedicated electronic warfare (EW) fighters, the training programs that supported them, and the EW-savvy crews who manned them, leaving fighter EW the purview of the Navy and Marine Corps. In light of the A-10's impending retirement, CAS is primed to go the same way as EW.

The Alternative

It is easy to criticize a developmental program; in fact, all advanced fighter programs endure robust criticism throughout their developmental lives. The strengths of any particular criticism are irrelevant in the absence of a genuine alternative. Unwillingness to investigate an alternative is not the same as not having one. The alternate force postulated here represents an attempt to illustrate that alternatives not only exist but also may present a more robust defense for the nation and its interests.

The fundamental objective of this force structure construct involves making a trade-off between a TACAIR force of limited numbers and narrow depth for a larger, more broadly useful one designed to tackle all of the Air Force's institutional challenges highlighted above. It does not entirely eliminate the F-35 force, given that we already have more of them than we ever had F-117s, but it effectively terminates the Air Force's participation in the program after fiscal year (FY) 2014. The objectives of this proposal are to

- maintain a limited number of F-35As (those already purchased) as a replacement for the capabilities lost upon retirement of the F-117;
- create a modernized TACAIR fleet consisting of a high-low mix of modernized legacy fighters, light attack aircraft, and multipurpose jet trainer / attack aircraft;
- recover some "sunk cost" of the F-35 program by using advanced systems to modernize older fighters, in effect fielding fifth-generation systems in fourth-generation airframes;
- restore the Air Force's SEAD/EW fighters and crews;
- expand the service's global reach capabilities by providing deployable TACAIR assets that can operate from short, rough airstrips on a logistical shoestring;
- increase the number of absorbable cockpits to the point where the Air Force can augment the inventory of fighter/attack aviators to meet requirements;
- invest in affordable, exportable "light combat aircraft" derived from Air Education and Training Command's T-X program;
- allow the Air Guard to maintain its position as the operational reserve and "relief valve" for experienced fighter/attack aviators while recapitalizing its portion of the CAF; and
- build a TACAIR force that can meet the nation's demands for airpower capabilities even in the face of increasing fuel costs and decreasing budgets.

This force design effectively captures sensors and systems intended for the F-35 and places them into new-build and refitted F-16s and F-15Es. To a great extent, this process is already occurring but without full funding. Such a realignment of future force structure terminates the F-35 in favor of advanced fourth-generation fighters, electing to defer stealth to a later generation. It involves a strong investment in improved fourth-generation aircraft, retains the A-10, and adds hundreds of OA-X, FT-X, and AT-X platforms.

Certain assumptions about the global context are necessary:

1. The most capable potential adversary remains the PRC with Iran and the Democratic People's Republic of Korea (DPRK) posing challenges of their own.
2. No significant change occurs in overseas permanent basing.
3. Air Force funding drops to sequester levels until at least 2024.
4. The PRC maintains its current spending levels and development of both combat aviation and theater ballistic missiles. No fundamental change occurs in governance of the PRC, Islamic Republic of Iran, or DPRK.
5. Continuous fighter presence remains a requirement in US Central Command's and/or US Africa Command's area of responsibility.
6. The existing B-2 and B-52 force is unaltered.
7. Fuel costs continue to increase.[17]

The force design reflects the reality that since Vietnam, the United States has been involved in far more irregular-style conflicts than regular ones—but that giving up a force designed to achieve coercive effects against a peer adversary amounts to an unwarranted risk. It expands upon the high-low mix model that gave us the F-16 and F-15 and builds a high-medium-low mix of TACAIR capabilities.[18]

Force Design

The existing F-22 fleet anchors the "high" end of the TACAIR mix. One oversize F-35 wing, modeled on the 37th Tactical Fighter Wing at Tonopah Test Range, Nevada, will fill the stealth fighter gap left by the F-117. The bulk of the high end will consist of upgraded F-15C, F-15E, and F-16C/D/F aircraft. Many of the upgrades to the fourth-generation fleet will be "harvested" from the JSF program, whereby advanced subsystems from the F-35/F-22 that are ready for fielding will be retrofitted into older fighter designs. In effect, this process is already happening with the F-15E and F-15C to some extent; upgrades of sensors and EW gear should be spread as far as possible throughout the force, including the B-52, not otherwise addressed by this article. The Air Force should purchase a limited number of new aircraft, with 60 F-15Gs and 72 two-seat Block 70 F-16Fs as the baseline. Such purchases are only partially additive. The Block 70 squadrons will be an in-place upgrade of Block 40 squadrons while the F-15G Strike Weasels are added to the force to replace the long-lost F-4G/EF-111A and the critical expertise that came with them.[19] When economically feasible, existing fourth-generation airframes with significant service life remaining should be upgraded to a common standard.

The middle of the TACAIR mix will include the A-10 and combat variants of the T-X—the FT-X and AT-X. The A-10 is facing its own fatigue problems, and the introduction of the OA-X (see below) may allow the Air Force to reduce the A-10 inventory to a number that can credibly support operations on the Korean Peninsula. The service should procure the F-X, envisioned as a T-38 replacement, in three variants. The base airframe—T-X, essentially a modernized T-38 equivalent purchased off the shelf—would constitute the most numerous aircraft (400). The AT-X would take the form of an all-weather, combat-capable, multirole T-X with air-to-ground capability including guns, rockets, and precision-guided munitions. The FT-X would be a fully capable light fighter with a modern air-intercept radar and air-to-air-missile capability comparable to that of the F-16C. The FT-X is intended as a good fit for the Air

National Guard's ASA mission and for use as an aggressor. As such it might replace the Guard's F-16s that have reached the end of their service lives. Both aircraft would also serve as relatively low-cost, dual-role, exportable fighters/trainers (similar to the F-5A/E). The low end of the manned TACAIR spectrum is occupied by the OA-X, Air Combat Command's concept of a modern turboprop light attack aircraft—intended to be additive over and above existing TACAIR numbers except when A-10 units are upgraded directly. The OA-X will assume the burden of irregular warfare and counterterrorism deployments as well as provide ASA alert on demand.[20]

The following offers a quick look at the future CAF without the JSF. In April of last year, members of Headquarters US Air Force / A8 ran a series of cost projections to 2023, using a tradespace analysis tool against the expected funding of the service's air superiority (AS) and global persistent attack (GPA) portfolios.[21] This reality-based assessment used a budget baseline that locked in spending levels expected from the Budget Control Act of 2011, with a real defense budget growth of a paltry 0.3 percent. All F-35 procurement funds from FY 2014 to FY 2023 were redirected within the AS and GPA portfolios, which do not include the MQ-9, B-52, or B-2 aircraft.[22] F-35 research, development, test, and evaluation funds are left intact for systems migration and maintenance of the aircraft already purchased although doing so will never be cost effective. The "sand charts" supporting this plan include sustainment as well as procurement costs. Table 1 reflects the recapitalized fighter/attack (plus B-1) total active inventory (TAI). The last two columns represent an increase in aircraft and cockpits compared to the FY 2013 programmed force extended (PFE) (1,763 F-35s). In some respects, this comparison is unfair. That is, the FY 2013 PFE overshoots the projected budget line (particularly beyond five years) by 10s of billions of dollars even before sequester while this alternate force stays within the sequester limits, with no gimmicks such as expected efficiency improvements or transfers from other portfolios.

Table 1. Alternate fighter/attack aircraft, TAI 2023

Mission Design Series	*Source*	*Regular AF*	*ARC*	*Total*	*Aircraft Delta*	*Cockpit Delta*
F-22	Existing	167	20	187	0	0
F-35	Existing	56	0	56	0	0
F-15C/D	Upgraded[a]	113	116	233	-16	-16
F-15E	Upgraded[b]	218	0	218	0	0
F-15G[c]	New Build[d]	60	0	60	+ 60	+120
F-16C/D	Upgraded[e]	377	361	738	-282	-282
F-16F	New Build[f]	54	18	72	+72	+144
AT-X	New Build	38	18	56	+56	+112
A-10C	Existing	60	90	150	-133	-133
FT-X	New Build	36	58	94	+94	+188
OA-X	New Build	132	108	240	+240	+480
Total Fighter/ Attack		1,311	789	2,100	+91	+613

[a] F-15C/D upgrades included infrared search and track, active electronically scanned array radars (APG-63v3), and the Eagle passive/active warning and survivability system (EPAWSS) upgrade to EW systems.

[b] F-15E upgrades included APG-82 and EPAWSS.

[c] The F-15G (called EF-15E by Boeing) moves the EW systems from the EA-18G to the F-15E+.

[d] New-build aircraft were priced for both purchase and operation and maintenance in accordance with existing examples. F-15Gs were priced at $110 million each, with the F-16F at $70 million. The baseline for the AT-X was the Royal Air Force's Hawk T2, priced at $33 million in adjusted dollars; the FT-X was priced at $35 million. The OA-X was priced at the light attack / armed reconnaissance + 20 percent price at $12 million each.

[e] F-16C/D upgrades, which were largely applied to Block 40/42/50/52 aircraft, consist of the combat avionics programmed extension suite radar / EW upgrade plus a service-life extension.

[f] The F-16F is a Block 70 F-16 modeled after the Israel Defense Force's two-seat, medium-range F-16I Sufa.

Under this projection, the fighter/attack force in 2023 includes 2,100 TAI aircraft, 91 more than the unconstrained PFE, with a concurrent increase in cockpits because every new aircraft is a two-seater.[23] Table 1 does not account for all of the money spent; B-1Bs were reduced (table 2).

Table 2. Alternate bomber aircraft, TAI 2013

Mission Design Series	*Source*	*Regular AF*	*ARC*	*Total*	*Aircraft Delta*	*Cockpit Delta*
B-1B	Existing	20	0	20	-18	-72

By 2023 the complete plan divests 18 B-1Bs, A-10s that have not already been rewinged, and the oldest F-16s in favor of 540 brand-new F-15Gs, F-16Fs, OA-Xs, AT-Xs, and FT-Xs. The Air Force's long-dormant EW fighters return, reducing dependence on the short-range EA-18G. Included in the reallocation are the entire GPA/AS sequester bill and munitions funding to 80 percent of desired war reserve as well as legacy modernization and upgrade. No training or range funds were raided. In the target year, production lines for the light combat aircraft (OA-X, FT-X, and AT-X) remain open, allowing for future purchases after the "bow wave" of expenditures subsides and for development of the long range strike bomber as well as the sixth-generation F-X. An alternative not only exists but also restores long-dormant capabilities and increases the size of the force.

Strategic Risk Management

The viability of the alternate force cannot be divorced from a discussion of force structure, which itself addresses expectations for twenty-first-century airpower. It is reasonable to assume that any conflict which involves the joint force also involves airpower application; consequently, we should give careful thought to what airpower brings to the fight.

Categorizing potential conflicts as "most likely" through "most threatening" and then making the case that the most threatening is of primary importance has become habitual. For the wars in Iraq and Afghanistan, the Air Force followed this approach—one that had the unfortunate effect of placing a heavy burden on legacy jet fighters that used only a fraction of their capabilities in these two wars. The ser-

vice's preferred structure emphasizes the most threatening conflict—often the descriptor for major combat operations with the established military forces of a peer or peer-like state.

