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AIR FORCE MAGAZINE

FEATURES

About the cover: The Thunderbirds perform the Line Break Loop. See "Thunderbirds," p. 44. USAF photo by SrA. Jason Couillard.

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1501 Lee Highway
Arlington, VA 22209-1198
Tel: (703) 247-5800
Telefax: (703) 247-5855

afmag@afa.org

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By Adam J. Hebert, Editor in Chief

Deterring the Dragon in the South China Sea

President Obama at the end of May made a trip to communist Vietnam, a place many Americans still think of with a mixture of anger, frustration, and sadness. The long Vietnam War had a profound impact on American society and the US military, and it took decades for relations between the two nations to thaw. Obama's visit was not unprecedented, but it was rare: He is just the third sitting US President to visit the nation in the past four decades.

From the national security perspective, the highest profile outcome of Obama's Vietnam trip was his announcement the US would end a long-standing ban on selling military hardware to Hanoi.

"The United States is fully lifting the ban on the sale of military equipment to Vietnam that has been in place for some 50 years," Obama said May 23 at a joint press conference with Vietnamese President Tran Dai Quang. "Sales will need to still meet strict requirements, including those related to human rights," Obama noted. "But this change will ensure that Vietnam has access to the equipment it needs to defend itself and removes a lingering vestige of the Cold War."

Arms sales to Vietnam may be a trifle, but the message is paramount.

Why does the United States care if economically tiny, distant, communist, and authoritarian Vietnam has the ability to defend itself? Obama said the only thing he really could, politically—that this decision is about a general improvement in relations between the two nations in a region of growing military and economic importance.

The decision to lift the arms-sale ban is "not based on China or any other considerations," Obama made a point of saying. It is "based on our desire to complete what has been a lengthy process of moving towards normalization with Vietnam."

In reality, it is about China. Of course it is about China. Vietnam is but one in a long line of Southeast Asian nations enduring a severely troubled relationship with their neighborhood's intimidator. In but one example of the tensions, China recently moved a huge oil rig into disputed South China Sea waters midway between Hainan island and central Vietnam, despite repeated objections from Hanoi.

"With respect to the South China Sea—although the United States doesn't support any particular claim—we are supportive of the notion that these issues should be resolved peacefully, diplomatically, in accordance with international rules and norms, and not based on who's the bigger party and who can throw their weight around a little bit more," Obama said. That is a good principle, but China is clearly not interested in international rules and norms when it comes to the South China Sea.

China claims the vast majority of the sea as its territorial waters, a claim that is contested by most of the other nations ringing the vital waterway. China's claims overlap with similar but much smaller territorial-waters claims put forth by Brunei, Malaysia, and the Philippines.

More troubling, China has overtly and incrementally taken highly questionable steps to bolster its control and sovereignty claims in the region. It has reinforced and expanded a series of reefs and shoals (creating artificial islands) in and around the Spratleys in the center of the South China Sea, claiming the land and in some cases even building military-grade air fields on these remote outposts. Fiery Cross Reef, in the center of the sea, has been greatly expanded by China and now boasts a 10,000-foot runway—on land also claimed by Vietnam, the Philippines, Taiwan, and previously Malaysia.

These moves have been met with broad international condemnation, to no effect.

"The United States will continue to fly, sail, and operate wherever international law allows, and we will support the right of all countries to do the same," Obama said, but US efforts to date have preserved freedom of navigation only. The US has been unable to prevent further Chinese military expansion into the sea.

China's intransigence has "exposed the hollowness of America's naval predominance. American might has not deterred the construction spree; and it is hard to see how, short of full-blown war, the new islands will ever be either dismantled or snatched from Chinese control," read a June 4 column in *The Economist.*

It gets worse. In mid-May, a pair of Chinese fighter jets buzzed a US Navy EP-3 spyplane on routine patrol in the South China Sea's international airspace. "Having insisted its island building in the Spratley archipelago was for purely civilian purposes, the Chinese Defense Ministry used [the] row last month ... to argue for 'the total correctness and utter necessity of China's construction of defensive facilities on the relevant islands,'" *The Economist* noted.

It is not enough for the US to have the world's most powerful military. For the nation to defend freedom, commerce, and international norms, nations such as China that are used to getting their way by intimidating their neighbors need to believe the US and its partners will defend their common interests. Thus far, China has been undeterred.

During the Cold War, the US needed to convince the Soviet Union it would go to war to defend America's NATO allies. In the nuclear era, that meant convincing the USSR that the US would be willing to risk the destruction of New York or Washington to defend Berlin or Brussels.

Thankfully, the tension is lower today, but those in China's shadow seek similar US security.

That is why Vietnam is now part of a long line of nations aligning more closely with the US to defend themselves against Chinese intimidation. The US must work more closely with Vietnam—and Australia, Brunei, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, and others—to preserve freedom and security in the Western Pacific. ✪

CORPORATE MEMBER SPOTLIGHT

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Letters

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Love the Badges

I enjoyed your recent photo collage highlighting New England's Air National Guard units. There's nothing like photos of our Air Force in action to get you pumped up *["On Guard in New England," May, p. 126]!*

I was disappointed that [the photo essay didn't show] occupational badges.

Occupational badges have been around since before the Air Force with many coming over when they emerged from under the Army in 1947. Those were predominantly for pilots and navigators but aerial gunners, bombardiers, flight mechanics, and turret specialists also had badges.

Other occupational badges were later introduced in piecemeal fashion. Air Force functionals would act unilaterally, designing and then advocating for badge approval through the Air Force Uniform Board.

In the early 1990s Air Force Chief of Staff Gen. Merrill McPeak opened the badge flood gates. He directed that every Air Force career field would have an occupational badge for wear.

When I was assigned to a majcom headquarters I frequently visited bases with inspection teams. Whenever I encountered a badge-less airman I'd always ask, "Where's your badge?" This was usually followed by some kind of a red-faced response.

I never met anyone trying to make a statement in regard to either their career field or the Air Force by not donning their badge. It usually came down to lack of attention to detail or situation awareness.

You got your badge the hard way: You earned it! Now wear it proudly for all to see!

Col. Bill Malec,
USAF (Ret.)
O'Fallon, Ill.

C-17 Angels of Mercy

I noticed in the "In Brief" section on the C-17 that there was no mention about the Globemaster III's ability to perform the aeromedical evacuation mission *["Airpower Classics: C-17," May, p. 152].* Each C-17 has three litter stanchions that are integral to the aircraft and can carry nine patients. With the addition of the patient pallet, the C-17 can carry 36 litter patients. Also in the event of contingency operations, 48 patients can be floor loaded on the main cargo compartment with an addition 12 more on the ramp. I was fortunate enough to be a small part of the team of Reservists with the 315th AES at Charleston Air Force Base that was the initial cadre that developed the AE mission on the C-17.

Col. John M. Starzyk,
USAF (Ret.)
Summerville, S.C.

It would be hard to beat your "whale of a tale" about the C-17 experiencing a collapsed landing gear while delivering a whale to Iceland. But I will offer that DOD used a C-17 to transport its first MIA recovery team to Pyongyang during the Clinton Administration. Led by retired Army Major Bob Jones, deputy assistant secretary of defense for POW/MIA affairs, the team spent eight hours on the ground negotiating the protocols that established the recovery efforts that would follow. Once back at the airfield, Jones noticed that dozens of locals had gathered along both sides of the runway to watch the C-17 depart. He asked the aircraft commander what the chances were for a maximum performance takeoff. The captain was more than happy to reply that such was very possible. The C-17 roared down the runway. It gave them a view of American airpower that they had never seen before nor likely will ever see again.

Unfortunately, even though the MIA recovery program in North Korea was a success, George Bush and Condoleezza Rice terminated it when that Administration came into office. Today, those listed as MIA in North Korea will remain there forever.

Maj. Vern J. Pall,
USAF (Ret.)
Tucson, Ariz.

Heavy Convention

Sam McGowan's interesting article "Herculean Ordnance" (April, p. 58) on the C-130s dropping BLU-82s raises the question of why no heavy conventional ordnance had been developed for US bombers despite lessons from both World War II and Korea that our bombs were too light to be effective against many targets. I think much of the problem can be traced to the leaders of Strategic Air Command and their focus on nuclear weapons despite the fact that we continued to fight non-nuclear wars. Even as late as 1990 when I proposed the development of 38,000-pound conventional bombs for the B-2, I was told by an *Air Force Magazine* editor that to his knowledge there was no program and no Air Force interest in such a bomb. Thankfully, the lesson on the need for

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heavy conventional ordnance for US bombers has finally been learned and we now have the GBU-43B. I hope tomorrow's Air Force leaders will always be students of our past experiences to ensure that we don't forget any more key lessons.

Lt. Col. Price T. Bingham, USAF (Ret.)
Melbourne, Fla.

Shot Down

Interesting story and pictures in the May issue of *Air Force Magazine* on the Black Cat U-2 losses over China *["Flashback: Dragon Ladies Down," May, p. 148].* I spent nine years flying the U-2 and was one of the instructors who helped check out the Taiwanese pilots back at Laughlin Air Force Base in the early '60s. I was always curious about their losses and, while on a trip to China, I visited the magnificent military museum in Beijing. By carefully watching the roving guards I was able to get some pictures of the same plane that is in your article. It was really a mess, and the wings were held in place by metal stands. One of the early Ryan reconnaissance drones is also displayed by the U-2. This section of the museum houses a number of American military items, including several Air Force planes that they either shot down or had been captured over the years.

Maj. Gen. Pat Halloran, USAF (Ret.)
Colorado Springs, Colo.

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To Be Lieutenant General: Jeffrey L. **Harrigian,** Stayce D. **Harris.**
To Be Brigadier General: Sean M. **Farrell,** Timothy D. **Haugh,** William G. **Holt II.**

CHANGES: Maj. Gen. Christopher J. **Bence,** from Vice Cmdr., 3rd AF, Ramstein AB, Germany, to Cmdr., USAF Expeditionary Center, AMC, JB McGuire-Dix-Lakehurst, N.J. ... Brig. Gen. Kathleen A. **Cook,** from, Dir., Public Affairs, OSAF, Pentagon, to Dir., Svcs., DCS, Manpower, Personnel, & Svcs., USAF, Pentagon ... Brig. Gen. (sel.) Kenneth P. **Ekman,** from DCS, NORAD, NORTHCOM, Peterson AFB, Colo., to Dep. Chief, Supt./Security Agreement, Office of the Defense Representative-Pakistan (ODR-P), CENTCOM, US Embassy, Islamabad, Pakistan ... Brig. Gen. (sel.) Sean M. **Farrell,** from Cmdr., 1st SOW, AFSOC, Hurlburt Field, Fla., to Dir., Strat. Plans, Prgms., & Rqmts., AFSOC, Hurlburt Field, Fla. ... Lt. Gen. (sel.) Jeffrey L. **Harrigian,** from Dir., F-35 Integration Office, Office of the C/S, USAF, Pentagon, to Cmdr., AFCENT, ACC, Southwest Asia ... Lt. Gen. (sel.) Stayce D. **Harris,** from Cmdr., 22nd AF, AFRC, Dobbins ARB, Ga., to Asst. Vice C/S, USAF, Pentagon ... Brig. Gen. (sel.) Timothy D. **Haugh,** from Cmdr., 480th ISR Wg., ACC, JB Langley-Eustis, Va., to Dep. Cmdr., Jt. Task Force ARES, CYBERCOM, Fort George G. Meade, Md. ... Brig. Gen. (sel.) William G. **Holt II,** from Cmdr., 352nd SOW, AFSOC, RAF Mildenhall, UK, to Dir., Ops., AFSOC, Hurlburt Field, Fla. ... Maj. Gen. Mark D. **Kelly,** from Cmdr., 9th AF, ACC, Shaw AFB, S.C., to Spec. Asst. to the Cmdr., ACC, JB Langley-Eustis, Va. ... Brig. Gen. Cory J. **Martin,** from Spec. Asst. to the Cmdr., US Forces Korea, PACOM, Yongsan, South Korea, to Spec. Asst. to the Vice C/S, USAF, Pentagon ... Brig. Gen. Lenny J. **Richoux,** from Dir., Svcs., DCS, Manpower, Personnel, & Svcs., USAF, Pentagon, to Vice Cmdr., 18th AF, AMC, Scott AFB, Ill. ... Brig. Gen. Edward W. **Thomas Jr.,** from Cmdr., Thomas N. Barnes Center for Enlisted Education, AETC, Maxwell AFB, Ala., to Dir., Public Affairs, OSAF, Pentagon ... Gen. (sel.) Tod D. **Wolters,** from Dir., Ops., Jt. Staff, Pentagon, to Cmdr., USAFE, Ramstein AB, Germany. ✪

Air Force Association
1501 Lee Highway • Arlington, VA 22209-1198

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Our mission is to promote a dominant United States Air Force and a strong national defense and to honor airmen and our Air Force heritage. To accomplish this, we:

Educate the public on the critical need for unmatched aerospace power and a technically superior workforce to ensure US national security.

Advocate for aerospace power and STEM education.

Support the Total Air Force family and promote aerospace education.

By Megan Scully

Will the F-35 Remain Joint?

The Senate Armed Services Committee wants to abolish the F-35 strike fighter program office, transferring oversight of the massive, multiservice program to the Navy and Air Force in approximately three years. The SASC proposes this in the hope of cutting overhead costs and improving management of the most expensive weapons system in Pentagon history.

Tucked in the panel's 1,600-page Fiscal 2017 defense authorization bill is a provision that would require the Defense Secretary to stand down the program office, currently led by Air Force Lt. Gen. Christopher C. Bogdan, within six months of the Milestone C production decision scheduled for April 2019.

The Air Force and Navy would then create separate program offices to manage the production, sustainment, and management of their respective jets. The Navy would oversee production of both the F-35B and F-35C variants, while the Air Force would be charged with the F-35A.

"The committee believes that the current consensus-driven management structure of the [F-35] program is ill-suited to what are in essence three separate aircraft programs, has led to aircraft that do not fully meet its customers' needs, and stifles the proper alignment of responsibility and accountability," according to the committee's report accompanying the bill.

In the report, the committee charged that commonality among the three variants—once a major selling feature of the joint program—never fully materialized. The program originally set out to share between 70 percent and 90 percent of its parts and technology among the variants.

In reality, the airplanes probably only have between 20 and 25 percent commonality, and that is mostly in their cockpits, the report stated, citing Bogdan as the source for those figures.