The fifth-generation fighter is held up as a hedge against the most threatening scenario, as if we must use this particular aircraft to fight a peer nation. This attitude is typical of a cultural belief that superior technology will lead to American victory and that if we lack the most technologically advanced aircraft, we cannot prevail in war. This hardware-based, strategy-independent assumption fails to consider the possibilities inherent in an approach that encompasses a broad range of airpower capabilities in favor of a very specific niche capability. It is also demonstrably false. Clearly, we had a technological edge in Vietnam, rough parity in Korea, and, arguably, technological inferiority against the Luftwaffe. Yet, the outcomes of those conflicts did not align with the associated aircraft technological advantage.

Under the approach that has prevailed since 2001, any possible conflict other than the most threatening one is a lesser-included case that a stealthy niche force can handle effectively. In effect, the F-35 in particular is presented as having broad applicability that makes it inherently well suited to any form of conflict simply because it can handle the so-called high end, when in reality the data does not support this conclusion. Using Afghanistan as an example, we simply could not have afforded to deploy or employ F-35s in the fashion that we employed F-16s and F-15Es—based on the operation and maintenance (O&M) costs or the fuel consumption, to say nothing of the decremented airframe life.[24] The use of existing fourth-generation aircraft in Iraq and Afghanistan was itself far more costly than a comparable strategy pursued with modern light attack aircraft, making the "lesser included case" path very hard on equipment, logistics, and personnel.[25]

Realistically, irregular conflicts are the most likely to occur, given that this has been the case throughout recorded Western military history.[26] Withdrawal from Iraq and eventual withdrawal from Afghanistan will not presage the end of US involvement in irregular warfare.

America is currently involved in Mali, the Philippines, Afghanistan, Pakistan, Yemen, Jordan, Uganda, and the Horn of Africa; Libya is a fading memory; and Syria remains a possibility. A very fuzzy dividing line also exists—a conflict with China over Taiwan might not prove most threatening to the United States if it remained a conventional battle. Further, a collection of irregular challenges might very well aggregate to provide a most threatening scenario, especially if it involved the collapse of a nuclear state or loss of access to critical resources, territory, or aspects of the global commons.

Making the "lesser-included" argument particularly weak is the assumption that forces constructed for a less intense, broader challenge are inherently inferior. Capabilities such as endurance, ordnance diversity, weapons payload, maneuverability, fuel economy, range, and rough field capability are not considered worthwhile in the face of a binary classification—stealthy / not stealthy. The environment in which a conflict occurs is one of the defining aspects of any war, unquestionably having an impact on the flavor of airpower capabilities that can be brought to bear. If all environments, strategies, and adversaries are lesser-included cases of the "stealth only" option, then large numbers of F-35s would make sense—if they are affordable. However, if that is not true, then we ignore the consequences of being unable to fight proliferating and widespread "most likely" scenarios—or the obvious consequences of treating irregular warfare challenges as a lesser-included case and flying the wings off our fast-jet TACAIR, despite a decade of hard data on the effect of this approach.

The all-fifth-generation force also ignores the wide applicability and deterrence value of having a flexible force that can do more than one thing well, particularly under uncertain conditions in a rapidly developing crisis. There is always value in deploying combat aviation forward if we can accept the risk. Such risk has nothing to do with an aircraft's stealthiness but everything to do with how fast we can deploy airpower into austere conditions, with limited manpower, to conduct combat operations shorn of a fixed, preplanned basing structure. It

would be a much easier decision to deploy OA-Xs or AT-Xs into Ukraine today, even knowing that we risked their loss on the ground, than to accomplish the same task with F-35s. If US Air Forces in Europe currently possessed light combat aircraft (OA-Xs, AT-Xs, and FT-Xs) capable of operating on a logistical shoestring from Ukrainian airfields in poor condition, then the supreme allied commander, Europe, would no doubt sleep more soundly in the face of a Russian irregular threat—which by itself was enough to secure Crimea.

The battle between the most threatening and most likely scenarios leads to an infertile discussion of false trade-offs. The force structure built solely for the most threatening scenario is fundamentally flawed because it relies on a false assumption that the A2AD challenge can be mitigated solely by fifth-generation fighters—in particular, a short-range, long-runway fleet shorn of EW/SEAD support. A force structure that discards some tailored capability for most likely conflicts may be unable to meet the needs of the nation because it relies on a faulty assumption that such a force cannot provide coercive effects against a peer and is therefore of little value.[27] Both of these scenarios ignore basic lessons in the art of war. If we have more employment options from more places, then we have more opportunities to gain leverage against an enemy. If we intentionally minimize our list of possible options, then we allow our adversaries the luxury of building and training a force designed to counter a limited US Air Force.

End State

The broad approach taken in the design of this proposed alternate force results in an increase in the number of fighter/attack squadrons and a significant increase in the number of absorbable cockpits while reducing O&M costs over the PFE.[28] It recognizes that one of the primary drivers of readiness problems is the high rotational burden on the fast-jet fleet and creates a force structure that drives the vast majority of the rotational burden to the lowest-cost aircraft with the lowest O&M and lowest fuel consumption. The approach also backs up the global-

reach tenet with aircraft that can fight from unimproved airstrips. The capability to counter advanced air defenses is retained, but it returns to an approach proven in Vietnam and Operation Desert Storm—specialized aircraft with well-trained crews flying dedicated missions in support of strike aircraft. The current Air Force approach, which has relied entirely on the Navy for jamming support for 16 years, is reversed with a combined Weasel/Jammer capability in the F-15G. The F-35s already purchased are retained, and advanced capabilities will be available to satisfy commitments made to partner nations.

Collateral effects include the shifting of the burden of expensive low-observable fighter programs to the PRC, which cannot effectively use them to project power far beyond the mainland. Although none of the aircraft numbers lost in the fighter reductions of the last decade are regained, the average age of the fleet is slightly reduced. Inclusion of the F-16F adds a medium-range F-16 variant better suited to the Pacific theater. Adding combat aircraft types that are less expensive than the heavier fighters better positions the Air Force to engage effectively with emerging partner air forces, expanding our influence and opening up opportunities for burden sharing. Critically, with most purchases complete in 2023, it frees multiple billions of dollars for development and procurement of the long range strike bomber and/or a next-generation fighter program (F-X) after 2023—a bonus that the PFE never comes close to providing.

Climbing Out of the Readiness Pit

Money gained through termination of the JSF cannot be entirely dedicated to aircraft purchase and upgrade, particularly in a case such as this in which TACAIR TAI actually increases. Some aircraft programs, such as the F-X and OA-X, are designed to "make money" by meeting current demands with an O&M cost low enough that the procurement is eventually paid for in O&M savings. Adding fuel cost increases into the sustainment calculation is difficult and not attempted,

but this construct is more forgiving of that expense than the PFE because of lower fuel consumption.

The effectiveness of TACAIR depends upon giving particular attention to several other areas—readiness, for instance.[29] Having used readiness funds to pay for hardware bills, we must now restore the resulting decrease in readiness with funds dedicated to the TACAIR enterprise. The point of F-35 divestiture includes avoiding a permanent low-readiness state that is an extension of our current condition. The second area is magazine depth. Having temporarily given up the (presumed) capability to bring aircraft into the worst of enemy air defenses, we should not entirely relinquish the capability to hold defended targets at risk. This means additional investment in standoff weapons, including AGM-158 joint air-to-surface standoff and antiradiation missiles. It also entails an increase in improved air-to-air missile inventories and development of weapons that need not trade away performance and capabilities in order to fit into a JSF weapons bay. Finally, restoration of long-dormant anti-surface-warfare weaponry is a critical capability for the Pacific region. In the third element—systems, particularly sensors and communications—the fruits of F-35 development can be practically harvested without continuing the program itself by fielding and deploying the advanced radar, EW gear, and data links from the JSF program onto fighters and conventional bombers.

Conclusion

It is time for a rational discussion of the F-35. Such a dialogue would have to be free from the vacuum of a notional volume of contested airspace and consider the context of the complete CAF enterprise and its application across the globe. The F-35 program has long since passed the point where we can expect it to provide a substantial improvement in a broad war-fighting context over its predecessors. Designed for a European conflict that did not occur and a threat environment less advanced than the present one, the F-35 program offers little improvement over its predecessors and demands vast resources from diminishing funds.

Following the example of the Comanche program, we should consider cancelling the F-35 in favor of a robust, modernized CAF that emphasizes broad capabilities rather than occupying the short-range stealthy niche. Facing a decade of reduced budgetary authority, we must follow a prudent path towards recovery after more than 20 years of continuous combat operations. Doing so will help address a number of collateral issues, including force readiness, global reach, and the inventory of fighter/attack aircrews. Viable alternatives to the F-35 exist if we have the courage to examine them. ✪

Notes

1. Dave Majumdar, "Kendall: Early F-35 Production 'Acquisition Malpractice,'" *DefenseNews*, 6 February 2012, http://www.defensenews.com/article/20120206/DEFREG02/302060003/.

2. Government Accountability Office, *Joint Strike Fighter: DOD Actions Needed to Further Enhance Restructuring and Address Affordability Risks*, GAO-12-437 (Washington, DC: Government Accountability Office, June 2012), http://www.gao.gov/assets/600/591608.pdf.

3. General Accounting Office, *Defense Aircraft Investments: Major Program Commitments Based on Optimistic Budget Projections*, GAO/T-NSIAD-97-103 (Washington, DC: General Accounting Office, 5 March 1997), http://www.gao.gov/assets/110/106735.pdf.

4. The high-low mix was the rationale for the procurement numbers of the F-15 and F-16. The F-15 was the high end, procured in limited numbers, and the F-16 the low end, procured in much larger numbers. The intent was to maintain a broadly capable force under post-Vietnam budget constraints.

5. Acting Secretary of the Army Les Brownlee, "Briefing on the Restructure and Revitalization of Army Aviation," Department of Defense, 23 February 2004, http://www.defense.gov/transcripts/transcript.aspx?transcriptid=2122.

6. Julien Demotes-Mainard, "RAH-66 Comanche—the Self-Inflicted Termination: Exploring the Dynamics of Change in Weapons Procurement," *Defense Acquisition Research Journal* 19, no. 2 (April 2012): 183–208, http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arj62/Demotes-Mainard_ARJ62.pdf.

7. David Alexander, "Theft of F-35 Design Data Is Helping U.S. Adversaries—Pentagon," Reuters, 19 June 2013, http://www.reuters.com/article/2013/06/19/usa-fighter-hacking-idUSL2N0EV0T320130619.

8. "Aircrew Summit 2012, 21 June General Officer Steering Group VTC Brief," v7 (Washington, DC: Headquarters US Air Force / A30, 21 June 2012).

9. The imprecise term *fifth generation* is used generically to apply to modern fighter aircraft that have radar low observability as one of their primary design characteristics. Typically, it includes the F-22, F-35, Russian PAK-FA prototype, and J-20. The F-15, F-16, and F-18 are fourth-generation aircraft.

10. Brian Everstine and Marcus Weisgerber, "Reduced Flying Hours Forces USAF to Ground 17 Combat Air Squadrons," *DefenseNews*, 8 April 2013, http://www.defensenews

.com/article/20130408/DEFREG02/304080011/Reduced-Flying-Hours-Forces-USAF-Ground-17-Combat-Air-Squadrons.

11. Julian E. Barnes, "Warning Sounded on Cuts to Pilot Training: Air Force Responds to Cost Concerns by Reducing Flight Hours to 120 Hours or Less, Fewer Than Those of Allies—and China," *Wall Street Journal*, 19 December 2013, http://online.wsj.com/news/articles/SB10001424052702304773104579268651994849572.

12. The series of fighter force-strength reductions in the last decade has been collectively referred to as the "fighter redux" or "CAF redux." At least two major strength reductions have occurred, bringing the planned total fighter strength below 2,000.

13. The OA-X is Air Combat Command's proposal for a turboprop light attack aircraft similar to the Embraer A-29 Super Tucano or the Beechcraft AT-6B. The FT-X (sometimes the AT-X) is the proposed combat variant of Air Education and Training Command's T-38 replacement—the T-X.

14. Government Accountability Office, *F-35 Joint Strike Fighter*: *Current Outlook Is Improved, but Long-Term Affordability Is a Major Concern* (Washington, DC: Government Accountability Office, March 2013), 5, table 1, http://www.gao.gov/assets/660/652948.pdf.

15. Kari (*Irak* spelled backwards) was the French-built integrated air defense system possessed by the Iraqis prior to Desert Storm. It was only partially reconstituted after the Gulf War. The F-117A had no radar, data link, afterburner, or EW gear; in fact, it did not even use radio after crossing a hostile border.

16. Gen Mike Hostage (speech, Air Force Association, 17 September 2013), http://www.af.mil/Portals/1/documents/af%20events/17SeptAFAGen%20HostageCOMACCSpeech.pdf.

17. The global assumptions are based on current trends. Like any other set of assumptions, a radical event such as a new revolution in Iran or the fall of the regime in the DPRK is an unpredictable occurrence that would alter the list substantially. Internal US trends are perhaps easier to predict—congressional resistance to reducing the B-1 fleet is well established, the 2011 Budget Control Act is law, and fuel costs have been on a steady, upward trend for two decades (arguably four) despite increased worldwide production.

18. When the terms *high*, *medium*, and *low* are used in this context, they refer to their cost and to the intensity of the conflict for which they are optimized. "High-end" aircraft are expensive because of the advanced sensors, weapons, and communications required to conduct missions in contested airspace; "low-end" aircraft are less costly and designed for the parts of a campaign that do not demand operations in hostile airspace.

19. The F-15G is a modified F-15E+. Its EW systems are migrated from the EA-18G Growler, just as the migration of EA-6B systems to the F-111 Aardvark created the EF-111A Raven.

20. The MQ-9, funded from the intelligence, surveillance, and reconnaissance (ISR) portfolio, is left alone since it does not compete for funds directly with other TACAIR.

21. We did not utilize any funding from the ISR portfolio, which covers the MQ-9, or the global strike portfolio, which covers the B-52 and B-2.

22. The tradespace analysis tool includes not only purchase costs but also sustainment costs.

23. The two-seat fighter squadron is more expensive than its single-seat counterpart for obvious reasons. However, in an environment where we have insufficient cockpits to go around, the two-seat fighter squadrons double the number of absorbable cockpits without a concurrent doubling of costs.

24. Estimated O&M costs for the F-35 currently hover around $32,000 per flying hour compared to the F-16's $19,000; the A-10's $18,000; and the F-15E's $28,000 (Air Force Total

Ownership Cost database, FY 2013). By comparison, the Air National Guard's AT-6B test program operated for two years with an hourly flying cost of less than $1,500.

25. For detailed discussions of the potential impact of a light attack aircraft on Air Force operations in Operation Iraqi Freedom and Operation Enduring Freedom, see Michael Pietrucha and J. David Torres-Laboy, "Making the Case for OA-X," *Air Land Sea Bulletin* 2010-1 (January 2010): 15–18; and Michael Pietrucha, "Logistical Fratricide," *Armed Forces Journal* 149, no. 6 (January/February 2012): 14–37.

26. Although the term *guerrilla warfare* derives from the Peninsular War in Spain against the Emperor Napoleon, historical examples of irregular warfare are legion. The Romans, for example, fought far more irregular conflicts than classical major combat operations such as the Punic Wars and had an adaptable military structure that varied by time and place, depending greatly on the nature of their adversaries.

27. A fifth-generation penetrating force is not necessary to produce coercive effects against a large, maritime-dependent nation. Approaches used against Japan in early and mid-World War II are but one example of an effective strategy that can be conducted with airpower and operated at a distance without the need for mass penetration of air defenses.

28. Absorbable cockpits—operational flying positions filled by fighter/attack aircrews—are a measure of the ability to develop and season aircrews.

29. Given this article's focus on TACAIR and the necessity of neglecting the bombers, it must be noted that readiness, system upgrades, and magazine depth are bomber issues as well.

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Religion in Military Society

Reconciling Establishment and Free Exercise

Chaplain, Maj Robert A. Sugg, USAF

The First Amendment of the US Constitution's Bill of Rights declares that "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof." In military society, a unique collision of "rights" between nonestablishment and religious freedom requires an equally unique accommodation of religious practices—that is, *an agreement that allows people, groups, and so forth, to work together*. Many recent news reports indicate that our commanders and senior leadership lack clear guidance for

parsing the complicated ground that separates "church and state." Because both the (non) Establishment and Free Exercise Clauses of our Constitution have equal weight, the government may not become "entangled" in religion or show it hostility.[1] By examining military society through both lenses—(non) establishment and free exercise—commanders can more clearly understand their responsibilities to service members as they carry out the mission. This article addresses establishment and free exercise in light of constitutional case law, offering four simple tools for making better decisions.

The Military Community

Military installations are isolated communities of culturally diverse people whose right of freedom of religion has been limited for the sake of the mission. Service members are American citizens protected by the Constitution and are on loan from 50 sovereign states while they continue to advocate for their legal and social preferences through the voting booth. In civilian communities, social and cultural standards found in laws and policies differ from town to town and state to state; they are established from the bottom up. For example, a Christian community will tend toward Christian standards; a Jewish community, Jewish standards; a progressive community, progressive standards; or a family community, family standards. In local politics, the religious and the secular all have equal access to the voting booth. In contrast, on military installations, all religious institutions have been fenced out, and political interaction between religious communities and elected officials does not exist. On fenced military communities, commanders are expected to maintain the constitutional balance of (non) establishment and free exercise. To do so, they have both a judge advocate general (JAG) and a chaplain to advise them.

To make things more difficult, military installations are a public-private hybrid consisting of government mission and family life. For instance, an aircraft hangar may be used for maintenance in the morning and a school-sponsored event in the afternoon. Funding options

are equally confusing. Taxpayer dollars are limited to direct mission requirements that include mandatory funding for chaplain salaries, chapel buildings, and religious worship services while chapel tithes and offerings from the collection plate are also used to fund unit-focused programs such as barbecues in the dormitories and work centers. Commanders must understand that simply scrubbing the religious from military installations or restricting it to the interfaith chapel is not what the writers of our Constitution intended. Consequently, the provision of the right of free exercise through religious accommodation is a direct mission requirement.[2] From the assembly of the Continental Army onward, citizen Soldiers, Sailors, Airmen, and Marines are primarily religious people with religious families, holding religious ethics and living religious lives on government property.

Establishment and Free Exercise: A Condition of Respect

The US Constitution ensures that religion in the public square does not end on military installations. Some people believe that neutrality toward church and state equates to the absence of the religious on government property and in government operations. By using constitutional case law, we will see that this position is emphatically false. The court of *Lemon v. Kurtzman* observes that "judicial caveats against (government entanglement in religion) must recognize that the line of separation, far from being a 'wall,' is a blurred, indistinct, and variable barrier depending on all the circumstances of a particular relationship."[3] Additionally, *Lynch v. Donnelly* notes that

> no significant segment of our society, and no institution within it, can exist in a vacuum or in total or absolute isolation from all the other parts, much less from government. "It has never been thought either possible or desirable to enforce a regime of total separation." . . . Nor does the Constitution require complete separation of church and state; it affirmatively mandates accommodation, not merely tolerance, of all religions, and forbids hostility toward any. . . . Anything less would require the "callous indifference" we have said was never intended by the Establishment Clause. . . . Indeed, we have observed, such hostility would bring us into "war

> with our national tradition as embodied in the First Amendment's guaranty of the free exercise of religion."[4]

Thomas Jefferson used the term *wall of separation*, writing to religious people in 1802 for the express purpose of allaying the churches' fears that the government would attempt to control their religion. Jefferson stated, "Believing with you that religion is a matter which lies solely between Man & his God . . . I contemplate with sovereign reverence that act of the whole American people which declared that their legislature should 'make no law respecting an establishment of religion, or prohibiting the free exercise thereof,' thus building a wall of separation between Church & State."[5] Jefferson intended the exact opposite of humanists' use of the phrase today in their attempt to keep religion out of government. In fact,

> in 1962, [Supreme Court] Justice Potter Stewart complained that jurisprudence was not "aided by the uncritical invocation of metaphors like the 'wall of separation,' a phrase nowhere to be found in the Constitution." Addressing the issue in 1985, Chief Justice William H. Rehnquist lamented that "unfortunately the Establishment Clause has been expressly freighted with Jefferson's misleading metaphor for nearly 40 years."[6]

Far from banning religion in the public square, the (non) Establishment and Free Exercise Clauses were drafted in a way that allowed people of all faiths—and none—to equally live out their lives on common ground. The founding fathers intended to require American citizens to maintain a condition of mutual respect while they shared the same space. A much better metaphor than "separation of church and state" is "a level playing field for all political issues to be heard equally."[7] Americans cannot choose one of two paths to arrive at common ground. The nonreligious cannot walk the road of (non) establishment and arrive at free exercise. In the same way, the religious cannot walk the road of free exercise and arrive at (non) establishment. Common ground is a level playing field upon which both parties must agree to live as coequals. Respectfully sharing space on a level playing field involves four constitutional principles.

Hostility toward Religion Is Not Neutrality

On military installations, some of what passes as neutrality toward religion is actually hostility—the primary concern of the religious majority on military installations today. We have already examined the Supreme Court statement that the Constitution "affirmatively mandates accommodation, not merely tolerance, of all religions, and forbids hostility toward any." Additionally the court of *Rubin v. City of Lancaster* cautions that "the danger that such efforts to secure religious 'neutrality' may produce 'a brooding and pervasive devotion to the secular and a passive, or even active, hostility to the religious.'"[8] A recent survey of Air Force chaplains included the statement "I believe Airmen are free to practice their religion except where military necessity dictates otherwise."[9] The chaplains were asked to agree or disagree on a scale of one to four. A subsequent memorandum from the chief of chaplains notes that 82 percent of chaplains believe that Airmen can practice their religion freely.[10] The corollary holds that, of approximately 500 active duty chaplains, 90 believe that Airmen cannot practice their religion freely. An additional concern is that the survey did not measure the ethos—the atmosphere of free exercise. In other words, is there a pervasive institutional bias against the religious that causes religious people or military leadership to "walk on eggshells"? To walk on eggshells in the matter of religion is not evidence of neutrality but of hostility.

God Is Presupposed on Government Property

Lynch v. Donnelly affirms that "there is an unbroken history of official acknowledgment by all three branches of government of the role of religion in American life from at least 1789" and that "we are a religious people whose institutions presuppose a Supreme Being."[11] The courts imply that because our government as a whole presupposes a supreme being, each department of our government must also presuppose a supreme being. The Department of Defense (DOD) is not free to banish God from the public square. In principle, the writers of the

Constitution clearly expressed that God is not confined to the chapel but walks the parade ground, the maintenance bay, and the flight line.