During an April hearing before his committee, Armed Services Chairman John McCain said the program merely created an "illusion of jointness," for both airplanes manufactured for the US military and those being sold to allies. The Arizona Republican has long been a critic of the program, calling it a "scandal and a tragedy with respect to cost, schedule, and performance."

"The Air Force, Navy, and Marine Corps each fly primarily a single variant and have different roles and missions, concepts of operations, and deployment requirements, all leading to highly different priorities for F-35 capabilities, capacity, maintainability, and follow-on modernization," the report states, adding that "international partners have needs and priorities that differ even further."

Those differences led the committee to conclude that a joint program office was not only unnecessary, it is also overly cumbersome and impedes accountability on the individual variants within the Defense Department.

But while the committee is seeking to stand down the joint program office, it also is directing the Navy and the Air Force to figure out a way to coordinate on issues where there is commonality among the jets.

Meanwhile, the Pentagon is still paying a premium for the joint office, which employs about 2,590 (including the testing workforce) and has overhead costs totaling $70 million a year, a figure confirmed by Bogdan at the hearing.

That price tag understates the true overhead costs of the program office, given the sheer number of people who work under Bogdan, and McCain called it "pretty disturbing." Bogdan acknowledged he didn't know whether the size of his workforce was correct or not, according to the committee report.

To boost its own ability to oversee the program, the committee also drafted a provision that would require the Defense Department to treat the follow-on modernization effort for the F-35 as its own major defense acquisition program.

The reporting and oversight mechanisms required of a so-called MDAP, which includes a business-case analysis and cost, schedule, and performance reporting, would give Congress and international partners better insight into the modernization effort. The cost of the F-35's first block upgrade alone, dubbed Block 4, is estimated to top $8 billion.

The Block 4 program involves a long list of upgrades to the baseline Block 3F version of software and weapons that all F-35s are to have by 2018. The Block 4 improvements, coming into service every other year or so through the 2020s, include new weapons, new electronic warfare systems, and connectivity enhancements. A later Block 5 effort could feature a new engine and increased range.

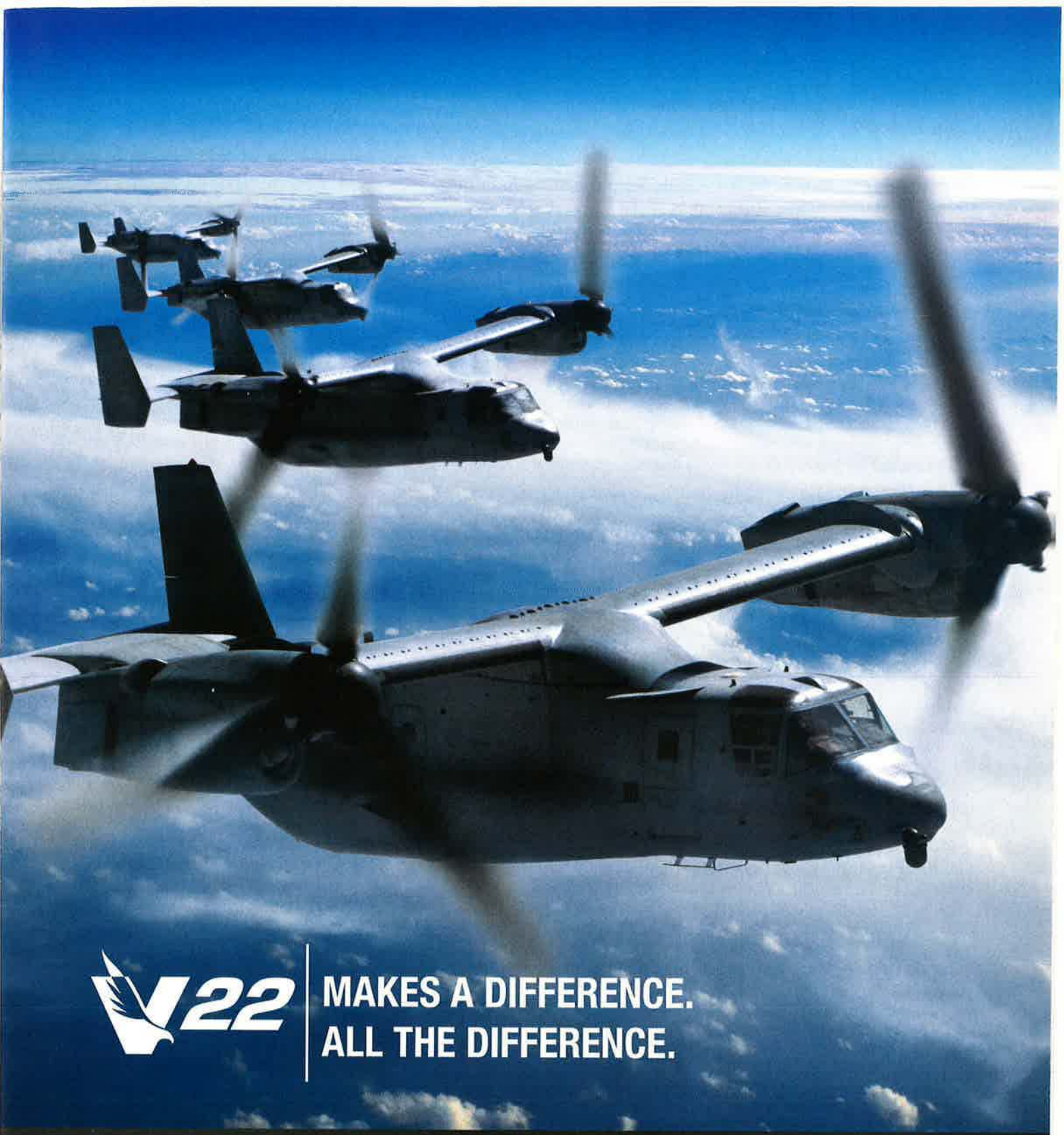
At the April hearing, McCain called the plan to keep block upgrades within the F-35's master program "incredible, given the department's dismal track record on these upgrade programs."

Pentagon acquisition chief Frank Kendall said the MDAP label essentially buys a lot of statutory oversight. The department, he told the committee at the hearing, is planning to account for the upgrades separately, including an independent cost estimate.✪

Megan Scully is a reporter for CQ Roll Call.

Critics say the F-35's joint program office is unnecessary.

USAF photo by SrA. Christopher Callaway



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Aperture

By John A. Tirpak, Editorial Director

Disappearing fighter fleet; No rescue from a sixth gen fighter; Uptick in attack helos; Retirement plans ....

WASHINGTON, D.C., JUNE 16

DOWN THE FIGHTER HOLE

Pssst: Don't tell Russia or China, but the US isn't going to have enough fighters for a major war six years from now.

The bad news was contained in the Pentagon's latest 30-year "Annual Aviation Inventory and Funding Plan," which is supposed to come out with the annual defense budget request in January but is always a couple of months late. This year it didn't become public until late May.

Summed up, the report says the services just can't field the number of fighters Congress told them to with the dollars they expect to have. That puts them in the unsavory situation of spending scarce dollars fixing up obsolete jets to try to make the required inventory levels—and still fall short of Congress' directive—or put all their money toward new jets, and be even further short.

"The Air Force has insufficient resources to maintain the FY 2016 [National Defense Authorization Act] mandated number of fighter aircraft," 1,900, beyond the 2017-21 Future Years Defense Program, according to the report. At current funding levels, the need to retire aircraft nearing or already beyond their planned service lives outpaces procurement of new fighters, and USAF's fighter inventory keeps falling until bottoming out in 2031.

Just six years ago, USAF said 2,100 was the rock-bottom number of fighters it could field among its three components—Active, Guard, and Reserve—and still meet national strategy requirements, which have not changed. The report says, though, that the force structure envisioned "meets the national security strategy of the United States," without explaining how.

Last year, Congress asked the services for a re-evaluation of the planned F-35 buy in light of Russia's adventurism in Eastern Europe, China's belligerent island-building campaign in the South China Sea and ongoing air combat in Syria and Iraq, all of which erupted after the services set their buy objectives for the F-35. The services have dodged the question, though, and have declined to boost their planned F-35 inventory goals, saying the planned numbers accounted for unexpected changes in the world situation.

The report didn't break out specific service inventories of fighters year-by-year, but taken as a whole—Air Force and Navy/Marine Corps—the total US fighter jet inventory will decline from 3,479 in Fiscal 2017 to 2,981 in Fiscal 2026 and will keep falling after that.

FUTURE AIR DOMINANCE

For the next 10 years, USAF will keep improving the F-22 so it remains "fully effective against the most challenging air-to-air and surface-to air threats" and will buy 243 more F-35As through 2021, the report continues. But the Air Force plans to retire A-10s during that same period and will have a net fewer fighters every year. Some older F-15s and F-16s will have to be upgraded and service structural life extended "to meet capacity demands" while research and development will focus on enhancing the fifth generation F-22 and F-35 and starting work on the "next generation air dominance" airplane.

The Air Force said in April it has abandoned the notion of looking to a future sixth generation fighter to rescue it from the rapid advance of world adversaries and will instead rely on quicker solutions to achieving air superiority in 2030. It will still aim for a sixth gen fighter, but on a longer timescale.

The Navy is in the same boat, the report says. The service "remains challenged" with retiring its F/A-18C/D 1980s-technology Hornet fighters because it's coming to the end of the production run of their successor, the F/A-18E/F SuperHornet, and "Strike Fighter Inventory Management (SFIM) risk remains high." The Navy will fly some stored aircraft to spread the pain and plans to simply fly the Super Hornets less to conserve their service lives. Even so, the Navy/Marine Corps will be 193 Super Hornets

USAF photo by SrA. Krystal Ardrey

A fighter deficit is on the horizon.

short in 2026, and it will have fewer EA-18G electronic warfare jets than needed because the "demand signal exceeds current proposed force structure capacity."

The Navy has a notional "F/A-XX" on the books, but it's still in early stages of development. Service and Pentagon leaders have said they won't attempt another joint fighter like the F-35 program—in which each service uses a variant of the same basic airframe—but will seek commonalities on components such as engines and software.

In all services, the plan had been to bring on F-35 fighters both earlier and faster, but delays in the program and lower budgets sharply reduced the originally planned annual buys.

The Air Force initially intended to buy 110 F-35s annually. That target declined to 80, then 60, and most recently to 48, though Air Combat Command chief Gen. Herbert J. "Hawk" Carlisle has said that 60 remains a goal. At 48 a year, the Air Force doesn't buy out its planned inventory of 1,763 jets until the 2040s.

The rest of the aircraft plan looks pretty benign, however. The Army and Marine Corps attack helicopter fleet is actually slated to grow about 20 percent through 2026, while most other categories—utility helicopters, intelligence, surveillance, and reconnaissance aircraft, air refueling, etc.—all largely hover at current levels.

BOMBERS AND OTHER NEW AIRCRAFT

Tellingly, the "Long Range Strike" fleet stays locked at 157 aircraft through 2026, when the first examples of the Air Force's B-21 bomber are supposed to be rolling off the production line. The report—which does not chart inventories 30 years away, despite the name—does not divulge whether the B-21 will be additive to the existing bomber fleet, or whether it will replace the B-52, the Air Force's youngest model of which will be 63 years old in 2026.

In the same vein, though USAF will be nearly finished buying the planned 179 new KC-46 tankers in 2026, the report notes that "continued procurement of KC-46s beyond FY 2027 or the acquisition of a new tanker will be necessary beginning in FY 2028," because the KC-135s still in the inventory then will be in excess of 70 years old. The KC-135s will need capability enhancement and structural help in the meantime, it says.

The T-X trainer is slated to start entering the inventory in 2024, and USAF plans to buy 350 through the mid-2030s, according to the report.

Though rebuffed from an earlier attempt to retire the U-2, USAF plans to divest the aircraft in the year between Fiscal 2019 and 2020, shifting to the RQ-4 Global Hawk for high-altitude reconnaissance. Similarly, the MQ-1 Predator, several times saved from retirement, goes away in 2018 in favor of an all-MQ-9 fleet in the medium-altitude remotely piloted aircraft regime, if USAF's plan as stated in the report comes to fruition.

The 17 E-8C Joint STARS aircraft are to be replaced by a new aircraft starting in 2024, USAF said, but the service will hang on to the RC-135 fleet of Rivet Joint, Combat Sent, and Cobra Ball aircraft indefinitely. Funding for a replacement of the E-4B National Airborne Operations Center is in the Fiscal 2017 budget request, but USAF plans to keep upgrading the EC-130H Compass Call electronic warfare airplane through the "midterm."

The Air Force buys its 51st and last CV-22 in Fiscal 2016; the last aircraft was an attrition reserve airplane provided by Congress.

06.09.2016

A B-52 leads a formation including two Polish F-16s (front right), four US F-16s (back right), two German Typhoons (front left) and four Swedish Gripens (back left) on a mission during BALTOPS 2016, a multinational exercise designed to train participants in maritime interdiction, anti-subsurface warfare, amphibious operations, and air defense in a joint environment. Fifteen NATO nations and two partner nations participated in this year's exercise.

USAF photo by SrA. Erin Babic

Welsh: USAF Really Short 40K to 60K People

The Air Force's recent moves to up its end strength to 321,000 people is only a crisis Band-Aid. To really fix the service's manpower shortages, as many as 40,000 to 60,000 more Active Duty airmen are needed, Chief of Staff Gen. Mark A. Welsh III said May 26.

Speaking at an AFA-sponsored Air Force breakfast in Arlington, Va., Welsh said USAF's recent plan to add 4,000 airmen will only be enough "to do what we're doing today," allowing remotely piloted aircraft operators to go down to "six [days] on, one off" from "seven on, no off." Absent the increase, "we will drive them out" of the service under a punitive and increasing workload. The 4,000 does nothing, he said, to address typical career field manning of 84 percent. Welsh called the 40,000 to 60,000 figure an "educated guess," but said that's what it would take "to do it right and fill in those manpower holes throughout the force."

There would also have to be a proportionate increase in the Guard and Reserve, "because they're a major part of this," he said.

Trimming From the Top

The Air Force tried to cut 15 three-star billets last year but was only successful in cutting eight, Chief of Staff Gen. Mark A. Welsh III said May 26.

"The others were just a bridge too far," not because of Air Force resistance, but because of resistance outside the service, he said.