For example, with regard to paintings, sculpture, and other displays, *Lynch v. Donnelly* affirms the propriety of nonproselytizing religious art in public places:

> Art galleries supported by public revenues display religious paintings of the 15th and 16th centuries, predominantly inspired by one religious faith. The National Gallery in Washington, maintained with Government support, for example, has long exhibited masterpieces with religious messages, notably the Last Supper, and paintings depicting the Birth of Christ, the Crucifixion, and the Resurrection, among many others with explicit Christian themes and messages. The very chamber in which oral arguments on this case were heard is decorated with a notable and permanent—not seasonal—symbol of religion.[12]

The walls of many DOD headquarters buildings, dining facilities, and other common areas are adorned with art and sculpture of many kinds. Art and sculpture with religious overtones are not, on their face, subject to removal or limitation. Regarding symbols of religion, *Lynch v. Donnelly* affirms the constitutionality of the National Day of Prayer, paid federal holidays of religious origin, the phrase "one nation under God" in our pledge of allegiance, the phrase "in God we trust" on our currency, and Christmas crèches owned and displayed by the government for secular purposes.[13] Religion is welcomed to pervade the public square, and it is the commander's constitutional duty to ensure that religion is welcome on military installations.[14]

God May Be Invoked and Welcomed during Government Business

Whether from a military chaplain or a volunteer from a local house of worship, prayer at government events is constitutional.[15] *Marsh v. Chambers* affirms the propriety of prayers during government assemblies.[16] These prayers are, and have always been, religious in nature and not simply ceremonial.

Regarding religious practitioners with whom he disagreed, founding father Samuel Adams said that "he was no bigot, and could hear a prayer from a gentleman of piety and virtue, who was at the same time a friend to his country."[17] According to *Lynch v. Donnelly*, "It is clear that neither the 17 draftsmen of the Constitution who were Members of the First Congress, nor the Congress of 1789, saw any establishment problem in the employment of congressional Chaplains to offer daily prayers in the Congress, a practice that has continued for nearly two centuries. It would be difficult to identify a more striking example of the accommodation of religious belief intended by the Framers."[18] Religious invocations at government events are an acknowledgement that people of faith have an allegiance to "the Supreme Judge of the world," who is higher than any law of humankind.[19] If we use the level playing field analogy, then providing a respectful presence for a religious prayer is no different than doing so for another nation's national anthem.[20] One does not have to agree with all members of a diverse population to be respectful.

The Threat of Litigation Cannot Be Grounds for Marginalizing the Religious

Lynch v. Donnelly affirms that "a litigant cannot, by the very act of commencing a lawsuit, however, create the appearance of divisiveness and then exploit it as evidence of entanglement."[21] Ethical leaders must be concerned about good order and discipline.[22] However, the principle of good order and discipline cannot be used as a carte blanche to bulldoze all traces of the constitutional rights of a vulnerable class of citizens. Balance is critical! On the one hand, we must not violate the Establishment Clause by offending the nonreligious with the appearance of a government-endorsed religion. On the other hand, we must not violate the Free Exercise Clause by demonstrating hostility to religion through the systematic purging of everything with a religious overtone. Angry agitators, religious or atheist, must not be the determining factor for leadership decisions. The courts have provided much guidance for walking this tightrope and have supplied the

groundwork for ethical decision making in a military context. In partnership, the JAG and Chaplain Corps must revisit the US Constitution and case law to move forward *collaboratively*, crafting policies and using explicit language that describes a level playing field on which respectful people may agree to disagree. In all cases, DOD policies must clearly define and prohibit hostility toward religion.

Four Tools for Parsing Establishment and Free Exercise

In the past few years, installation commanders in a number of reported incidents have apparently been advised to focus exclusively on the Establishment Clause in an attempt to secure religious neutrality. Unfortunately, in some cases their intended defensive action for (non) establishment was rightfully perceived as offensive to free exercise. In the same way we use 3-D movie glasses, commanders must intentionally look through both lenses of (non) establishment and free exercise to see the constitutional picture clearly. The following four simple tools for discerning the line between the Establishment and Free Exercise Clauses use court decisions as a guide. These court decisions are few, readily available, and easily read.

Historic Practice

Marsh v. Chambers tells us that the constitutionality of government-paid chaplaincy and legislative-type prayer is not found in any "test" but in historic practice.[23] Responding to a suit in which a complainant objected to a government-paid chaplain for the Nebraska Legislature, the Supreme Court held that

> the Nebraska Legislature's chaplaincy practice does not violate the Establishment Clause. . . . The practice of opening sessions of Congress with prayer has continued without interruption for almost 200 years, ever since the First Congress drafted the First Amendment, and a similar practice has been followed for more than a century in Nebraska and many other states. . . . Standing alone, historical patterns, cannot justify contemporary violations of constitutional guarantees, but there is far more here

> than simply historical patterns. In this context, historical evidence sheds light not only on what the draftsmen intended the Establishment Clause to mean, but also on how they thought that Clause applied to the practice authorized by the First Congress—their actions reveal their intent.[24]

The court of *Marsh v. Chambers* appeals to the contemporary practices of those who actually penned the law. The writers of the Constitution did not forbid what they themselves permitted.[25] When confronted with questions about the scope and practice of chaplains and public prayer, one should employ the first tool to determine if historic practice exists.

Context

Lynch v. Donnelly upheld the constitutionality of a private association to erect a Christmas display on public property on the basis of context:

> The Court has recognized that "total separation is not possible in an absolute sense. Some relationship between government and religious organizations is inevitable." . . . The narrow question is whether there is a secular purpose for Pawtucket's display of the creche. . . . Here, whatever benefit there is to one faith or religion or to all religions, is indirect, remote, and incidental; display of the creche is no more an advancement or endorsement of religion than the Congressional and Executive recognition of the origins of the Holiday itself as "Christ's Mass," or the exhibition of literally hundreds of religious paintings in governmentally supported museums.[26]

Another case, *County of Allegheny v. American Civil Liberties Union*, concerns the constitutionality of a crèche placed on the "Grand Staircase" of a county courthouse. The crèche was part of a larger holiday display dispersed throughout the grounds. The court found that the *location* of the crèche was unconstitutional, based on the context:

> The creche sits on the Grand Staircase, the "main" and "most beautiful part" of the building that is the seat of county government. . . . No viewer could reasonably think that it occupies this location without the support and approval of the government. Thus, by permitting the "display of the creche in this particular physical setting," . . . the county sends an unmistakable message that it supports and promotes the Christian praise to God that is the creche's religious message.[27]

This case tells us that discerning the line between "a secular purpose" and promoting a religion involves not the religious presence or practice but the context in which it is found. A frontline supervisor, for example, may be religious and live his or her religious life at work. A supervisor, however, must not live this religious life in such a way that it would give *reasonable* people the appearance of favoring the religious over the nonreligious or others of differing faiths. It is a difficult line, but simply "playing it safe" and sanitizing the area violates the supervisor's constitutional rights. When confronted with an object or practice with religious overtones, one should use the second tool to observe the context.

The Lemon Test

> *In the absence of precisely stated constitutional prohibitions, we must draw lines with reference to the three main evils against which the Establishment Clause was intended to afford protection: "sponsorship, financial support, and active involvement of the sovereign in religious activity."*
>
> *—Lemon v. Kurtzman*

This three-point litmus test, also known as the "*Lemon* test," determines the dividing line between free exercise and establishment.[28] A more recent case, *Lynch v. Donnelly* (1984), offers additional clarification for application: "In the line-drawing process, we have often found it useful to inquire whether the challenged law or conduct has a secular purpose, whether its principal or primary effect is to advance or inhibit religion, and whether it creates an excessive entanglement of government with religion."[29] The descriptions and examples below are brief. Commanders and senior leadership would benefit greatly by reading the court decision for themselves.

The first point of the *Lemon* test evaluates for the legitimacy of a secular purpose. The question at hand is, Does the mere presence of a religious symbol or practice on government property imply government *sponsorship* for a specific religion or religion over nonreligion?

The *Lynch v. Donnelly* court addresses the often misused metaphor of a "wall" of separation between church and state, observing that the "metaphor itself is not a wholly accurate description of the practical aspects of the relationship that in fact exists between church and state" and that "total separation is not possible in an absolute sense."[30] Religious symbols and celebrations may be found on government property for secular reasons and are not, in themselves, evidence of government sponsorship.

The second point of the *Lemon* test evaluates whether or not a symbol or practice's primary effect advances or inhibits religion. This is assessed through context. Regarding the City of Pawtucket's practice of including a crèche in its larger holiday display, the court found that, as mentioned above, "whatever benefit there is to one faith or religion or to all religions, is indirect, remote, and incidental; display of the crèche is no more an advancement or endorsement of religion than the Congressional and Executive recognition of the origins of the Holiday itself as 'Christ's Mass,' or the exhibition of literally hundreds of religious paintings in governmentally supported museums." Again the issue is context. Whether we are looking at a holiday scene or viewing a picture on a wall, the government's question should be, In the eyes of a reasonable person, does this act or display give the appearance of government advancement or inhibition of a particular religion or religion over nonreligion?

The third point of the *Lemon* test evaluates unnecessary government entanglement. In other words, if we go down this road, will the government have to spend significant resources in policing and monitoring to ensure that secular-religious lines are not crossed or that no significant amount of manpower and funding is expended? The court found that

> entanglement is a question of kind and degree. . . . There is no evidence of contact with church authorities concerning the content or design of the exhibit prior to or since Pawtucket's purchase of the creche. No expenditures for maintenance of the creche have been necessary; and since the city owns the creche, now valued at $200, the tangible material it contrib-

> utes is *de minimis*. In many respects, the display requires far less ongoing, day-to-day interaction between church and state than religious paintings in public galleries.[31]

Allowing the religious time and space in the public square is not government entanglement with religion. Even the government purchase and maintenance of religious items for secular purposes do not constitute entanglement with religion.

Let us examine three recent examples of DOD intervention in religious issues and apply the *Lemon* test to each one. Again, the three questions are as follows: (1) Does the mere existence of a religious symbol or practice on government property imply government sponsorship for a specific religion or religion over nonreligion? (2) Does the context of a religious symbol or practice on government property advance or inhibit a specific religion or religion over nonreligion? (3) Will the religious symbol or practice be an entanglement to the government due to significant amounts of monitoring, funding, or manpower?

The first example comes from a June 2013 news story reporting that "an Air Force video saluting first sergeants—produced by an Air Force Chaplain—was removed by order of the Pentagon because it mentions the word 'God,' even though it was never intended as required viewing."[32] The video was produced in conjunction with a number of first sergeants and intended as a humorous parody of a Super Bowl commercial. In directing the removal of the video, "the Chief of the Air Force News Service Division stated incorrectly, . . . 'Proliferation of religion is not allowed in the Air Force or military. How would an Agnostic, Atheist or Muslim serving in the military take this video?'"[33] Applying the *Lemon* test, we ask, Does the video have a secular purpose? Yes. Is the video's primary effect to advance or inhibit religion? No. Does the video foster excessive government entanglement? No. If all the facts are as stated, then the Pentagon's actions appear to violate the Constitution's First Amendment by favoring nonreligion over religion and evidence of hostility toward religion. Additionally, the Penta-

gon's position was eventually reversed. No evidence of malice exists—only the lack of clear, objective written guidance from our most senior policy makers.