Defense Secretary Ashton B. Carter recently proposed updating the Goldwater-Nichols Act, and lawmakers and defense officials have been discussing trimming headquarters operations and jobs for the highest-ranking officers. Welsh said it is fair to ask why the general and flag officer ranks have not been downsized at the same rate as the overall force. If the services can't justify those positions, he said, "maybe they shouldn't be there."

Still, he said, "it's very difficult to reduce," in part because senior positions "are coming out of somebody's district, somebody's state."

General officer rank reductions have cascading effects, as downgraded three-star positions become two-star billets that may in turn require cutting, etc. This all leads to a "pretty robust discussion," Welsh said.

Gorenc Retiring

Gen. Frank Gorenc, head of US Air Forces in Europe and Allied Air Command, will retire in July after 37 years of commissioned service, Air Force officials said. Gorenc has held the USAFE job since August 2013 and has led the command during Russia's invasion of Crimea and

USAF photo by Amn. Daniel Snider

Watch Me Whip, Whip, Watch Me Nae Nae: *An F-15E banks above Grand Bay Bombing and Gunnery Range at Moody AFB, Ga., during joint aerial training. Air Combat Command aircraft including F-16s, HH-60G Pave Hawk helicopters, and A-10C aircraft participated in the training, showcasing tactical maneuvers and weapons capabilities.*

By Brian W. Everstine, Pentagon Editor

USAF photo by SrA. Justyn M. Freeman

They're Strapped: *TSgt. Joseph McCullough straps down a GBU-54 to a munitions loader at Bagram Air Field, Afghanistan, on June 7. The guided munition was to be loaded onto an F-16.*

Ukraine, overseeing deployments of US Air Force assets to Europe—including the first deployment of F-22s to the continent—partnership activities with NATO and other air forces, and shifts of USAF European posture to deter Russia from further adventurism.

President Barack Obama on June 7 nominated Lt. Gen. Tod D. Wolters for a fourth star and to head USAFE and Allied Air Command. Wolters has been the director of operations on the Joint Staff since July 2015 and served as deputy chief of staff for operations, plans, and requirements on the Air Staff before then.

B-52 Crew Averts Catastrophe in Mishap

The quick thinking of a B-52 crew during a mishap at Andersen AFB, Guam, averted a "more catastrophic incident" as the Stratofortress caught fire on the ground, base officials said.

Images of the May 19 mishap on the Andersen flight line showed a B-52H fully engulfed in flames. The seven-member crew was able to escape the aircraft without any injuries reported.

"Because of their quick thinking and good judgment in this emergency situation, the aircrew not only saved their lives but averted a more catastrophic incident," Brig. Gen. Douglas A. Cox, 36th Wing commander, said in a news release.

The B-52H had deployed from Minot AFB, N.D., for a Pacific bomber rotation, was conducting routine flight training, and was carrying inert munitions at the time.

Pilots' Errors Caused F-16 Collision at Nellis

Mistakes by a pair of pilots caused their F-16s to collide after landing on the runway at Nellis AFB, Nev., in August 2015, Air Combat Command investigators found.

The collision almost killed one pilot and caused nearly $70 million in damage, according to the accident investigation report released May 9.

The pilots were both assigned to the Air Force Reserve Command's 301st Fighter Wing at NAS JRB Fort Worth, Texas, and were participating in exercise Red Flag 15-4 at the time.

After the first pilot landed his fighter normally, he did not move to the exit side of the runway. While preparing to land, the second pilot did not open his speedbrakes. He landed with the proper spacing, but closed on the other F-16 because "he landed too fast, touched down long, and had the engine above idle power," according to the report.

After noticing the first aircraft on the hot side of the runway, he applied heavy braking pressure and directed his fellow pilot to clear right. The pilot of the first aircraft misunderstood the call and continued to drift left, but braked and turned hard right after hearing a second command. At the same time, the second pilot abandoned normal runway deconfliction and pulled hard right in an attempt to pass on that side. Instead, the aircraft collided.

The impact forced both aircraft off the runway, fired the second pilot's ejection seat, and pinned him under the other F-16's wing, causing "life threatening blunt force, burn, and crush-type injuries." First responders were on the scene in

USAF photo by A1C Alexa Ann Henderson

Cozy Abodes: *Airmen inspect the engines of a B-52 at Andersen AFB, Guam, where they are deployed as part of the military's continuous bomber presence in the Pacfic.*

68 seconds, helping save the pilot's life. The other pilot was not injured. One aircraft was considered a total loss and the repair costs to the other aircraft are estimated at $5.4 million.

Hesterman Retires With Three Stars

The former assistant vice chief of staff of the Air Force, who was removed from office in March after a USAF inspector general investigation found he engaged in an unprofessional relationship as a two-star general, retired as a three-star May 1.

"In the case of retirements, the Secretary of Defense retains the authority to determine satisfactory or nonsatisfactory service for all officers in the grades of O-9 or O-10 who have adverse or reportable information," an Air Force spokeswoman said.

In the case of Lt. Gen. John W. Hesterman III, Air Force Secretary Deborah Lee James made a recommendation to Defense Secretary Ashton B. Carter "based on the recommendation of the supervisor, the recommendation of an officer grade determination board, consideration of DOD-wide precedents, and very extensive consideration of the nature of the misconduct, when it occurred, and the accomplishments of the individual in the last grade," the spokeswoman said.

The IG report found a "string of suggestive emails" supported allegations that Hesterman had an unprofessional relationship with an Air Force lieutenant colonel between March and May 2011, and that the relationship "seriously compromised his standing as an officer."

On June 7, Obama nominated Maj. Gen. Stayce D. Harris, 22nd Air Force commander, for promotion to lieutenant general and assignment as assistant vice chief of staff.

The Future of Drones

The Air Force on May 17 unveiled a plan for small, unmanned aircraft systems—drones smaller than Predators

By the Numbers

The Air Force has 194 golf courses on its bases around the world, according to a count released by *Mother Jones.* The Pentagon, meanwhile, has just 183 of its advanced Air Force F-22 fighter jets. Air Force officials, including Air Combat Command boss Gen. "Hawk" Carlisle have said ending F-22 production was a mistake. Air Force Chief of Staff Gen. Mark Welsh said May 26 that restarting the F-22 production line isn't a "wild idea," though it is "cost prohibitive."

The War on Terrorism

US Central Command Operations: Freedom's Sentinel and Inherent Resolve

Casualties

As of June 15, 22 Americans had died in Operation Freedom's Sentinel in Afghanistan, and 20 Americans had died in Operation Inherent Resolve in Iraq and Syria.

The total includes 38 troops and four Department of Defense civilians. Of these deaths, 15 were killed in action with the enemy, while 27 died in noncombat incidents.

B-52s Picking Up the Pace

The B-52s that deployed to fight ISIS earlier this year have not been flying high-tempo operations, though they have been "picking up the pace," said US Air Forces Central Command boss Lt. Gen. Charles Q. Brown Jr. in a May 26 briefing.

Since the B-52 hasn't been based in the US Central Command area of operations for 26 years, the command needs to build up its logistic supports to "make sure they've got everything they need," he said.

The operations tempo had continued to increase in April and May and would continue to do so, Brown said. The Stratofortresses replaced B-1s that were recently rotated out of CENTCOM for the first time since 2001 after setting records for the amount of weapons dropped during its last deployment.

In that same briefing, Brown said the Air Force is conducting constant analysis to make sure US Central Command has enough weapons to fight ISIS, and that means taking weapons away from other contingencies. The number of weapons available to strike aircraft in Operation Inherent Resolve is "still a concern," he said

The coalition conducts a lot of strikes with precision guided munitions and the Defense Department has not bought a large amount of those weapons since Afghanistan started drawing down because it did not "forecast for this particular operation."

The Air Force is increasing the numbers of weapons it will buy over the next five years, but those weapons are still two years away, said Brown.

In the meantime, the Air Force is doing analysis "about where [to] take risk" with other combatant commands so it can move weapons from one stock and bring it to the fight, he added.

Extenders Mark 25 Years in Middle East

The KC-10 Extender recently marked 25 years of continuous operations in the US Central Command area of responsibility. The tankers first deployed to the region in 1991 to begin refueling aircraft conducting operations in the region, and they continue to support aircraft flying for operations Freedom's Sentinel and Inherent Resolve.

KC-10s are based at only two locations—Travis AFB, Calif., and JB McGuire-Dix-Lakehurst, N.J.—so the crews routinely rotate to locations in the AOR.

STO Receives Posthumous Silver Star

Special tactics officer Capt. Matthew Roland on June 1 received a Silver Star posthumously, about nine months after he was killed in an insider attack in Afghanistan.

Roland, 27, of Lexington, Ky., was deployed from the 23rd Special Tactics Squadron at Hurlburt Field, Fla. On Aug. 26, 2015, Roland was driving the lead vehicle, a bus, in a convoy of US Army Special Forces soldiers to Camp Antonik in Helmand province when they pulled up to an Afghan security checkpoint.

Shortly after the bus stopped, two guards in Afghan National Defense and Security Forces uniforms moved, one toward a bunker, the other toward the bus while raising his weapon, according to an Air Force press release. Roland shouted, "Insider attack, insider attack!" and reversed the bus as the guard opened fire.

Roland was killed instantly, but by moving the bus he gave the rest of the special operations team time to respond and kill the gunmen. "His actions on that night do not surprise me," Roland's father, retired Air Force Col. Mark Roland, said in the release. "He was a warrior, a leader, and more than that, a servant leader whose first thoughts were for those he served."

Another airman, combat controller SSgt. Forrest Sibley, 31, from the 21st Special Tactics Squadron at Pope Army Airfield, N.C., was killed in the same incident.

and Reapers—that the service expects will take over as its dominant means of surveillance.

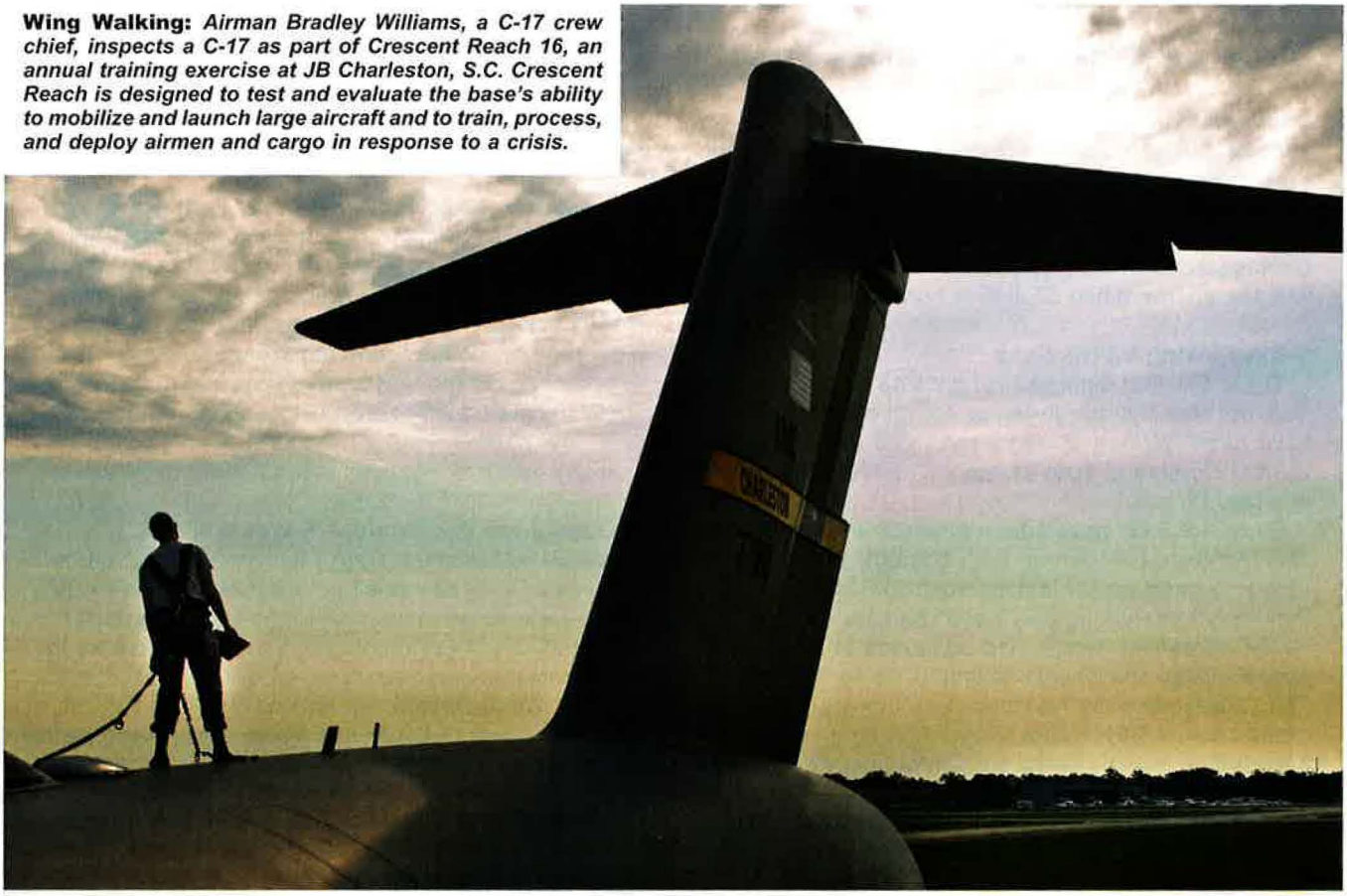
"What we're saying today is we do believe small unmanned aircraft systems will be the cornerstone of Air Force ISR," Lt. Gen. Robert P. Otto, deputy chief of staff for intelligence, surveillance, and reconnaissance, said in unveiling the "Small Unmanned Aircraft Systems (SUAS) Plan: 2016–2036."

The Air Force's current fleet of remotely piloted aircraft is falling drastically short of the unrelenting need for more ISR, so the service needs to look at creative ways to make up the gap. In the future, this will be small-scale RPAs with miniaturized sensors, like those on the bigger aircraft. These will be more autonomous, cheaper, and work alongside other RPAs and manned aircraft in what the service plans to be the Third Offset.

The future dependence on autonomy will dramatically change the manpower makeup of the remotely piloted aircraft force, and it will take humans even more out of intelligence gathering and targeting. However, people will not completely be out of the process. The Air Force now has humans physically flying MQ-1B Predators and MQ-9 Reapers in ground stations, and "that can't happen in the future," said Col. Brandon Baker, director of remotely piloted aircraft capabilities.

The service needs to take the man "out of the loop" and put the man "on the loop"—instead of having a pilot in control of one aircraft, have the pilot in charge of a fleet of small UAS systems that can largely operate autonomously. A human will remain in charge of decision making for air strikes, Baker said.

Wing Walking: *Airman Bradley Williams, a C-17 crew chief, inspects a C-17 as part of Crescent Reach 16, an annual training exercise at JB Charleston, S.C. Crescent Reach is designed to test and evaluate the base's ability to mobilize and launch large aircraft and to train, process, and deploy airmen and cargo in response to a crisis.*



USAF photo by SrA. Ericka Engblom

Robinson Is First Female Combatant Commander

Gen. Lori J. Robinson on May 13 took command of NORAD and US Northern Command from Adm. William E. Gortney, becoming the first woman to lead a combatant command.

Robinson "has a remarkable and complete set of proven experience" and is a strong strategic thinker and manager, Defense Secretary Ashton B. Carter said during the ceremony.

"We cannot predict precisely how or when the men and women of NORAD and NORTHCOM will be called forward to carry their mission, but we do know this: We know General Robinson will lead this team with certainty, clarity, and with the full trust and confidence of me and the President," said Carter.

Rice Takes Reigns of Air National Guard

Lt. Gen. L. Scott Rice pinned on his third star and assumed his new role as director of the Air National Guard on May 9.

Rice, who previously served as the adjutant general of the Massachusetts National Guard, replaced Maj. Gen. Brian G. Neal, who has served as the acting director since December 2015. The former director, Lt. Gen. Stanley E. Clarke III, retired officially in March. National Guard Bureau Chief Army Gen. Frank J. Grass, who presided over the ceremony, said Rice "has all the right tools to do this job." ✪

USAF photo by Roland Balik

In His Spare Time: *A1C Andrew Des Marias, a member of the Honor Guard at Dover AFB, Del., stands at port arms during the change of command ceremony for the 436th Maintenance Group on May 24. Col. Chuck Nesemeier relinquished command to Col. Tyler Knack. Marias is a 436th Aerial Port Squadron fleet service specialist.*

chartpage@afa.org

WHERE THE GENERALS ARE

RANK	BASE	GENERAL OFFICERS
1	Scott AFB	17
2	Wright-Patterson AFB	14
3	JB Langley-Eustis	10
4	Ramstein AB	9
6	JBSA-Lackland	8
6	Peterson AFB	8
7	JBPH-Hickam	6
8	JBSA-Randolph	6
8	Fort Meade	6
10	Maxwell AFB	5

All data as of June 1, 2016

It probably comes as no surprise to learn that 81 of the Air Force's 302 general officers are stationed at the Pentagon, headquarters for both the Air Force and the entire Defense Department.

Taking the Pentagon out of the equation, what other locations do the largest numbers of USAF generals call home?

The "top 10" list of brass-heavy facilities collectively home to 89 general officers is dominated by the headquarters locations of the Air Force's major commands.

Topping the list with 17 general officers is Scott AFB, Ill. (home to both Air Mobility Command and US Transportation Command), followed by 14 generals at Wright-Patterson AFB, Ohio (headquarters for Air Force Materiel Command), and 10 general officers at JB Langley-Eustis, Va., (home to Air Combat Command).

There are only two Air Force facilities not home to a majcom on this particular list: JBSA-Lackland, Texas (housing various training, cyber, and medical units), and Maxwell AFB, Ala. (home to Air University).

There is also one true outlier. The Army's Fort Meade, Md., hosts six Air Force general officers at US Cyber Command and the National Security Agency.

See the May issue for a look at where Active Duty airmen are most likely to be assigned overall. (Spoiler alert: Think Lackland and Ramstein.)

FIFTY YEARS OF MISSION IN THE MOUNTAIN

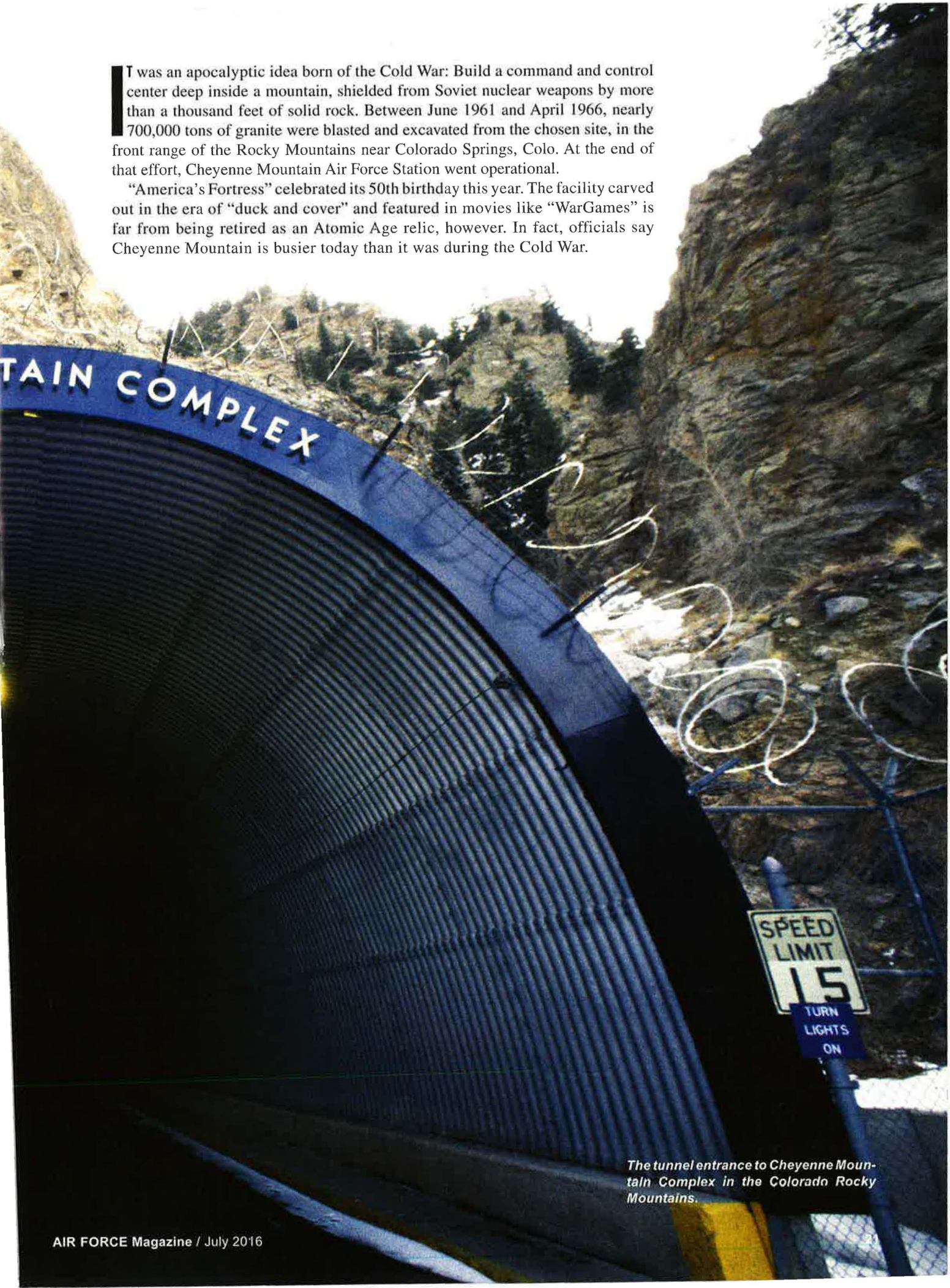
By Jennifer Hlad, Senior Editor

USAF's Cheyenne Mountain complex is, in some ways, busier than ever.

USAF photo by SSgt. Bob Simons

IT was an apocalyptic idea born of the Cold War: Build a command and control center deep inside a mountain, shielded from Soviet nuclear weapons by more than a thousand feet of solid rock. Between June 1961 and April 1966, nearly 700,000 tons of granite were blasted and excavated from the chosen site, in the front range of the Rocky Mountains near Colorado Springs, Colo. At the end of that effort, Cheyenne Mountain Air Force Station went operational.

"America's Fortress" celebrated its 50th birthday this year. The facility carved out in the era of "duck and cover" and featured in movies like "WarGames" is far from being retired as an Atomic Age relic, however. In fact, officials say Cheyenne Mountain is busier today than it was during the Cold War.



The tunnel entrance to Cheyenne Mountain Complex in the Colorado Rocky Mountains.

HYTEN SAID HE AND THIBAULT BOTH FIELDED LATE-NIGHT PHONE CALLS FROM THE PUBLIC ABOUT UFOS—CALLS THAT WERE AMUSING AND DIVERTING IN THE MIDDLE OF A LONG SHIFT.

Robert E. Thibault was one of five airmen who worked the first night shift at the North American Aerospace Defense Command Combat Operations Center inside "the mountain" in 1966. At the April 15, 2016, anniversary ceremony, the 79-year-old retired master sergeant remembered having to wear a yellow hard hat that first night because bits of rock were still falling from the ceiling.

Thibault worked as a surveillance operator, processing data inside the mountain for four years. One night, at 3 a.m., a colonel walked up to him and gave him his next assignment. He went to work at a Canadian air force base for four years before returning to Cheyenne Mountain in 1973. He was still working there when he retired in 1977.

Touring the facility recently, Thibault said it's really changed since the early days. The command post area is so different he didn't even recognize it.

"I can't believe it's been 50 years. ... It's just amazing," an emotional Thibault told *Air Force Magazine.*

Gen. John E. Hyten, the head of Air Force Space Command, served as a mission director in the mountain from 1994 to 1996. At the anniversary


USAF photo


USAF photo


USAF photo by SSgt. Bob Simons

high-quality equipment, leap-ahead technologies, and associated operational concepts. It was quality vs. quantity.

This approach didn't headline speeches. Epic debates on US and Soviet nuclear strategy usually overshadowed it, and harvesting the gains of the Second Offset took the better part of 20 years.

Yet this quiet approach was a tour de force that bridged across the Nixon, Ford, Carter, and Reagan presidencies and ultimately fueled the precision targeting revolution in the 1990s. According to Jimmy Carter's Secretary of Defense, Harold Brown, some of the Second Offset's deepest roots lay with the Air Force.

The need for the Second Offset began to sharpen with Russia's deployment of the fearsome new Soviet SS-19 nuclear missile, carrying multiple, independently targetable re-entry vehicles, or MIRVs. American leaders realized Soviet strategic nuclear parity or even potential superiority might create a window of vulnerability, giving Moscow free rein in international politics at US expense.

The top spokesmen for this theory were Eugene V. Rostow and Paul H. Nitze. They formed the Committee on the Present Danger in 1976. "If we continue to drift, we shall become second best to the Soviet Union in overall military strength," they warned. "Then we could find ourselves isolated in a hostile world, facing the unremitting pressures of Soviet policy backed by an overwhelming preponderance of power."

In 1976 the Soviets deployed their first mobile theater nuclear missile, the SS-20. 1978 was the tipping point, as the USSR's inventory of 25,393 warheads for the first time topped the US's inventory of 24,243. The Russians had added over 8,000 warheads since 1974. The fear was that if the Soviets had nuclear supremacy, they might just be willing to risk a conventional push into NATO.

"Soviet military leaders in their doctrinal writings expressed the belief that they could win a blitzkrieg victory in Europe," recalled Brown in his book *Star Spangled Security.* Brown served as Secretary of the Air Force from 1965 to 1969 and Secretary of Defense from 1977 to 1981.

Improving NATO's conventional forces with superior firepower to disrupt a ground attack became a top priority. Specifically, that meant developing forces able to find, fix, and destroy the forward line of Soviet troops while striking follow-on echelons as they attempted a thrust into West Germany.

The offset strategy sought advanced technologies for precision attack in order for NATO to whittle down superior numbers of Soviet tanks and other conventional forces to battle-manageable levels.

"We do not plan our theater nuclear forces to defeat, by themselves, a determined Soviet attack in Europe, and we rely mainly on conventional forces to deter conventional attack," Brown told Congress in 1980. "As one example, we cannot permit a situation in which the SS-20 and Backfire [bomber] have the ability to disrupt and destroy the formation and movement of our operational reserves, while we cannot threaten comparable Soviet forces."

To threaten those Soviet forces, the US needed rapid precision attack of Soviet counter air and ground force targets.

Airmen had been on this quest for over a decade. Brown credited USAF's 1963 Project Forecast, directed by Gen. Bernard A. Schriever, as the genesis of precision strike. One of Schriever's top recommendations was to concentrate on zero circular error probable, or CEP.

Early ICBMs like Minuteman I had a CEP of 1.3 to 1.7 miles, as cited by Donald A. MacKenzie in his book *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance.* ICBMs could therefore strike enemy cities under a strategy of mutually assured destruction, but a valid counterforce strategy depended on accuracies good enough to hit Soviet military targets directly.

"From that idea flowed generations of increasingly accurate weapons called precision guided munitions," Brown wrote in his 2012 memoir.

It wasn't quite that simple, of course. Research had to switch from improving floating gyros and other elements of inertial navigation to harnessing the power of electro-optics, lasers, and ultimately, global positioning.

By the early 1970s, the airmen's quest for precision had put in place a strong basis for building up precision attack. One milestone was the 1972 destruction of the Thanh Hoa Bridge in North Vietnam, using laser guided bombs. The success of that strike—following 871 unsuccessful attacks—proved the value of laser targeting.

SEEKING THE HOLY GRAIL

In those early days of aided precision, F-4 Phantoms used electro-optical guided bombs, with TV cameras on the bomb transmitting a picture to the weapon systems officer in the aircraft. The WSO adjusted contrast to pick out the target, then transmitted the selection to the bomb, which flew itself to impact. Laser guided bombs went one better: The bomb could follow the low-power laser beam illuminating the target from a pod carried under a fighter and operated by the fighter crew. Both systems worked well—if visibility was good.

Offsetting the Soviet conventional advantage would require much more, though. The "Holy Grail" was a way to hit Soviet tanks on the move, especially in rear echelon areas. Ideally, it all had to be done at night and in bad weather, too.