The second example is from a news report that the Air Force's Rapid Capabilities Office (RCO) removed the Latin name *Dei* (God) from its logo after objections by the Military Association of Atheists and Freethinkers: the "RCO patch logo previously included the motto 'Opus Dei Cum Pecunia Alienum Efficemus' (Doing God's Work with Other People's Money), an inside joke among RCO members. Caucus members say it was changed to 'Miraculi Cum Pecunia Alienum Efficemus' (Doing Miracles with Other People's Money)."[34] Applying the *Lemon* test, we ask, Does the logo have a secular purpose? Yes. Is the logo's primary effect to advance or inhibit religion? No. Does the logo foster excessive government entanglement? No. If all the facts are as stated, then the Pentagon's actions appear to violate the Constitution's First Amendment by favoring nonreligion over religion and evidence of hostility toward religion. Additionally, atheist groups have petitioned our courts for years to remove the phrase "in God we trust" from our monetary notes and coins.[35] The courts have repeatedly and emphatically rejected their argument: "In dismissing the suit, U.S. District Judge Harold Baer, Jr., wrote that 'the Supreme Court has repeatedly assumed the motto's secular purpose and effect' and that federal appeals courts 'have found no constitutional violation in the motto's inclusion on currency.' He added that while the plaintiffs might feel offended, they suffered no 'substantial burden.'"[36]

The third example involves the removal of religious artwork from a dining facility. A painting entitled *Blessed Are the Peacemakers*, a 9-11 memorial gift to the installation, had long been displayed on a dining facility's wall. An atheist organization petitioned for and was granted the removal. A news report also relates that the wing commander said that "he will be ordering another inspection to rid his base of anything else like what had been hanging in the dining hall."[37] Applying the *Lemon* test, we ask, Does the artwork have a secular purpose? Yes. Is

the artwork's primary effect to advance or inhibit religion? No. Does the artwork foster excessive government entanglement? No. If all the facts are as stated, then the commander's actions appear to violate the Constitution's First Amendment by favoring nonreligion over religion and evidence of hostility toward religion. Another report indicated that the commander maintained that "the painting violated military regulations governing the free exercise of religion" and that "the . . . [regulation] states that we will remain officially neutral regarding religious beliefs—neither officially endorsing nor disapproving any faith belief or absence of belief."[38] The commander cited the regulation correctly, but his interpretation was faulty. He had no "test" available to determine the ground between neutrality and hostility.

The three-part *Lemon* test is a simple tool for items with religious content. Each point of this test involves some subjectivity. Thus, it is critical that *both* the JAG, arguably representing (non) establishment, and the chaplain, representing free exercise, have equal input into a commander's decision process. We must use the 3-D glasses! When faced with an object or practice with religious overtones, ethical leaders should utilize a respectful, methodical, and equitable process to find the balanced position. The third tool in the box is the *Lemon* test.

Bottom-Up Consensus

Commanders at all levels are unelected stewards who have limited legal authority to constrain constitutional rights to accomplish their missions. Primary drivers for poor command decisions include haste, misinformation, or personal bias. Regarding removal of the artwork from the dining facility, for instance, a report noted that the non-DOD complainant "gave the Air Force an hour to take action" and that the subsequent removal took place in 56 minutes.[39] This was a top-down decision. When dealing with social issues, religious or otherwise, the community must be consulted from the bottom up and must take time to contact the JAG, chaplain, senior leadership, and the installation's private organizations. The Air Force's integrated delivery system

should have an opportunity to broker a peaceful settlement among organizations. Any *appearance* of the imposition of a commander's personal preference for cultural and religious standards that exceed those necessary for the mission may be construed as social engineering and must be seen as a catastrophic moral violation of professional ethics. Commanders must never use their positions to impose any religious or cultural standard, whether Christian, Jewish, Muslim, Wiccan, atheist, conservative, or progressive. In social issues within a closed community, "good order and discipline" is not a top-down affair.[40] Ethical commanders allow members of their community to speak to one another, advocate for their positions, and, most of all, be respected. Then and only then do ethical commanders make command decisions. The fourth tool is bottom-up consensus.

Legal "Tests" or Historic Practice?

In 2007 the *Air Force Law Review* published an article entitled "Religion in the Military: Navigating the Channel between the Religion Clauses."[41] For seven years, it has remained a significant "think piece" for making Air Force policy; indeed, the article is listed as a reference in the current Air Force JAG publication *The Military Commander and the Law*.[42] The legal assessments and conclusions of the authors—Maj David E. Fitzkee, USA, retired, and Capt Linell A. Letendre, USAF—regarding the Chaplain Corps's scope and practice and the provision of public prayer are horribly wrong.

Referring to *Marsh v. Chambers* (1983), Fitzkee and Letendre correctly remark that "the court has upheld an opening prayer for a legislative session relying on the historical exception but has denied a moment of silence in public schools using the *Lemon* analysis."[43] The authors clearly delineate between historically sanctioned prayers at a historically rooted, adult-dominant event from prayers at a child-dominant public school event. Then, inexplicably, they choose to argue the validity of historical prayer in military settings (*Marsh* language) from the same category as prayer at school graduations and

football games (*Lemon* language).[44] In short, they switch from historical precedent to "tests." Fitzkee and Letendre complete their conversion with the following statement: "When facing the challenging question of prayer at an official military function, one must navigate through the array of legal opinions deliberately and with full understanding of the particular context in which the prayer will be given."[45] Absolutely not! In a legislative or military setting, prayer is found constitutional through historic practice; context is irrelevant. Worse, they end their analysis by declaring,

> Unlike a school environment, where students can vote on whether or not to have a message and decide what the content of the message should be, the military does not put to a vote whether to have an "opening message" at a change-of-command or a dining-in. Instead, a commander typically decides that there will be an invocation and routinely asks a chaplain to perform this duty. This overt government involvement, both in the decision making and delivery of an invocation, results in clear government speech, thereby compelling Establishment Clause analysis.[46]

Do Fitzkee and Letendre really believe that the framers of our Constitution held that military commanders who request chaplain invocations at change-of-command ceremonies are guilty of violating the Establishment Clause? The Supreme Court does not agree.[47] To examine the constitutionality of the Chaplain Corps's scope and practice, one must consult the best court ruling—*Marsh v. Chambers* (historic practice).

A Word about Ceremonial Deism

At the time of this writing, in *Town of Greece v. Galloway*, the Supreme Court is deliberating the consequences of a relatively new artificial construct called "ceremonial deism."[48] At issue is "whether the court of appeals erred in holding that a legislative prayer practice violates the Establishment Clause."[49] In other words, is a prayer at a government event really a prayer? To understand the debate, one must grasp the origins of ceremonial deism. The original term comes from an unpublished 1962 lecture at Brown University given by Yale Law

School dean Eugene Rostow in which he proposed that "certain types of religious speech, which he called 'ceremonial deism,' were 'so conventional and uncontroversial as to be constitutional.'"[50] Reflecting on this reference in 1984, Justice William Brennan offered his dissenting opinion in *Lynch v. Donnelly*:

> While I remain uncertain about these questions, I would suggest that such practices as the designation of "In God We Trust" as our national motto, or the references to God contained in the Pledge of Allegiance to the flag can best be understood, in Dean Rostow's apt phrase, as a form of "ceremonial deism," protected from Establishment Clause scrutiny chiefly because they have lost through rote repetition any significant religious content.[51]

In his ponderings of uncertainty, Justice Brennan implies that he personally finds that these religious references have no "significant religious content." The original intent of the authors is lost on him.

In 1989 Justice Brennan's thoughts became a legal player through the majority opinion of *County of Allegheny v. American Civil Liberties Union*:

> The concurrence, in contrast, harmonized the result in *Marsh* with the endorsement principle in a rigorous way, explaining that legislative prayer (like the invocation that commences each session of this Court) is a form of acknowledgment of religion that "serve[s], in the only wa[y] reasonably possible in our culture, the legitimate secular purposes of solemnizing public occasions, expressing confidence in the future, and encouraging the recognition of what is worthy of appreciation in society." . . . The function and history of this form of ceremonial deism suggest that "those practices are not understood as conveying government approval of particular religious beliefs."[52]

With regard to legislative prayer, the justices chose not to refute *Marsh*'s historic-practice argument and so added a new proposition on top of it. The *County of Allegheny* court stated that it has "harmonized" *Marsh* with "this form of ceremonial deism" so that legislative prayer should be viewed as a method of "solemnizing public occasions, expressing confidence in the future, and encouraging the recognition of what is worthy of appreciation in society" (see above). But by artifi-

cially separating the act of prayer from its religious content, the Supreme Court has created additional confusion. The decision of *Town of Greece v. Galloway* may be intended as clarification. Will the Supreme Court uphold the original intent of the framers of the Constitution, meaning that public prayer is an example of free exercise, or will it overturn *Marsh* and pursue ceremonial deism in the name of (non) establishment? It is doubtful that the Supreme Court would overturn *Marsh*. However, it is almost certain that it will also continue to "harmonize" the founders' religious intent with antireligious ceremonial deism.

In the foreseeable future, regardless of *Town of Greece v. Galloway*, the American people should expect that the painting *The Baptism of Pocahontas* will remain on the Capitol Rotunda wall and that the National Gallery of Art will continue to display *Rabbi* and fund the maintenance of the *The Sacrament of the Last Supper*.[53] The Senate chaplain will continue his or her duties, ensuring that "all sessions of the Senate have been opened with prayer, strongly affirming the Senate's faith in God as Sovereign Lord of our Nation."[54] Each of these long-standing government practices provides examples of how our commanders should manage religion on their installations.