In 1973, the Advanced Research Projects Agency, ARPA, launched the Long-Range Research and Development Planning Program "to provide the President and the joint force with better tools to respond to a Warsaw Pact attack," recounted Deputy Secretary of Defense Robert O. Work in a January 2015 speech.

The offset coalesced around an operational concept.

Step One was accurately tracking moving tanks and other mechanized vehicles.

Step Two was developing munitions to hit the small targets precisely.

Step Three concentrated on ways to deliver munitions: either via ground launch or from aircraft. Accordingly, those aircraft needed standoff missiles or a way to penetrate close to the target—especially important against moving armor.

"The objective of our precision guided weapon systems is to give us the following capabilities: to be able to see all high value targets on the battlefield at any time; to be able to make a direct hit on any target we can see, and to be able to destroy any target we can hit," testified William J. Perry,

DOD photo by Ken Hackman via National Archives

An 82nd Airborne Division soldier gives a commence-firing order during a NATO-sponsored exercise in Europe in 1982. By this time, the US knew it needed a new way to offset huge Soviet conventional force advantages.

undersecretary of defense for research and engineering (also called DDR&E), in 1978.

This would emerge only after careful work on a fusion of systems—a core attribute of the offset. The Pave Tack pod, for example—built by Ford Aerospace—illustrated the maturation of precision. Pave Tack fused several technologies: forward-looking infrared, a laser rangefinder and a laser designator.

How would the Pentagon focus its research efforts? Perry's role as DDR&E was crucial. The offset emerged at a time when direction, management, and funding were highly concentrated in that post, created by President Dwight D. Eisenhower. In his memoir *Waging Peace,* Eisenhower said legislation passed in 1958 set up the job for a "nationally recognized leader in science and technology" who would advise the Secretary of Defense and "supervise all research and engineering activities in the department."

FOCUS ON THE BATTLEFIELD

DDR&E was at its peak power by the early 1970s. For example, ARPA reported directly to DDR&E. Brown, John S. Foster Jr., Malcolm R. Currie, and Perry held the post from 1965 to 1981. Consistent leadership of research and development efforts by astute scientists and engineers kept work on track even as Administrations changed.

Another ingredient for success may have been the comparatively low-key approach. The original offset strategy was by no means a dominant part of the strategic dialogue of the mid-1970s and 1980s, as academics and agitators alike spent far more energy on détente, arms control, and the perils of nuclear parity. Nuclear weapons strategy overwhelmed all else and typically relegated debates on the offset strategy's conventional force improvements to the realm of congressional testimony. In fact, the offset strategy proceeded without much countervailing debate—at least until some of the programs fed by it moved into the procurement phase.

The most lasting cohesion came from focusing on the battlefield. The centerpiece of the offset was not any one technology in particular. It was an operational concept for precision: how to see and target Soviet ground forces and debilitate them quickly enough to prevent them from overrunning Europe. That operational imperative for precision drove forward through the ups and downs of research and development. Programs might start with one intent, then go on to deliver real capability in another, next generation application.

A case in point was Assault Breaker. This concept posited standoff weapons attacking moving, rear echelon armor massed deep behind enemy lines. According to a 1981 Government Accountability Office report, components included: airborne ground moving target indicator radar; missiles with submunitions for airborne or surface launch; and anti-armor self-guided munitions. Topping it all off was a comprehensive communications, command, and control network. The program sought a "uniquely high rate of kill at a much smaller risk and cost than present tactics permit," summarized GAO.

The offset strategy also required aircraft to deliver weapons both in direct attack and at standoff range. Medium-to-high technology aircraft were among the biggest programs. One was known by the code name Tacit Blue (and by testers as "The Whale"). Highly classified at the time, this rounded aircraft was designed to loiter over the battle area, detecting moving targets with radar while protected by its stealthy shape. Tacit Blue was no mere model: The craft weighed in at 30,000 pounds and completed 135 test flights before the program ended in 1985.

Though no operational version of Tacit Blue resulted from the prototyping effort, it spun off stealth technology that found its way into the B-2 bomber, while the radar became the centerpiece of the E-8 JSTARS ground surveillance aircraft.

Assault Breaker was a canonical offset program in that it spawned much interesting research and experimentation. The Army's Corps Support Weapon System was another spinoff. In CSWS, USAF's Pave Mover target radar on an F-111 aircraft would view the cluster of Soviet tanks and provide down link guidance to a ground station, which would then launch missiles as the Pave Mover kept track. The missiles would dispense wide area anti-armor submunitions.

Ultimately the offset strategy depended on investment in major programs to deliver capability to the combatant. One favorite of Brown was the Airborne Warning and Control System, or AWACS. Brown accelerated the program as the Carter Administration began, and the purchase of E-3 AWACS aircraft by NATO "sent a signal to the Soviet Union," he observed. AWACS made NATO "more useful not only militarily but also politically, because the planes showed the Soviet Union that the United States and NATO had become more integrated," added Brown.

The thinking behind the offset strategy was of course a spur to stealth programs such as the F-117 and the B-2. The Soviets' vast investment in air defense radars could be rendered obsolete by aircraft whose radar signature was so sharply attenuated that they could fly undetected between the radars.

Offset strategy programs kicked into high gear under President Ronald Reagan, who took office in January 1981 primed to rebuild US military power.

The situation was worse than the new Administration had thought.

According to *Reagan's Ruling Class,* "the principal shock was to find out, through daily briefings, the extent and the size of the Soviet buildup and the rapidity with which it had taken place—in all areas, land, sea, and air," Defense Secretary Caspar W. Weinberger told reporters after a short time in office.

"There was the window of vulnerability, which the Administration at that time felt very strongly about being able to close," said retired Air Force Lt. Gen. Richard M. Scofield, who spent much of the Reagan years leading the F-117 and then the B-2 program.

The Reagan Administration would also move offset technologies from Pentagon research portfolios to major service programs. The Administration provided funding and continued focus, and through the 1980s, a new wave of capabilities specific to the tactical air forces came into being.

The change was remarkable. As late as 1978, Gen. David C. Jones despaired of USAF capabilities to hit moving targets—or any targets—at night and in Europe's poor weather.

"It would be prohibitively expensive for us to build all, or even most, of our aircraft to operate all night or in bad weather," he said that year.

By 1983, however, USAF had several programs under development that would yield just that capability. An infrared seeker for the Maverick anti-tank missile was one. The LANTIRN pod system, combining navigation and targeting in low-light conditions, was another. The air-to-air Sparrow missile follow-on begun in 1977 was now gelling under the name AMRAAM.

Lt. Gen. Kelly H. Burke, a senior acquisition leader, explained in a hearing on DOD's 1981 appropriations that the "confluence of technology" propelling LANTIRN and other programs would soon give USAF's single-seat fighters "a very good night/under the weather capability at low altitude with multiple kills per pass." This was just the force needed to parry Soviet conventional power and keep the enhanced communist nuclear forces at bay.

The true maturation of the offset depended on the US armed services funding major programs—or collaborating together.

THE 31 INITIATIVES

One early 1980s collaboration between the Army and the Air Force, led by their respective Chiefs of Staff, was called the 31 Initiatives. These were framed in tactical doctrine spanning concepts for air defense, suppression of enemy air defenses, rear area operations, joint munitions development, special operations, and fusion of combat information.

Many of the Assault Breaker concepts reappeared in the 31 Initiatives. The joint munitions work and combat information initiatives prompted offset technologies. For example, Initiative 20 designated a single Air Staff manager for improving night attack capabilities. The operational concept was to shore up close air support and precision attack at night; but the means to do so drew on technologies funded under the offset strategy.

Two of the 31 were clear descendants of the offset strategy. Initiative 18 set in motion the Joint Tactical Missile System first dubbed JTACMS but later known simply as ATACMS. This was the use of precise, standoff weapons akin to the idea

DOD photo via National Archives

A NATO E-3A AWACS assigned to Geilenkirchen AB, West Germany, takes off in 1988.

USAF photo

Tacit Blue at the National Museum of the United States Air Force in Dayton, Ohio.

USAF photo by SSgt. Jose Lopez

An F-111 carrying four GBU-10 Paveway II bombs and a Pave Tack laser target designator banks over Loch Ness, UK.

of using American precision to offset Warsaw Pact mass. The Army would adapt its JTACMS to a ground-launched system with better range than its artillery. The Air Force sought an air-launched weapon for rapid strikes on air defenses and other offensive counterair targets.

Initiative 27 pledged the Army and Air Force to fund JSTARS. This was a direct result of the offset funding of Tacit Blue and airborne battlefield radar. Though JSTARS was not the program first envisaged in the heyday of the offset in the 1970s, it became, over time, a way to reveal enemy movement on the battlefield. JSTARS' operational payoff began in the 1990s, in Iraq, Serbia, and Afghanistan.

Deputy Secretary of Defense Work reckons the Second Offset took the better part of two decades to bear fruit; by his account, the ARPA program of 1973 marked the true beginning. Fortunately, the offset's research and development efforts carried real weight in international diplomacy long before battlefield forces were fully equipped.

The first big success registered in 1984. As Work told it, the Soviet General Staff looked at intelligence on the developing "reconnaissance strike complexes"—their term for what in the West was becoming known as the Revolution in Military Affairs—and concluded that Western militaries employing these "very accurate terminally guided conventional munitions would achieve the same destructive effects as tactical nuclear weapons."

Work said the Soviets were "very model-driven at that time," and once they ran the models, "they said, 'Game over.'"

Airmen took the lead in demonstrating the early results of the offset strategy. In 1986, Operation El Dorado Canyon—the retaliatory raid on Libya for its role in bombing US servicemen at a West Berlin nightclub—gave the world a taste of these technologies. Air Force F-111s in the raid employed the Pave Tack infrared acquisition pod to deliver 500-pound bombs precisely. At least one scored a direct hit on a Libyan Il-76 transport airplane parked at Tripoli's airport. Navy A-6s also conducted precision attacks.

Five years later, in Operation Desert Storm, precision attacks grabbed world headlines. The US had developed technology it knew the USSR "couldn't copy," said Work. "And we demonstrated [it] in 1991 to the rest of the world, and it really had a giant impact."

Desert Storm saw the use of AWACS, a pair of experimental JSTARS, new radar missiles, anti-radar missiles, laser guided bombs, satellite guided missiles, satellite-aided navigation and timing, and stealth. All together, the Second Offset technology thoroughly overwhelmed the Soviet-built Iraqi air and ground forces. The Soviet Union realized its military technology had been rendered obsolete, and this massive vulnerability played no small role in the final dissolution of the Soviet Union that same year.

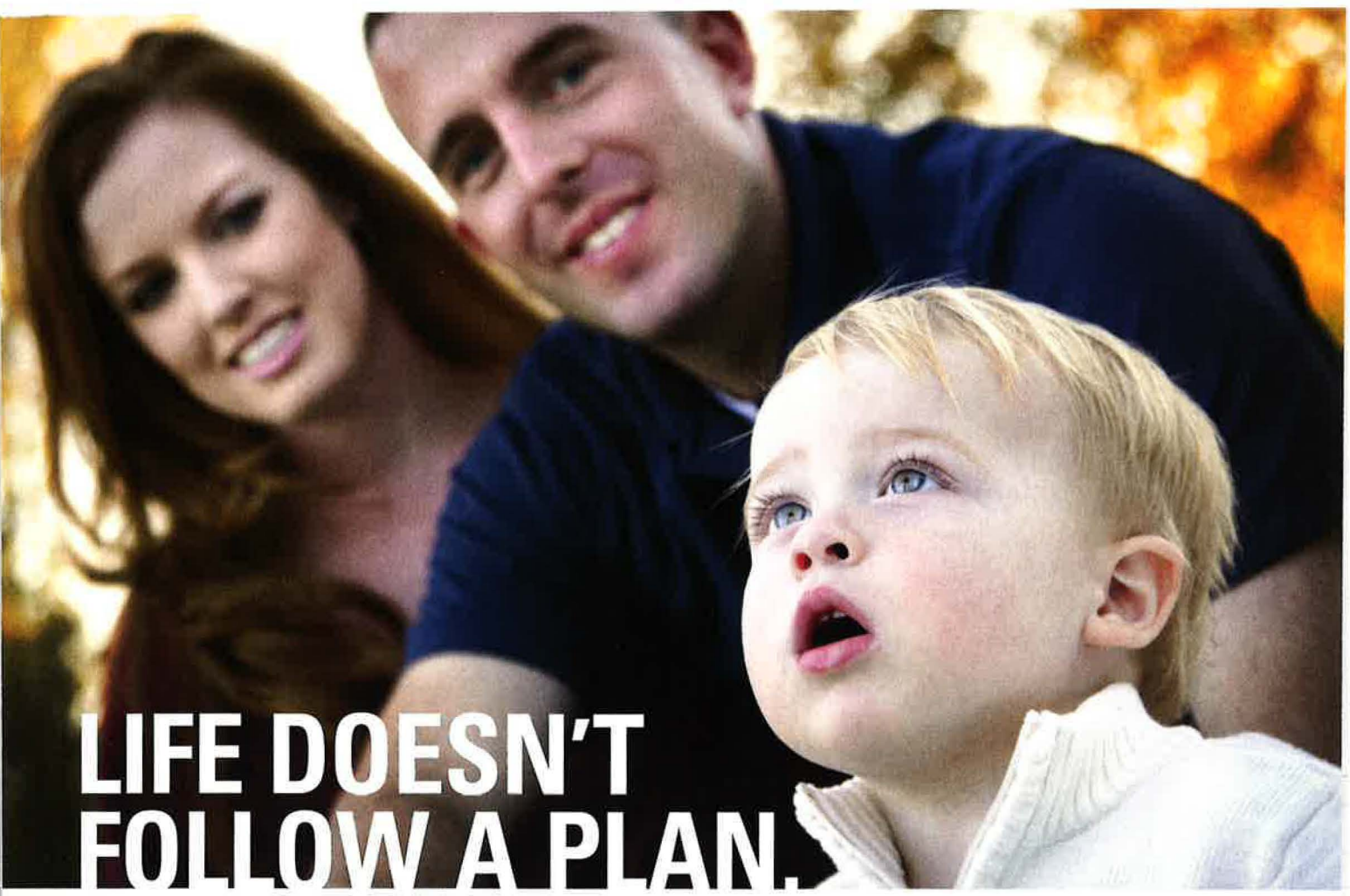
The Second Offset didn't stop there. Laser guided bombs worked well, but not in bad weather. After an aggressive development program, every bomb-dropping aircraft in the US combat fleet became a precision-attack platform with the widespread deployment of the JDAM bomb, guided by Global Positioning System satellites. Innovative design and large production made extreme precision not only widespread, but relatively cheap. The calculus of air warfare had been turned on its head: No longer did airmen have to plan for how many aircraft were needed to destroy each target; now it was about how many targets could be destroyed by a single aircraft.

The Second Offset played a big role in the air campaign against Serbia in 1999. For the first time, enemy real estate was given up solely because of American attack from the air.

In order to succeed, the Second Offset demanded an initial vision, time, investment over many years, and the willingness of the political parties to keep it going when political power changed hands back and forth.

Brown summed it up best: "The Carter Administration initiated and developed these programs, the Reagan Administration paid for their acquisition in many cases, and the ... Bush Administration employed them." ✪

Rebecca Grant is president of IRIS Independent Research. Her most recent article for Air Force Magazine, *"Horner's Gulf War," appeared in the March issue.*



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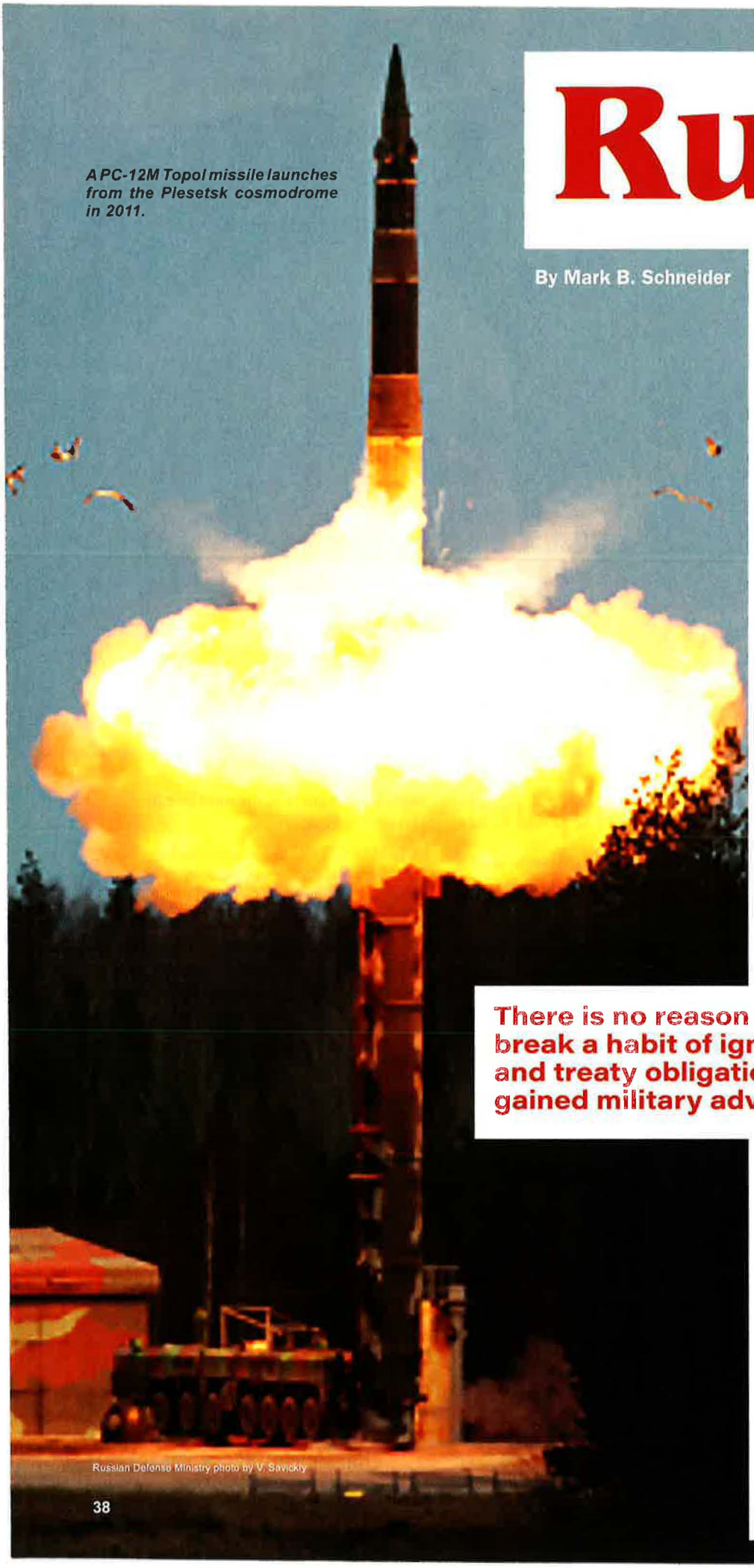

A PC-12M Topol missile launches from the Plesetsk cosmodrome in 2011.

Russian Defense Ministry photo by V. Savitskiy

Russia

By Mark B. Schneider

Since the 1970s, Russia has cheated on its arms control agreements, clearly seeing this tactic as a tool to gain military advantages over the US and leverage over Russia's neighbors. Many Administrations, either in hopes of keeping the arms control process alive or simply not wanting to inflame relations, have looked the other way while this was happening, but past precedent bodes ill for future strategic dealings with Russia.

In violation of its various arms control agreements, Russia has developed new strategic nuclear weapons; is building new strategic bombers; has developed new nuclear-capable sea-launched cruise missiles; and has moved to make its air defense systems dual-capable, doubling as treaty-prohibited ground-launched nuclear weapons.

Russia shows no inclination to give up this tactic and has in fact stepped up its rhetoric that it will resort to nuclear weapons first if it feels threatened.

The first serious government effort to examine the problem didn't occur until the Reagan Administration. In 1985, President Ronald Reagan informed Congress of "a pattern of Soviet noncompliance" and said the Soviet Union had violated "its legal obligation under, or political commitment to, the [Strategic Arms Limitation Talks I Anti-Ballistic Missile] Treaty and Interim Agreement, the SALT II agreement, the Limited Test Ban Treaty of 1963, the Biological and Toxin Weapons Convention, the Geneva Protocol on Chemical Weapons, and the Helsinki Final Act. In addition, the USSR has likely violated provisions of the Threshold Test Ban Treaty."

There is no reason to expect Russia to break a habit of ignoring its arms control and treaty obligations. By doing this, it has gained military advantages for decades.

Things didn't improve when the Soviet Union went out of business. A 2015 House Armed Services subcommittee report noted, "The Russian Federation is not

Cheats

complying with numerous treaties and agreements, including the [Intermediate-Range Nuclear Forces] Treaty, the Open Skies Treaty, the Biological Weapons Convention, the Chemical Weapons Convention, the Vienna Document, the Budapest Memorandum, the Istanbul Commitments, the Presidential Nuclear Initiatives, [and] the Missile Technology Control Regime." It also stated that Russia had withdrawn from the Treaty on Conventional Armed Forces in Europe (CFE).

The evidence indicates that such violations aren't accidents, one time incidents, misunderstandings, or legitimate disputes over treaty interpretation, and they are often quite militarily significant. If a legal or political commitment hinders an important Russian objective, it tends to be ignored. Cheating can result in numerical advantages, more effective weapons, and in some cases, lower costs.

Unlike Russia, the US has long and optimistically viewed arms control as a way to reduce the probability and destructiveness of conflict. In November 1975, British strategist Colin S. Gray wrote in *Air Force Magazine* that the Soviets conducted arms control negotiations in "a fairly crudely combative way." Russia, he said, saw arms control as a "political struggle." Absent a response, cheating gives Russia military advantages.

NUCLEAR THREATS

Soviet/Russian military doctrine allowed for the first use of nuclear weapons in conventional war, and today Russia threatens nuclear attacks. In June 2015, Deputy Defense Secretary Robert O. Work and then-Vice Chairman of the Joint Chiefs of Staff Adm. James A. Winnefeld Jr. told Congress, "Russian military doctrine includes what some have called an 'escalate to de-escalate' strategy—[one] that purportedly seeks to de-escalate a conventional conflict through coercive threats, including limited nuclear use," a policy they described as "playing with fire."

Russia's nuclear doctrine affects its policy on nuclear reductions, arms control, and compliance. Willingness to use nuclear weapons provides the motive for resisting nuclear arms cuts and for cheating. Indeed, during Russia's New Strategic Arms Reduction Treaty ratification process, its defense minister said Russia intended to increase its strategic nuclear forces. Since New START entered into force in 2011, Russia increased its deployed warheads, deployed delivery vehicles, and deployed and nondeployed delivery vehicles, reaching 1,735 deployed warheads by March 2016, an increase of 198.

Since the signing of New START in 2010, Russia has refused to negotiate deeper cuts in strategic nuclear weapons or limits on tactical nuclear weapons. In a Russian newspaper interview in 2013, Sergei B. Ivanov, Kremlin chief of staff, explained why: "When I hear our American partners say, 'Let's reduce something else,' I would like to say to them, 'Excuse me, but what we have is relatively new.'" The Americans, he said, "have not conducted any upgrades for a long time. They still use Trident [missiles]."

Failure to call Russia out on cheating increases its incentive to do it, and American officials have long been reticent to challenge Russia on its violations or respond to them. With the exception of the Reagan Administration's 1986 termination of US observance of the SALT I and II agreements in response to multiple Soviet violations, there's been no substantive US response to Russian violations.

Russia's invasion of Ukraine and the annexation of Crimea violate a number of arms control and international security agreements. Secretary of State John F.

An SS-27 Sickle B mobile ballistic intercontinental missile is prepared at the Alabino training ground near Moscow for the 2012 Victory Day parade.

Photo by Vitaly V. Kuzmin

Kerry said, "The United States condemns the Russian Federation's invasion and occupation of Ukrainian territory and its violation of Ukrainian sovereignty and territorial integrity in full contravention of Russia's obligations under the UN Charter, the Helsinki Final Act, its 1997 military basing agreement with Ukraine, and the 1994 Budapest Memorandum." The Budapest Memorandum was a condition for the START entry-into-force and the denuclearization of Ukraine.

The Obama Administration also says Russia is violating the CFE Treaty, which was intended to limit the amount of conventional military forces in Europe. This is particularly significant in light of Russia's aggression against Ukraine and the ensuing European crisis. But even before Moscow suspended its obligations under the CFE Treaty in 2007, it had been in violation of its terms. Russia actually admitted this in 1999, according the the Arms Control Association. In March 2015, TASS news agency reported that Anatoly I. Antonov, deputy defense minister, said the CFE Treaty "is dead and there are no prospects for reviving it." A month later, TASS quoted Anton Mazur, the head of the Russian delegation at the Vienna talks on military security and arms control, as saying that while Russia "formally remains [a]party of the CFE Treaty ... there will be no return to the treaty." There's no legal basis for Russia's long-term refusal to comply with CFE while remaining a party to it.

By increasing the level of forces arrayed against parts of Europe, Russia's violation of the CFE Treaty has enhanced its military capability against some NATO states. Russia's suspension of CFE inspections reportedly blocked information about its preparations to attack Georgia in 2008.

The most common Soviet/Russian arms control violations have involved the nuclear treaties that were the focus of bilateral arms control. The full scope of Russian noncompliance is not in the public domain because there's only been one comprehensive and unclassified compliance report since 1993. US law, however, requires an annual report with "a specific identification, to the maximum extent practicable in unclassified form," of each potential violation of an arms treaty.

VERIFICATION ISSUES

The 2005 State Department compliance report documented Russian violations of important verification provisions of the START agreement, but its discussion was limited to issues active that year. The next compliance report wasn't issued until 2010 and revealed that the US had raised some compliance issues since the previous report, but didn't disclose what those were, except that some involved verification.

The Obama Administration has said the most common Russian violations of START involved warhead counting inspections and telemetry provisions.

There were substantive Russian START violations. One of the most significant was the Russian failure to eliminate 22 SS-18 heavy ICBM silo launchers, as required, annually for over three years in the 1990s. According to Russia's own unclassified START data declarations, it had 28 more deployed 10-warhead SS-18s than allowed under START.

Another apparent START violation will shape Russian strategic nuclear forces for decades to come. Russia tested the SS-27 Mod 1/Topol M Variant II ICBM—which was supposed to have a single warhead—with multiple independently targetable (MIRV) warheads from 2007 through the expiration of the START agreement in 2009. Through these tests, Russia developed and deployed the MIRVed SS-27 Mod 2.

Russia gave this missile a new designator and name (RS-24/Yars)—apparently to conceal the START violation under the rubric of a "new type" of ICBM.

Prior to START, Russia violated a number of SALT II provisions, including the limit of one "new type" of ICBM. The Reagan Administration concluded that the Soviet SS-25 mobile ICBM (still deployed) was a prohibited second new type of ICBM. The Soviet SS-18 Mod 5 heavy ICBM (still deployed) was a prohibited third.

Russia has gained advantages from ignoring its legal and political commitments regarding testing of nuclear weapons. Likely Soviet testing well above the 150-kiloton yield limit of the Threshold Test Ban Treaty apparently aided development and deployment of more powerful and reliable MIRVed Russian nuclear warheads. The 2009 US Strategic Commission report stated, "Apparently Russia and possibly China are conducting low-yield tests." Reports of low-yield hydronuclear tests have appeared in the Russian press since the 1990s. President Boris Yeltsin's April 29, 1999, decree on nuclear weapons development reportedly approved "hydronuclear field experiments."

Senior Russian officials have said they are developing and introducing new and improved types of nuclear weapons. According to Russian expatriate Pavel Podvig, an expert on Russian strategic forces, the new nuclear warhead for its Bulava-30 SLBM has three times the yield-to-weight

Russian President Vladimir Putin in the cockpit of a Tu-160 bomber before military exercises at Chkalovsky Airfield in 2005.

Photo by Oleg V. Belyakov

Russian officials have said the Su-34 would be modified to carry long-range nuclear missiles.

ratio of the best small warheads the Soviets had during the Cold War.

Russia is also cheating egregiously with regard to the INF Treaty and the 1991-92 Presidential Nuclear Initiatives (PNIs). It is now modernizing weapons that were supposed to have been eliminated.