Conclusion

In the twenty-first century, US military society has entered a new era of cultural change, and we have been given few tools to make the transition. Indeed, we have not even framed the questions. Military leaders have sworn to support and defend the Constitution of the United States, and service members depend upon those in authority to act honorably. Leaders must be concerned about good order and discipline but must never use this as an easy excuse to sanitize religion. We can neither endorse religion nor show it hostility. We should use the four tools for discerning the line between establishment and free exercise. The only way to determine constitutionality in matters of religion is to look through both the 3-D lenses of (non) establishment and free

exercise. In practice, the JAG office represents the commander and has given the appearance of advocating for the institution over the rights of the individual. The scale has tipped in favor of (non) establishment. The scale must now be balanced to include the weight of free exercise. It is most critical that the Chaplain Corps "get smart" on constitutional law. Our JAGs and Chaplain Corps should transparently work together to restore First Amendment balance throughout the DOD. Constitutional free exercise must always remain a positive principle to be celebrated and not simply the dark side of (non) establishment. ✪

Notes

1. Lemon v. Kurtzman, Supreme Court, 403 US 602 (1971); and Rubin v. City of Lancaster, United States Court of Appeals, Ninth Circuit, no. 11–56318, 8 November 2012.
2. Joint Publication 1-05, *Religious Affairs in Joint Operations*, 20 November 2013, viii, http://www.dtic.mil/doctrine/new_pubs/jp1_05.pdf.
3. *Lemon*.
4. Lynch v. Donnelly, Supreme Court, 465 US 668 (1984) / Committee for Public Education and Religious Liberty v. Nyquist, 413 US 756, 760 (1973). See, for example, Zorach v. Clauson, 343 US 306, 314, 315 (1952); Illinois ex rel. McCollum v. Board of Education, 333 US 203, 211 (1948); *Lynch/Zorach*, 314; *Lynch/McCollum*, 211–12; and *Lynch*.
5. "Jefferson's Letter to the Danbury Baptists: The Final Letter, As Sent," 1 January 1802, Library of Congress, http://loc.gov/loc/lcib/9806/danpre.html.
6. James Hutson, "'A Wall of Separation': FBI Helps Restore Jefferson's Obliterated Draft," Library of Congress, accessed 14 March 2014, http://www.loc.gov/loc/lcib/9806/danbury.html.
7. "Rev. John C. Rankin to Discuss 'Honest Politics,'" Community College of Rhode Island, 24 February 2011, http://www.ccri.edu/marketing/news_events/2011/february/rankin.html.
8. *Rubin*.
9. Headquarters US Air Force / Office of the Chief of Chaplains, Survey Questions, 28 August 2013.
10. Office of the Chief of Chaplains to ALMAJCOM-FOA-DRU / wing chaplains, memorandum, 25 September 2013.
11. *Lynch*.
12. Ibid.
13. Ibid.
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Chaplain, Maj Robert A. Sugg, USAF

Chaplain Sugg (MDiv, Seminary of the East; BS, Charter Oak State College; MS, Tarleton State University) is the staff chaplain for the USAF Expeditionary Center, Joint Base McGuire-Dix-Lakehurst, New Jersey. As course director and academic instructor, he developed and delivered cutting-edge education and training for Chaplain Corps personnel deploying to high-risk environments. As staff chaplain, he provides pastoral care and counseling to a staff of 400 and a student population of 24,000 while advising Expeditionary Center leaders on matters of religious accommodation, ethics, and morale. Chaplain Sugg assists the joint base's Chaplain Corps to ensure free exercise of religion and to provide pastoral care, counseling, worship, rites, and sacraments to joint base personnel and their families. He is a credentialed pastoral counselor with over 4,000 hours of client counseling, 870 hours of clinical supervision, and 8 units of Clinical Pastoral Counseling. Chaplain Sugg has been the senior pastor for 12 congregations, including military communities in South Korea, Kuwait, and Saudi Arabia.

Cataclysm: General Hap Arnold and the Defeat of Japan by Herman S. Wolk. University of North Texas Press (http://untpress.unt.edu/), 1155 Union Circle no. 311336, Denton, Texas 76203-5017, 2012, 352 pages, $24.95 (hardcover), ISBN 1-574412-81-7; $19.95 (softcover), ISBN 1-574414-73-9.

In *Cataclysm* Herman S. Wolk argues that Gen Hap Arnold counted upon the B-29 campaign as a means to an end (i.e., the continued future of the Army Air Forces [AAF] and the effort to make it an independent service). The author does not indicate that Arnold himself ever openly promoted strategic bombing as the decisive tool for victory and, thus, a proof of concept. However, he does convincingly present the case—through Arnold's actions—that privately he thought that the strategy of air bombardment and the AAF's participation in creating a sea blockade could bring about the war's end without a costly ground invasion of the Japanese home islands.

The book includes an introduction and seven chapters, the introduction and last chapter acting as bookends. In the introduction, Wolk identifies his goal of uniquely examining the interconnected roles that General Arnold played in the development and deployment of the B-29 and the establishment of Twentieth Air Force as well as the strategies and policies of an air campaign whose design could have ultimately led to the defeat of Japan. He also notes that his study draws on a source little used in the examination of that defeat—the wartime accounts of the Japanese themselves, a source that gives particular credence to his thesis. In the final chapter, "Who Was Hap Arnold?," Wolk addresses the impact of Arnold's determination to bring about an independent Air Force, including his futurist vision of a radically different aviation technology. The central chapters cover the general's career from his early days in aviation to the period immediately following the Second World War. Each chapter develops the unfolding story of policy, strategy, and command that emerged from the debate about whether an air cam-

paign and naval blockade could bring about a Japanese surrender or whether a ground invasion was necessary. Of course, the successful use of the atomic bombs rendered that debate moot.

Within the central chapters, Wolk details Arnold's relationship with President Franklin Roosevelt and his cabinet members, such as Harry Hopkins; his struggle to ready the B-29 for operational deployment in spite of numerous technological problems; and his successful establishment of Twentieth Air Force as an independent command under his direct leadership. The general's willingness to replace the Twentieth's operational commanders when he felt they were not producing the desired results demonstrates his emphasis on the success of the Pacific air campaign. In Gen Curtis LeMay, Arnold found a commander who would lead the XI Bomber Command and produce those results. LeMay's shift from high-altitude precision bombing to low-altitude area incendiary bombing brought about the destruction of Japan's dispersed urban industries and, Wolk maintains, the collapse of its will to continue prosecuting the war. Though not *the* factor that brought about surrender, Wolk convincingly argues that strategic bombing and the AAF's involvement in the sea mine campaign were key elements in setting the stage for Japan's capitulation when confronted with the destructiveness of the atomic bombs.

I found this book repetitive at times, particularly in its first half, but I also found it an enlightening and enjoyable read. As the author observes in the introduction, this study is not an operational history but an examination of policy, strategy, and command. As such, Wolk's narrative of Arnold impressed me. The general's impact on the air campaign in the Pacific theater and the interconnected drive to maintain operational independence for Twentieth Air Force laid the foundation for the creation of an independent postwar Air Force. *Cataclysm* is a welcome addition to literature on the air campaign in the Pacific, the debate over the effectiveness of a strategic air campaign, and Arnold's vision of how—through the contributions of a wartime campaign—the AAF could transform itself into a coequal service.

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War over the Trenches: Air Power and the Western Front Campaigns, 1916–1918 by E. R. Hooton. Ian Allan Publishing (http://www.ianallanpublishing.com), 12 Ethel Street, Birmingham B2 4BG, UK, 2010, 352 pages, $18.79 (hardcover), ISBN 9780711034150.

The impetus for the rise of American airpower does not begin with Billy Mitchell in the interwar years but within the Anglo-German competition for aerial dominance during World War I. That is just one of the themes that emerges from E. R. Hooton's superbly researched volume *War over the Trenches: Air Power and the Western Front Campaigns, 1916–1918*. The author provides the reader with what may be the first detailed study of the contributions of airpower during the war.

Most airpower studies tend to gloss over World War I, focusing on airpower theory and its development afterward but rarely addressing the actual use of airpower in that conflict. One sees the same tendency in the Air Force's professional military education for officers, resulting in a fairly superficial view of airpower's contributions. Hooton seeks to fill this gap in historical research by giving the reader comprehensive descriptions (both quantitative and qualitative) of the employment of airpower on the Western Front from 1916 to 1918.

The author chronicles the evolution of airpower at this time by dividing the book into separate periods by chapter. In each, analysis first addresses the campaign from the perspective of the ground commander before discussing the contributions of airpower. Intertwined with the historical accounts is considerable detail about tactical- and operational-level air operations, which Hooton uses to explore the beginnings of many of today's airpower roles.

For example, he examines the Allied successful campaign in the Somme from June to November 1916, describing the static form of warfare that killed hundreds of thousands of troops in the process of taking small stretches of ground (p. 91). Airpower relieved much of the

stalemate. During this battle, British airmen under Marshal of the Royal Air Force Hugh Trenchard flew more than 21,400 combat sorties (p. 124). Regarding the Somme, Hooton documents one of the first realizations of the split between tactical- and operational-level air operations: "Trenchard believed this outer air battle both on the main battle front and on its periphery was the key to success in the Tactical Level inner air battle to keep the enemy air force at arm's length" (p. 97). Additionally, he notes the emphasis on strategic bombing (a concept applied emphatically in World War II): "Sustained bombing was the other plank of Trenchard's strategy, the aim being to inflict material damage, to divert enemy resources and to dilute enemy air power on the main battlefront" (p. 113). Between 1916 and 1918, aircraft dropped 25,000–30,000 tons of bombs on the Western Front (p. 77). Compared to the tonnage dropped during the next war, these totals may seem insignificant, but in the context of World War I, they are noteworthy, given the fact that bombing began early in the war with pilots releasing hand-grenade-size explosives directly from the cockpit.

In *War over the Trenches,* the author offers the reader unparalleled information about air operations on the Western Front in World War I. That said, the reader should buckle in and brace for 65 detailed tables and an impressive list of sources in multiple languages. Clearly, Hooton addresses a fundamental gap in airpower history, having produced a body of knowledge that should be an asset to both the researcher and recreational reader. For today's airmen, this book makes for a very interesting read—indeed, a must-read for any instructor who needs the context to talk intelligently about the contributions of airpower during World War I, much less the origins of many airpower roles that modern air forces perform today. Even though the author's extensive research may at times overwhelm the reader with detail, the concepts related in the book will appeal to any airpower professional or enthusiast.

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Internal Security Services in Liberalizing States: Transitions, Turmoil, and (In)Security by Joseph L. Derdzinski. Ashgate Publishing (http://www.ashgate.com), Wey Court East, Union Road, Farnham, Surrey GU9 7PT, UK, 2009, 180 pages, $114.95 (hardcover), ISBN 978-0-7546-7504-4.

In a short, scholarly monograph that serves as a cross-cultural case study examining the security regimes and stalled democratic transition between Morocco and Indonesia, Prof. Joseph L. Derdzinski of the US Air Force Academy clearly demonstrates the work done in these two nations (and, more broadly and less deeply, the rest of the developed world). He also addresses the effort that remains, seeking to fill the niche of examining the critical role of internal security systems (like the police, intelligence services, and related institutions) in the process of democratization throughout the world. The study is very technical (but accessible to readers familiar with political science and international relations), meticulously researched, and filled with explanatory footnotes and charts that organize information efficiently.

From the outset, it is clear that *Internal Security Services* assumes the realist perspective, from its approving quotation of Machiavelli that "security for man is impossible unless it be conjoined with power" (p. 3) to its rigorous, detailed examination of the challenges of both Morocco and Indonesia in increased liberalization, given the state of elite power and interests within both countries and the presence of continued terrorist and separatist violence. The introduction examines the state of the literature and identifies the case study's goal of filling a gap by considering the neglected role of internal security forces as a measure of the success of liberalization within a nation. The author then explains his principal approaches and findings. He accounts for the strong focus on two countries by seeking to build a broader conceptual framework for ways that third-party nations and international organizations can effectively encourage liberalization and engender greater respect for personal freedom and human rights as well as leave behind an authoritarian past. Derdzinski offers a detailed assessment of the history and role

of internal security forces in Morocco (a nominally constitutional Islamic monarchy) and Indonesia (a nominally secular Islamic democracy with a lengthy history of brutal and corrupt dictatorship) before closing with findings and recommendations for reforming the security sectors of liberalizing nations. These suggestions emphasize enforcement and justice rather than merely legal structure. They also encourage rooting out corruption (through providing a living wage for workers and discouraging moonlighting for police and intelligence officials) and developing a robust civil culture that demands accountability and answerability from security forces for any human-rights violations they commit after the transition from authoritarian rule.

Among the many strengths of this book are its awareness of relevant research, including interviews, periodicals, monographs, and reports about human rights conditions from nongovernmental organizations and the US State Department. The study's concentration on two nations and its broader comparative analysis at the end benefit from both its depth and breadth of approach. The scholarly, technical language may prove a barrier to a general audience, but readers equipped with an understanding of the professional language of political science and international relations will find the book's insights immensely rewarding if they are sympathetic to the realist perspective. The author makes numerous practical recommendations for nations of the West regarding how they might best help other countries in the difficult process of liberalizing and moving beyond "partly free" status. Specifically, he suggests that they honestly wrestle with tensions that arise from the need for truth and accountability from internal security forces and the need for some secrecy and freedom of action on their part to conduct necessary tasks. The latter include preserving the security of the state from threats like secession movements as well as domestic and international terrorism—threats by no means unique to the developing world.

The author's research and findings are of the highest quality and apply to a range of nations far beyond the two cases examined. Derdzinski refers to his own experience in Bosnia as an officer with the North

Atlantic Treaty Organization, and this reviewer has relevant expertise that confirms the validity of the findings of this research to the nations of Chile and Thailand as well. Clearly, the author's findings and conclusions apply to many nations with stalled democratization in the face of separatist violence, concerns about terrorism, and a lack of commitment to broad-based societal and institutional change that threatens their privileged status and could bring them to justice for past wrongs. The United States has engaged and may yet engage in the process of nation building in several countries across the Muslim regions of the world (e.g., Iraq, Afghanistan, Libya, and Syria). Consequently, the subject of this monograph has considerable relevance to individuals interested and involved in present American military policy as it relates to the Muslim world, especially in light of the democratization of states after the Arab Spring. Well written and exceedingly applicable to our times, *Internal Security Services* offers a scholarly approach to an often-neglected and vitally important aspect of ensuring that postauthoritarian regimes can successfully conform to civilized and democratic norms of behavior. It deserves a wide audience and a fair hearing for its policy recommendations.

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Freedom's Forge: How American Business Produced Victory in World War II by Arthur Herman. Random House (http://www.randomhouse.com/), 1745 Broadway, New York, New York 10019, 2012, 346 pages, $28.00 (hardcover), ISBN 978-1-4000-6964-4.

Admittedly, the B-29 fuselage on the cover of *Freedom's Forge: How American Business Produced Victory in World War II* by Arthur Herman caught my eye and led me to scan the first few pages. Thank goodness for slick-looking dust jackets because Herman's book is a page-turner. It is 1939, and Hitler attacks Poland. Soon Britain stands alone. Far away the United States struggles out of the Great Depression. President Franklin D. Roosevelt (FDR) knows that the ocean cannot forever

protect America from the chaos engulfing Europe. He decides to prepare via US industrial might, but industry is not all that mighty in the late 1930s. What to do?

The "greatest generation" story of how US industry ramped up to build liberty ships in record time and crank out bombers by the hundreds is probably familiar, at least vaguely, to most people. Herman's book goes deep to tell the story of the men behind that production, shining light on names like Henry Kaiser and others perhaps unfamiliar to Airmen. Wisely, FDR summons and corrals these men, relying on their peacetime métier to make that wartime industrial miracle happen.

And what men they are—the best in their fields: Bill Knudsen and mass production, the aforementioned Henry Kaiser and big construction, and "Cast-Iron Charlie" Sorensen and Ford Auto, to name just a few. Herman explains where these individuals came from and how their American industrial backgrounds—successes and failures—position them to foment brilliant recommendations and tough decisions to get US industry in high gear. It will not be easy; the state of many US industries is dismal. Further, these individuals are human; some simply do not like each other. We witness big egos at play. They clash, on occasion, even to the point of physical violence.

Airpower advocates will find that the book has a certain appeal, simply from the standpoint of how all the airframes such as B-24s and P-51s begin coming out of car factories. Yes, car factories. But be advised that the book focuses on masters of industry as opposed to masters of the air. If one is researching the machinations of, say, Hap Arnold or Jimmy Doolittle in this tale, he or she should note that Herman covers them only slightly. General Arnold's classic book *Global Mission* is the best go-to source for how *A Few Great Captains* played their roles, as described by DeWitt S. Copp in *his* classic work of the same name.

However, one military person does stand out—and rightfully so—albeit briefly. In May 1940 as German tanks traverse France like so many bumper cars, an epochal scene occurs at the White House. Gen

George C. Marshall asks FDR if he can have the famous three minutes to give, as Herman appropriately describes it, "the speech of his life" (p. 10). Once FDR grants Marshall the time, the president then receives a stern remonstration to rearm America, and quickly. This is classic "cometh the hour, cometh the man" stuff. Herman captures, perhaps unknowingly, the real pivotal moment that saves America. There is, however, a slight variance with Herman's timing of the event and that of other sources: the author indicates that an urgent telegram from Churchill to FDR, after the fall of France, triggers that meeting; FDR's historical calendar, however, shows Churchill's telegram arriving a day later. This discrepancy, however, is not a detractor. Those, but only a few, lie elsewhere.

For instance, when it comes to the production numbers of tanks, planes, machine guns, and so forth, the book contains a good deal of data—actually, an *incredible* amount of data. The before-and-after numbers are staggering, and a reader may become desensitized to them. Nevertheless, the numbers do work to convey the magnitude of production; they do add to the story's coherence. Also, the creative modular construction of the liberty ships is fascinating, but to a nonengineer, the processes described might be difficult to follow. Readers may need to google terms such as *retractor conveyor* (p. 186) to get a visual idea of this assembly line. A diagram or graphic would have been helpful here. And Herman does not narrate the industrial experts' histories on one timeline. He covers the prominent characters in significant detail, appropriately dedicating a chapter to each. However, readers will have to backtrack to establish who is meeting whom—and when—as their careers intertwine.

Finally, a warning is in order for anyone enamored of FDR and his New Deal. Herman takes aim in an almost iconoclastic way. True enough, prescient FDR eventually brings America's industrial know-it-all men together. But as they undertake the business of industrial conversion for war, they constantly clash with skeptical administration New Dealers who persistently watch, hover, and probe to ensure that big business does not profit too much—never mind that America's sur-

vival is at stake. Bill Knudsen, in particular, constantly brushes away inimical bureaucrats as a struggling farmer swats away gnats while racing to finish a harvest ahead of an approaching hailstorm.

Interestingly, one aspect of this saga is not mentioned but inferred. As automakers, dam builders, and clothing manufacturers struggle to accelerate production, they do so without computers, PowerPoint, or any other type of modern cyber convenience. One can almost hear the typewriters clattering away in the background and the screaming into 1930s telephones as monumental problems of factory locations, contracts, material shortages, and worker strikes are sorted out. Perhaps this is instructive for us today: could the United States meet this type of challenge without our modern communications, let alone make it happen *at all*?

No plot spoiler here. History shows that US production capability eventually wins the wars in Europe and the Pacific. Still, Herman writes of these men, their challenges, the obstacles, and crushing deadlines in a way that makes the heart pound.

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Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation
by William F. Trimble. Naval Institute Press (http://www.usni.org/navalinstitutepress), 291 Wood Road, Annapolis, Maryland 21402, 2010, 304 pages, $37.95 (hardcover), ISBN 9781591148791.

Hero of the air? Dr. William Trimble's exhaustive biography of aviation pioneer Glenn Curtiss certainly drives the reader to that conclusion. The author offers a thorough study of the aviation pioneer's flying life and his predominant role in the early days of naval aviation. The book is more than the subtitle implies, pointing out that although the Wright brothers were the first to fly, "Curtiss was instrumental in [flight's] development or innovation phase" (p. xiv). As is his practice, Trimble has extensively researched the personal papers of the key

players of aviation, official naval documents, period newspaper accounts, and a myriad of secondary sources.

Accompanying the central theme of Curtiss's overall contribution to aviation are several secondary themes, one of which examines the strong partnership between Curtiss and the US Navy: "Early on, advocates of aviation in the Navy, chief among them Capt. Washington I. Chambers, recognized that the Navy had special requirements for airplanes and their operations, and for aviators and their training" (p. xv). Trimble affirms the well-supported position that Chambers utilized Curtiss's unique ability to "design and develop" aircraft along with his experience in experimentation to "meet the Navy's special requirements" (p. xv).

This partnership leads to another secondary theme—that the Navy didn't resist aviation; rather, "the Navy's leadership and bureaucracy adjusted well to aviation and other changes" (p. xv). To support this point, the book discusses at length the Navy's efforts to embrace new technologies, such as long-distance flying, and highlights its desire to conduct the first flight across the Atlantic Ocean, which did in fact occur in 1919. Clearly, the Curtiss-Navy partnership helped add aviation to the Navy's capabilities.

Professor Trimble tells Curtiss's story chronologically, beginning with his family's move to western New York and ending with the death of the aviation pioneer at the age of 52. He portrays Curtiss as an innovative and enterprising man who used a "cut and try" approach rather than a scientific or engineering-based method with everything from bicycles to motorcycles to airplanes. His detailed, almost weekly, accounting effectively relates Curtiss's activities and numerous aviation firsts. Understanding the importance of the often-hostile relationship between Curtiss and the Wright brothers, Trimble includes the substory of their legal battles over aviation patents and their desire to protect their respective business interests.

The author does not place his subject on a throne as the infallible creator of naval aircraft. Rather, he notes that Curtiss's "slack and inef-

ficient 'shop' organization had been a source of frustration" to the Navy (p. 189). Throughout, Trimble clearly articulates the negative effect of the cut-and-try approach to aircraft design and Curtiss's lack of an engineering background. Readers learn that after the Navy's successful flight across the Atlantic Ocean in the Curtiss-built NC-4, Curtiss had the "good sense to walk away" from an aviation industry that had outgrown his aeronautical abilities (p. 214). Rather than offer a whitewashed, glossy characterization, this inclusion of the man's shortfalls helps the reader assess his effect on aviation.

As with Trimble's book *Admiral William A. Moffett: Architect of Naval Aviation* (Smithsonian Institution Press, 1994), readers who seek insight into the subject's family life will be disappointed. This is no "there I was" study. Instead, *Hero of the Air* gives us an in-depth look at a key aviation pioneer who had an immense impact on aviation in general and naval aviation in particular. Although Glenn Curtiss was not the first to fly, one cannot deny his critical role in the early days of flight. William Trimble's biography is a must-read for both aviation and naval historians.

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The Royal Air Force in Texas: Training British Pilots in Terrell during World War II by Tom Killebrew. University of North Texas Press (http://www.unt.edu/untpress), 1155 Union Circle no. 311336, Denton, Texas 76203-5017, 2009, 208 pages, $26.95 (hardcover), ISBN 978-1-57441-169-0; $19.95 (softcover), ISBN 978-1-57441-272-7.

In his contribution to the University of North Texas Press's War and the Southwest series, author Tom Killebrew examines a little-known element of the vital and historic "special relationship" forged between the American and British governments during the Second World War. The monograph opens with varied accounts of British wartime hardships and endurance in the face of the widening Nazi political and military advance across Europe. As continental nations fell to Nazi expansion,

Hermann Göring's Luftwaffe set its sights on Britain during the summer and fall of 1940, subjecting it to the oft-accounted aerial punishment of the Battle of Britain. Although "the Few" of the Royal Air Force (RAF) valiantly halted the German onslaught, flight schools in the British Isles and across the Commonwealth states could not effectively meet the operational demand for pilots in the expanding war. Airspace congestion, notoriously dismal and uncertain isle weather, and austere operational conditions at overseas training locations prevented them from doing so. Given the ever-present risk of raiding German fighter and bomber formations further compounding the problem of fielding effective daily flight training, the RAF had to find a better solution.