In 2014, the Obama Administration called this "a very serious matter" and determined "the Russian Federation was in violation of its obligations under the ... INF Treaty ... not to possess, produce, or flight-test a ground-launched cruise missile with a range capability of 500 [kilometers] to 5,500 [km] or to possess or produce launchers of such missiles."

This violation goes to the heart of the treaty. According to a senior State Department official, "The Russian system is a state-of-the-art GLCM [ground-launched cruise missile] that Russia has tested at ranges capable of threatening the European continent."

Rose E. Gottemoeller, State Department undersecretary for arms control and international security, said in December 2015 testimony, "This is not a technicality, a one-off event, or a case of mistaken identity, but a serious Russian violation of one of the most basic obligations under the INF Treaty."

ENABLING EXPANSIONISM

Commenting a year ago on the State Department arms control compliance report, Congressman Mac Thornberry (R-Texas), chairman of the House Armed Services Committee, stated, "Russia's development of intermediate-range nuclear platforms is designed to hold our interests at risk and enable [President Vladimir I.] Putin's expansionist policies."

Russian press reports have cited other developments that appear to be recreating the systems eliminated by the INF Treaty. These include:

- Testing and deployment of the R-500 cruise missile with a range of 1,000 km (621 miles) or more.
- Development of the RS-26, an intermediate-range missile masquerading as an ICBM (a possible violation or circumvention of both the INF Treaty and the New START agreement).
- Nondeclaration and elimination of the late Soviet-era Skorost IRBM.
- Giving surface-to-air missiles and ABM interceptor missiles a surface-to-surface nuclear attack role.
- The reported 600- to 1,000-km (373- to 621-mile) range of the Iskander-M ballistic missile and the possible range of a new version of the missile.

Russian journalist Pavel E. Felgenhauer said in 2010 that Moscow plans to covertly quit the 1987 treaty on medium- and short-range missiles because its air defense missiles could double as nuclear armed intermediate-range ballistic missiles. The Russian S-300 and the S-400 air defense missiles, the new S-500 air and missile defense interceptor, and the Moscow ABM interceptors are nuclear armed and could function either as conventional or nuclear medium- or shorter-range ballistic missiles. He said this capability was demonstrated in the Vostok 2010 military exercise conducted in the Far East.

In April 2015, Felgenhauer wrote that the Russian S-300 system (the shortest range system he listed) has a nuclear ground attack capability and a range of "up to 400 kilometers" [249 miles]. A link attached to the article revealed one of his sources as the President of Belarus. In February 2016, Felgenhauer said the S-300PMU2, which Russia plans to sell to Iran, can attack "land and sea targets" with precision. In February 2016, TASS reported the S-400 "can also be used against ground objectives." A 2011 *Red Star* article said Russia has 700 nuclear warheads for the Moscow ABM system and its surface-to-air missiles.

If Felgenhauer is correct about these capabilities, at least two of the systems he mentioned (the Moscow ABM and the S-500) violate the INF Treaty. The development of a dual-capable anti-air/anti-ground capability would also have

Suspected Russian gunmen on patrol at Simferopol Airport in Ukraine's Crimean peninsula in 2014. Oddly, the rifle carried by the gunman on the right does not have a magazine inserted.

important implications for US Air Force and Navy aviation. If dual-capable missiles can be launched at surface or naval targets without the use of the radar, missions to suppress or destroy enemy air defense could fundamentally change. Individual launchers may have to be targeted, and they would have substantial self-defense capability.

In 2004, then-Assistant Secretary of State for International Security and Nonproliferation Stephen G. Rademaker voiced Washington's concern that "Russian commitments have not beeen entirely fulfilled" under the Presidential Nuclear Initiatives of 1991-92 to reduce tactical nuclear weapons in Europe. Among the reported PNI violations is the retention and modernization of battlefield nuclear weapons (nuclear artillery, short-range nuclear missiles, and nuclear land mines) that Russia had pledged to eliminate by 2000.

These weapons can support Russian coercive threats of nuclear escalation and threaten NATO's capability to defend itself against Russian attack. There's also open-source evidence that Russia is violating its PNI commitment not to deploy nuclear weapons on naval ships routinely, other than on ballistic missile submarines, and not to develop new types of nuclear sea-launched cruise missiles (SLCMs). The new Kalibr SLCM, which Putin has just said *is* nuclear-capable, is prohibited under a Russian PNI commitment not to develop new nuclear SLCMs.

Russia also announced in 2015 it had built a few new Tu-160 Blackjack bombers and would build at least 50 more—a move prohibited under PNI.

Despite Russian violations, the US remains in full compliance with its PNI commitments. This has created an asymmetric situation that eliminates in-kind deterrence, rather ominously in the context of current Russian aggression and explicit nuclear threats.

Russian compliance under New START is also suspect. Unclassified State Department New START reports say the US has "raised implementation-related questions with the Russian Federation" but the reports have not revealed what these issues are.

In 2014, Brian P. McKeon (then a senior National Security Council official, at his nomination hearing for principal deputy undersecretary of defense for policy) stated that, in September 2010, the Senate had been informed of a compliance issue that "implicated possibly New START, possibly INF."

CHEATING AS DOCTRINE

In December 2014, Colonel General Sergey Karakayev, commander of Russian ICBM forces, said, "There are currently around 400 missiles [ICBMs] with warheads on combat duty." Legally, Russia is only allowed about 300 ICBMs on alert. Of note, in 2011, the Russian space agency published a request for proposals for eliminating ICBMs including the Kuryer, a late Soviet-era small mobile ICBM.

This missile should have been declared under START and the New START, but wasn't.

In 2012, the Russian air force's commander stated the Su-34 strike fighter would be given "long-range missiles. ... Such work is underway, and I think that it is the platform that can solve the problem of increasing nuclear deterrence forces within the air force strategic aviation."

Legally, though, this can't be done without declaring the Su-34 a heavy bomber, which has not been done. There are reports of long-range nuclear cruise missiles on the Tu-22M Backfire bomber, raising the same compliance issues.

Russian arms control violations are now a normal and predictable Russian behavior. Cheating is linked to its military doctrine and force posture that in turn is linked to Russian foreign policy goals. Russian noncompliance is quite simply for the purpose of achieving military advantages.

British Army Gen. Adrian J. Bradshaw, deputy NATO Supreme Allied Commander, Europe, has voiced concern that Russia might launch a conventional attack on a weak NATO state, threatening nuclear escalation to deter a response.

Cheating on arms control agreements is certainly not the only reason why Russian strategic rocket forces are seeing increases in numbers and capability, but it has contributed substantially to that growth.

Meanwhile, the military and political significance of Russian arms control violations both nuclear and conventional has been all but ignored in the West. Russia's habit of ignoring its treaty obligations has provided it with military advantages, backstopping its aggressive assaults on Ukraine and Syria.

"Simply collecting agreements will not bring peace," Reagan observed in 1982. "Agreements genuinely reinforce peace only when they are kept. Otherwise, we're building a paper castle that will be blown away by the winds of war." ✪

Mark Schneider is a retired member of the DOD Senior Executive Service. He is now a senior analyst at the National Institute for Public Policy. His most recent article for Air Force Magazine, *"Zero Deterrent?", appeared in the August 2012 issue.*

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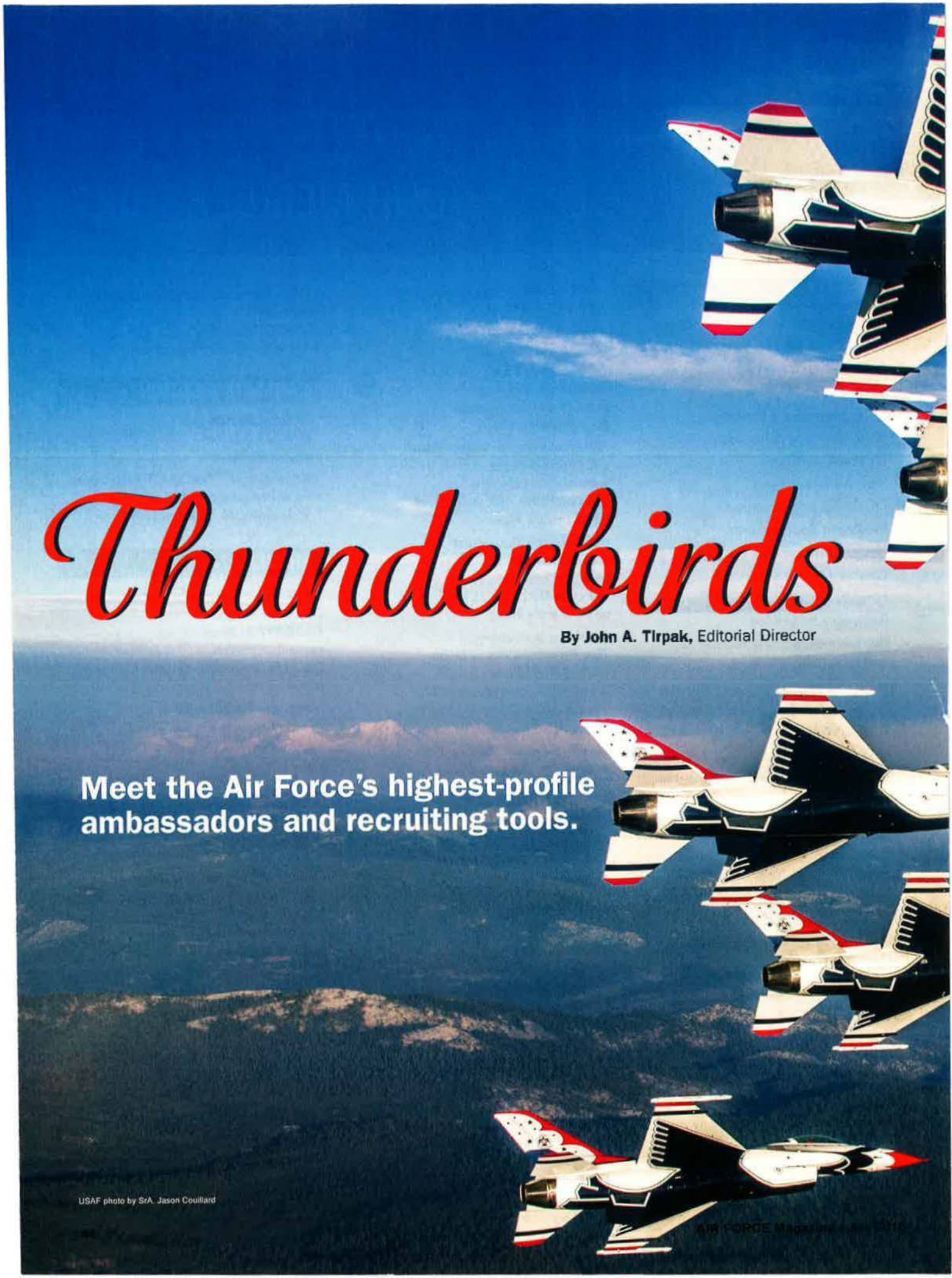


Thunderbirds

By John A. Tirpak, Editorial Director

Meet the Air Force's highest-profile ambassadors and recruiting tools.

USAF photo by SrA. Jason Couillard

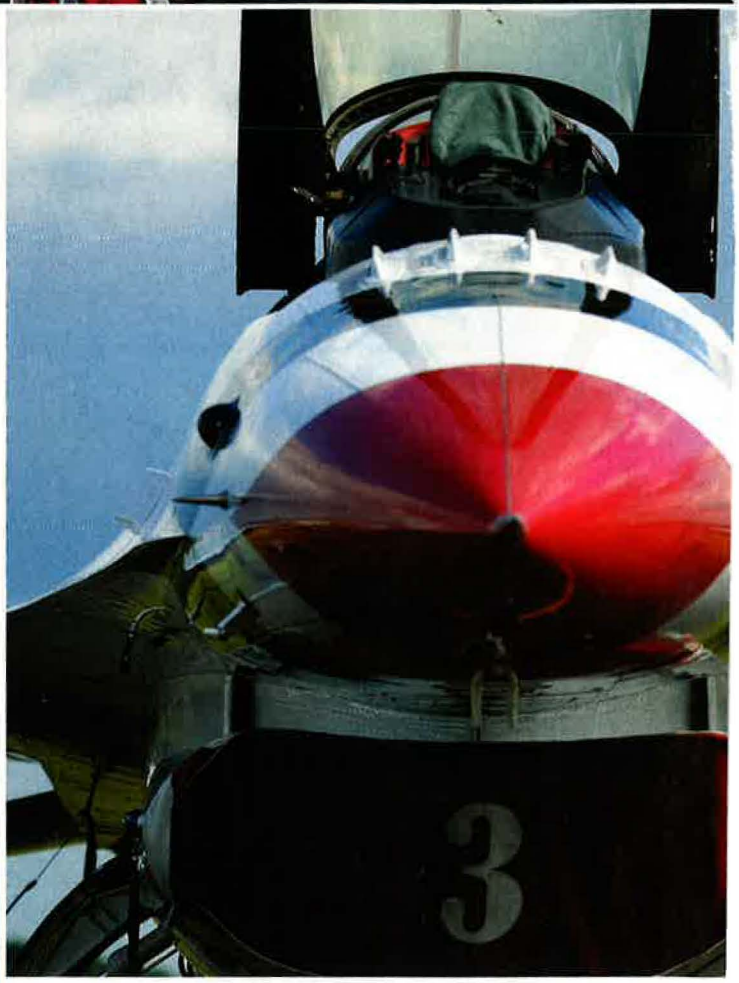
The Thunderbirds soar in the Delta formation in August 2015.

As the narrator announces, "Ladies and gentlemen, *your* United States Air Force Thunderbirds!" the crowd scans the sky, searching the horizon left and right for the polished red, white, and blue F-16s. Suddenly, the entire flight line shudders as the six jets boom overhead, surprising the audience by zooming in from behind. Startled but grinning, the crowd whoops and cheers. The show is on.

At about 40 venues a year—nearly every weekend from March to November—the Air Force's Thunderbirds aerial demonstration team shows off what high-performance fighters can really do in the hands of skilled aviators. After a ground show of about 20 minutes, in which the trim, blue-suited pilots march to their jets, salute their crew chiefs, strap in, and taxi off, the team treats air show attendees to a 40-minute program of solo high- and low-speed passes, seemingly suicidal games of aerial chicken, snap rolls, and inverted flight, interspersed with graceful formation maneuvers and turns in such tight, precise proximity the jets seem welded together. It all comes to a climax with the Bomb Burst, as all the jets fly toward show center, pull into a steep climb, spin, trail smoke, and finally separate to roar off toward all compass points. So dramatic and well-known is the maneuver that it inspired the design of the Air Force Memorial, just outside Washington, D.C.