The end of 1940 found British military forces girding themselves to repulse the later-abandoned German invasion across the English Channel. Filling the ranks of the RAF took on even more importance during this time since the subject of flight training beyond the confines of the British Empire had become a topic of conversation during the lend-lease discussions held in Washington, DC, in early 1941. Maneuvering around the fading façade of American neutrality, flag-officer luminaries of the US Army Air Forces, US Navy, and a British delegation agreed to host a four-element training scheme for British student pilots in the United States. One of these elements involved the pairing of British training detachments with existing civilian flying-training facilities throughout the American South and Southwest. Thus, the British Flying Training Schools (BFTS) scheme was born, with No. 1 BFTS taking root at the Kaufman County Airport in Terrell, Texas, in 1941.

The Royal Air Force in Texas relates the four-year history of the No. 1 BFTS in meticulous detail, thoroughly describing the school's early days, including site selection, the administrative trials of standing up the new unit, and the logistical challenges of keeping aircraft and pilots flying over foreign soil. The thorough treatment of these subtle contextual details—one of Killebrew's demonstrated strengths as a researcher and author—greatly enhances the story. His inclusion of considerable primary source material enlivens the tale with such comic details as cold-weather flying gear mistakenly provided to initial classes for use

during the Texas summer, together with illustrative descriptions of the British cadets' most frequented establishments in downtown Terrell. However, most fascinating are the author's accounts of the nuances of the odd yet very functional command relationship between the on-site British officer cadre and host civilian flight school. Although many individuals in senior RAF circles feared that the cultural and professional divide would make for complications in the execution of vital military training, Killebrew notes the mutual respect and resolve demonstrated by both American and Briton alike. This understanding between aviators became the hallmark of an extremely successful effort to produce top-quality aviators for Britain's first line of defense.

Although the book offers impressive details about the administrative and structural attributes of the No. 1 BFTS, it gives less consideration to the crucial account of the British aviation cadets as individuals. Throughout, Killebrew effectively captures student issues with individual aircraft types, the comedy and tragedy of in-flight incidents, and favored off-duty activities, among other details. For all its strengths, however, *The Royal Air Force in Texas* would have benefited greatly from deeper exploration of the motivations, fears, and personal struggles of the British cadets as they left their loved ones to confront wartime hardships during their rigorous six-month training regimen. That said, Killebrew does not ignore the personal dimension entirely, in that his story includes accounts of cadet interactions at social functions and hospitality visits with Terrell residents, descriptions of the distinctive characters among the 26 total classes of the No. 1 BFTS, and praise of selected graduates' wartime heroics. Further, one must acknowledge that recounting the individual hopes and fears of British cadets was likely hindered by the sheer passage of time, incomplete record keeping by the US government during wartime, and contested claims that structural fires consumed school records in the postwar years.

Despite its isolated shortcomings, *The Royal Air Force in Texas* is an impressive and effective account of the interaction of two seemingly opposite worlds brought together in the name of liberty and embody-

ing the greatest tradition of Anglo-American cooperation. By documenting and recounting the events of over 70 years past, Killebrew vividly reminds us of the "special relationship" that still endures, perhaps best captured on the No. 1 BFTS patch: *Mare nos dividit, Set Caela Conjungunt* (what the sea divides, the skies unite).

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Liberty's Fallen Generals: Leadership and Sacrifice in the American War of Independence by Steven E. Siry. Potomac Books (http://www.potomacbooksinc.com/), 22841 Quicksilver Drive, Dulles, Virginia 20166, 2012, 184 pages, $15.96 (hardcover), ISBN 978-1-59797-792-0.

Liberty's Fallen Generals is a detailed historical look at a group of generals who gave their lives to the cause of independence during the American Revolutionary War, a conflict laced with stories of the Founding Fathers and other larger-than-life figures. Author Steven Siry paints a picture of these lesser-known martyrs to the cause and shines the light of history onto the significance of their actions and sacrifice. He outlines his purpose in the preface as "a study of generalship, valor, and death" (p. xi) of the 10 men who died in combat from 1775 to 1781, introducing the reader to each general's military background, personal information, and the action that led to his death. Such a method may seem rather mundane, but Siry uses it artfully and masterfully.

His study represents an excellent resource for any serious student of America's foundations. This diverse, interesting group of generals spans the demographic spectrum of the colonies at the time. By presenting each man in chronological order of his death, Siry effectively clarifies the timeline of events—much more so than would a condensation of their lives into an overall history. The index makes the book a useful desk reference while the notes and bibliography lend it authority as they elaborate on general points. Clear citations and the aca-

demic source material add to the study's appeal as an important part of any library on the Revolutionary War.

Unfortunately, one finds a significant amount of overlap in the background material for Siry's 10 subjects. Initially, he points out that many of these men were present at the same actions or came from similar origins. Given the set structure used for each of the chapters, reoccurring events appear in multiple sections, increasing the probability of confusing the subjects with each other or, worse, of becoming boring. This practice creates irregularity in the book and abruptness between chapters, making it seem more like a collection of essays on a single subject than an organized study. Nevertheless, *Liberty's Fallen Generals* is a well-done examination of an overlooked but fascinating topic.

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The Insurgents: David Petraeus and the Plot to Change the American Way of War by Fred Kaplan. Simon & Schuster (http://www.simonandschuster.com/), 1230 Avenue of the Americas, New York, New York 10020, 2013, 432 pages, $28.00 (hardcover), ISBN 978-1-4516-4263-6; 2014, 432 pages, $16.00 (trade paperback), ISBN 978-1-4516-4265-0.

Fred Kaplan's *The Insurgents*, a *New York Times* best seller, is the most comprehensive account yet of the reframing of American military strategy in Iraq and Afghanistan as counterinsurgency (COIN) campaigns. A masterful storyteller, Pulitzer prize–winning journalist, columnist for *Slate*, and an MIT PhD, the author is well versed in security studies, and in this case he has created a real page-turner. His previous publications include *The Wizards of Armageddon* (Simon & Schuster, 1983), a classic study of nuclear strategists and their theories.

Kaplan argues that David Petraeus and his fellow insurgents succeeded in changing the Army from an institution focused on fighting Cold War–style air-land battles against conventionally equipped uni-

formed opponents to a more flexible force prepared to conduct wars among the people. The larger context is an Army that turned its back on COIN after Vietnam even though the United States engaged almost continuously throughout the 1990s in such places as northern and southern Iraq, Somalia, Haiti, Bosnia, and Kosovo. These engagements were euphemistically called military operations other than war (MOOTW). The prevailing ethos among top Army generals about such conflicts was that "real men don't do MOOTW," attributed to Gen John Shalikashvili, USA, chairman of the Joint Chiefs of Staff (p. 45).

Because of this prevailing ethos against MOOTW and Secretary of Defense Donald Rumsfeld's policy of transitioning responsibility as quickly as possible to the Iraqis, the revival of COIN thinking required a revolutionary movement or insurgency within the Army. Its center of gravity was a network of Soldier-scholars who, as captains and majors, had taught in either the Department of Social Sciences ("Sosh") or History at West Point. These officers kept alive the lessons of Vietnam and revolutionary warfare through their teachings. More importantly, they also developed bonds among themselves that would later enable them to become a critical mass for changing how the Army fought in Iraq and Afghanistan.

Authors David Cloud and Greg Jaffe advanced a similar thesis in *The Fourth Star: Four Generals and the Epic Struggle for the Future of the United States Army* (Three Rivers Press, 2009), which featured Gen Peter Chiarelli and Gen David Petraeus as Sosh alums spearheading a more enlightened strategy in Iraq, compared to that of Gen John Abizaid and Gen George Casey, who supported Secretary's Rumsfeld's policy of rapid transition. Kaplan's work picks up on this Sosh connection and expands it to tell a completer story about how the United States changed its strategy in Iraq and Afghanistan.

Kaplan's heroes are the network of warrior-scholars who taught at West Point. They include John Nagl, Petraeus's protégé, who earned a PhD at Oxford where he wrote *Learning to Eat Soup with a Knife: Counterinsurgency Lessons from Malaysia and Vietnam* (University of Chicago

Press, 2005). His book was widely distributed by the Department of Defense and Army officials as things turned south in Iraq. Nagl would coauthor Field Manual (FM) 3-24, *Counterinsurgency*, 2006, the new COIN manual. H. R. McMaster, another Sosh alum, studied for his PhD at the University of North Carolina where he wrote *Dereliction of Duty: Lyndon Johnson, Robert McNamara, the Joint Chiefs of Staff, and the Lies That Led to Vietnam* (HarperCollins, 1997). The chairman of the Joint Chiefs of Staff, Gen Hugh Shelton, ordered all of the service chiefs to read it. Several other Sosh alums with PhDs, including some with equally impressive publications to their credit, constituted the movement's core.

Kaplan's study shows that the Army's program of sending promising captains to graduate school to earn PhDs followed by instructor duty at West Point has proven a wise investment. The Army seems to have broken the code on how to get these young officers back to qualifying operational assignments so that at least some—Petraeus is a case in point—progress to the top ranks and affect the course of events for the better.

Kaplan portrays Petraeus as a master at bureaucratic politics, which he learned from previous mentors. He adeptly exploited and expanded the Sosh network to include like-minded civilian academics, think tanks, and policy wonks as he orchestrated development of the new COIN doctrine. They became known as "COINdinistas." Kaplan does a remarkable job of tracing their influence as they build momentum for a new campaign strategy. As a result, efforts converge from different quarters supporting the appointment of Petraeus to implement it.

A strength of this work is Kaplan's ability to relate the richness and complexity of the historical case without overwhelming the reader. To his credit, he shows that COIN strategies were already being implemented in Iraq before the troop surge of 2007 and the publication of FM 3-24. McMaster's pacification of Tal Afar demonstrated this fact and set in motion a chain of events that would lead to the Anbar Awakening. The difference when Petraeus took charge, however, was a *campaign* establishing unity of effort on the COIN strategy throughout Iraq.

Kaplan's identification of the central paradox of COIN campaigns is an important insight. The illegitimacy of the ruling elite causes insurgencies to exist in the first place. Yet, successful COIN campaigns require a legitimate host whose interests coincide with those of the intervener. Although the COIN approach produced stunning results in parts of Iraq and Afghanistan, the goal of stable, legitimate governments has not been achieved. The lesson is that COIN will probably not prove effective when the insurgents are out of reach, the government is too corrupt, or the intervening nation is unwilling to commit resources to a lengthy campaign.

Students of the art of war develop themselves by analyzing cases of challenge and response as well as the relationship between military theory and practice. Kaplan has a writer's knack for crafting these themes in a gripping way. Change begins with ideas and is therefore an intellectual endeavor. As Jimmy Doolittle said, "If we should have to fight, we should be prepared to do so from the neck up instead of from the neck down." *The Insurgents* is an excellent case study about the relationship among theory, doctrine, and institutional change.

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