USAF photo by TSgt. Manuel J. Martinez

USAF photo by SrA. Jason Couillard



Counterclockwise from left: The two solos peel off from the Delta formation at Daytona Beach, Fla., in 2014. / The Line Break Loop maneuver. In the "clean" configuration, the F-16C is one of the most agile jets in the Air Force. / SSgt. Stephen Leonardi, a crew chief, makes a postflight check on No. 3 in 2011 at RAF Waddington, UK. / Maj. Jason Curtis, then No. 5, signs a Thunderbirds toy for a fan at Dyess AFB, Texas, in 2015. / Maj. Curtis Dougherty chats with a future airman before a practice at JB Andrews, Md., in 2015.

Though much of the crowd will head for the exits after the finale, many will linger. After taxiing in, the pilots will usually walk over to what they call the "autograph line" to shake hands, pose for pictures, and chat up starstruck youngsters.

"I can't tell you how many times people have said to me, 'You [the Thunderbirds] are the reason I joined the Air Force,'" said team commander—and Thunderbird 1—Lt. Col. Christopher B. Hammond in an April interview. Though drawing a direct cause-and-effect relationship between USAF recruiting and Thunderbirds performances isn't easy, Hammond observed, "The decision to join the Air Force doesn't happen when you're 18 years old." Typically, the seeds of an Air Force career are planted at a young age, and often at a Thunderbirds show, he said.

Air Education and Training Command sees a definite link. An AETC spokeswoman said, "When Thunderbirds are present at air shows, registrants increase by 40.49 percent, and leads increase by 43.76 percent." A "registrant" is someone close to enlistment age who signs in at an Air Force recruiting trailer to take in a short video about the service. A "lead" is someone who's not only interested but qualified to enlist and whose name is referred to the recruiting service.

Most of the pilots he's encountered got the bug to join by seeing the Thunderbirds put on their dramatic performance, Hammond said. US Air Forces in Europe commander Gen. Frank Gorenc, in a recent talk with reporters in Washington, D.C., volunteered that the Thunderbirds hooked him, too.

"The mission, the airplanes intrigued me," Gorenc said. "When I was growing up, my dad used to drag [us] to the air shows, and I used to go watch the Thunderbirds. I grew up in the time [when the Thunderbirds flew] the F-4s. ... We were drawn to the Air Force by the public displays of the military and the people that represented the military." Gorenc's older brother, Stanley, then Gorenc himself—both immigrants—earned appointments to the Air Force Academy and became pilots and USAF general officers.

Gorenc added, "I'm an absolute beneficiary of the military being out there at air shows demonstrating to the American people exactly what we're buying and the people who are operating [the equipment]. ... That inspired me."

Hammond said the team's mission is to show off "the precision, professionalism, and power of the Air Force,"

USAF photo by SrA. Daniel Hughes

USAF photo by SSgt. Larry E. Reid Jr.

so taxpayers can get a glimpse of what they're getting for their military dollar, and yes, to encourage youth to want to join up.

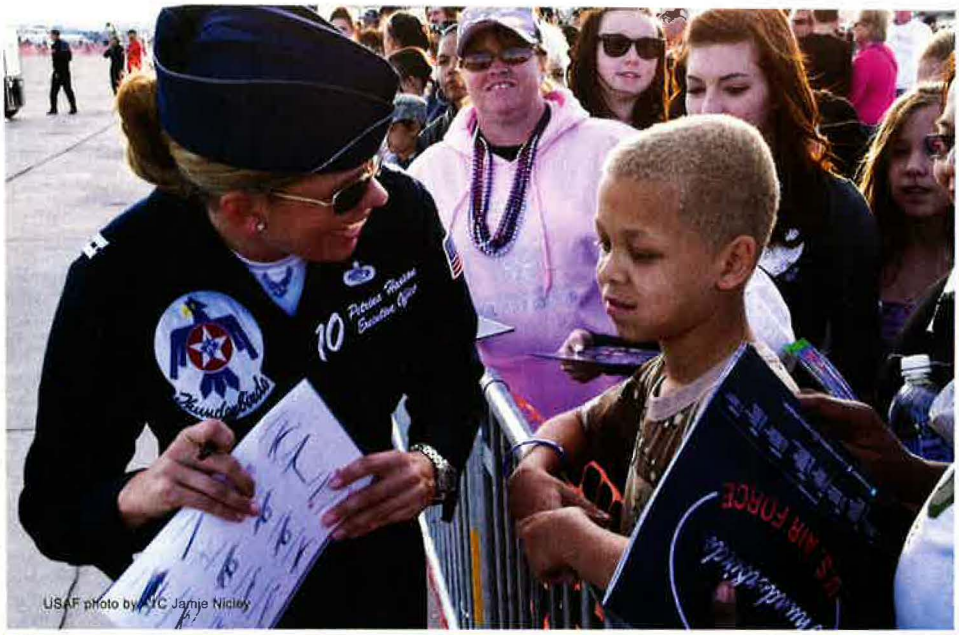
To avoid disappointing fans, Hammond said the team has three shows ready to go, depending on the weather. The "high" show is the full program, flown on days with sunny skies and high ceilings; "medium" is flown on gray days with lower ceilings and eliminates the high-altitude formation work; and "flat" is a basic series of passes that hug the airfield in marginal weather.

Opposite, top: The T-Birds in trail over Nellis AFB, Nev., at a 2012 open house. In some formations, the jets fly as close as 18 inches apart. Opposite, bottom: TSgt. Joseph Maestre leaps to chock his Thunderbirds jet after a 2012 training sortie. Clockwise from top: SSgt. Tacota LeMuel, then T-Bird 7 crew chief, polishes her jet in Cleveland, 2011. Behind is an un-numbered two-seater, used as a spare or for crew or VIP orientation flights. / SSgt. Eduardo Sibaja, then assistant crew chief on No. 6, applies a new flag prior to a performance in Finland. Due to budget austerity, the team has not traveled overseas since the 2013 sequester. / A team member stands ready to start preflight checks at JB Langley-Eustis, Va., in April. / No. 8 checks controls before a media flight. Below: TSgt. Andrew Junker explains his job to high school students at Newport News (Va.) Aviation Academy in April.

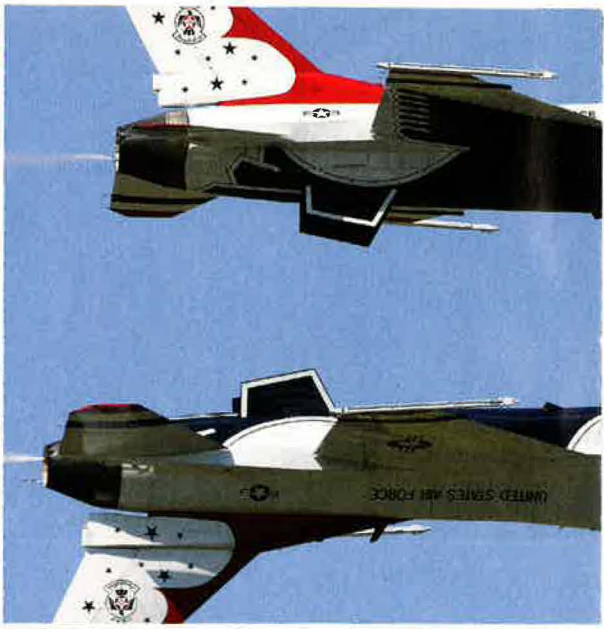
Air shows are only a fraction of the team's activities, however. Aside from the performances themselves, there is extensive advance work for every venue. The team pays prearranged calls at elementary, middle, and high schools, vocational schools, hospitals, and churches. They meet with community organizations, Boy Scouts and Girl Scouts, ROTC and Junior ROTC cadets, and kids from Special Olympics. They also visit with airmen at the bases, both as a morale-builder and to recruit members to the team.

"I'd say 60 to 70 percent of our time is engagement with the public," Hammond observed. "The reception is always warm. Ever since Desert Storm [in 1991] our relationship with the public has been a good one."

One duty that Hammond said is particularly satisfying to him is that at just about every show, "I get to swear in a group of new airmen" or re-enlist oth-



USAF photo by A1C Jamie Nicley



USAF photo by Dennis Rogers

USAF photo by TSgt. Christopher Boitz

USAF photo by TSgt. Christopher Boitz

Historical Thunderbirds

USAF photo via National Museum of the US Air Force

USAF photo

USAF photo via National Museum of the US Air Force

Opposite, clockwise: Capt. Petrina Hanson signs autographs at a 2010 Nellis open house. Even non-pilot team members experience a Thunderbird flight so they can talk up the experience on the autograph line. / Nos. 5 and 6 perform the Calypso pass, one of several mirror-image maneuvers. Note the No. 5 painted so it appears right-side up when the jet is inverted. The No. 5 lead solo pilot also wears an upside-down No. 5 on his flight suit. / SSgt. Madeline Davis explains aircrew life support gear to the author prior to his media flight. T-Birds wear G suits and positive-pressure oxygen masks to overcome high G forces in flight. / Team flight surgeon, No. 9, Maj. Christopher Scheibler explains proper muscle-tensing and breathing techniques before a media flight. The techniques help pilots and aircrew avoid G-induced blackouts. / Two solo jets make a close crossover pass at the Air Force Academy in 2009.

ers. The team also recognizes "hometown heroes, ... firefighters, police, ... someone who's made a difference in the community."

Hammond said the demonstration team gives good value in making that connection between the public and the service, and "It's not just the Air Force." The Department of Defense, in the wake of the 2013 sequester, took a hard look at all the service demonstration teams, such as the Thunderbirds, the Navy's Blue Angels, Army Golden Knights, etc.—"and they think we are all relevant and they revalidated the requirement to keep them operating," he said.

The Air Force cancelled the 2013 season because of the sequester, and the team, based at Nellis AFB, Nev., did not even fly basic proficiency sorties until late that year. While grounded, team pilots visited local schools in the Las Vegas area, while enlisted members took up alternate duties, such as inspecting base housing.

The return to flying had to be done in a "building block approach," adding more difficulty and more jets with each sortie. Eventually, team members were extended for a year so that the regular rhythm of training and performing could be restored.

The team numbers about 110 to120 people, of which 90 are maintainers in dozens of specialties, 12 are officers, and the rest perform logistical and administrative functions, according to Maj. Scott Petz, who flies Thunderbird 8. A Reservist, he's the advance pilot, the show narrator, and also flies VIPs and journalists in one of the team's two-seat F-16Bs. Of the entire complement of the unit, about 60 deploy for a given performance, abetted by a C-17 or two C-130s to haul the support gear.

Pilots do a two-year tour with the team, and their tours are staggered so that half the pilots have a year's seasoning in the aerial routines and can pass on what they've learned. To be selected, they must have more than 1,000 fighter hours, have recommendations from prior commanders, and go through extensive interviews and evaluations. The Thunderbird commander then forwards his preferred short list of new hires to the head of Air Combat Command for final selection.

Enlisted Thunderbirds serve a three-year tour with the team, but they can extend to four. They, too, must be exceptionally proficient in their specialty to qualify and, as Hammond noted, "We all have to be comfortable talking to people."

The enlisted members of the team get to fly in one of the two-seat F-16Bs at least once during their tour. SSgt. Madeline Davis, a life support specialist, said such flights are not for motivation but for essential knowledge.

"I have to know how this equipment is supposed to work up in the air," she said, especially since she has to explain the equipment to VIPs who may have

Bottom left and bottom: The straight-wing F-84 was the first jet of the Thunderbirds. Through most of the team's history, frontline Air Force fighters were the aircraft of choice. / From 1955-56, the swept-wing F-84F Thunderstreak was the team mount. / The F-100 served many years as the T-Bird jet; it was replaced for only six performances by the F-105B. An accident caused the team to go back to the F-100. / The F-4E was the first team jet to be painted white instead of bare metal. A special paint had to be developed for this purpose. / The energy crisis in 1973 caused the team to trade to the far more efficient T-38 Talon trainer. Though not a frontline fighter, everyone who saw a performance could be told that if they qualified and went to USAF flight school, they, too could fly the "white rocket." The team switched to the F-16 in 1983.

USAF photo by SrA. Jason Couillard

USAF photo by TSgt. Manuel J. Martinez

Opposite, top: The T-Birds perform a Diamond Loop over Gary, Ind., in 2015. Opposite, bottom: At the closer of the Amigo Air Show in Santa Teresa, N.M., in 2014, the team performs a finale Delta. This page, clockwise: The team casts a striking shadow on the Ocean City, N.J., boardwalk in 2012. / Maj. Alex Turner, No. 6, fist-bumps a Special Olympics competitor at Joint Base Langley-Eustis in April. / One of the two-seat F-16Bs powers up an orientation flight for the author. / Team commander Lt. Col. Christopher Hammond administers the Oath of Enlistment to new USAF recruits at Langley in April.

never flown in a combat aircraft before. She said enlisted members of the team work the autograph line and have to be able to talk about the Air Force and the flying Thunderbirds.

"We get asked, 'What's it like to fly one of these?' And I'll say, 'Well, I'm not a pilot, but I've been up in one of these jets and it's pretty cool.' And I can talk about that experience." The entire team receives media training once a year.

An email from Brig. Gen. Christopher M. Short, then commander of the 57th Wing at Nellis AFB, Nev.—the Thunderbirds' parent unit—to fighter units around the Air Force went viral in March. Short exhorted fighter unit commanders to encourage more people to apply for the team, as applications were down and he wanted a greater "diversity of gender, ethnicity," and aircraft-type backgrounds. Though there have been women pilots on the team, the 2016 season is an all-male group. Short asked unit leaders to offer their insights as to why fewer top pilots were applying.

"We're on the road a lot, ... 220 days a year," Hammond said. After back-to-back-to-back combat deployments, fewer pilots may wish to sign up for a tour that will keep them away from their families so much, he acknowledged, and "you can't volunteer someone for this." He observed, however, that "the Air Force values diversity, and we want to be representative of the true Air Force."

At every base or airfield visit, the team provides one or two orientation rides in one of the team's two two-seat F-16Bs. The rides are offered to "influencers": opinion-shapers and journalists with large audiences, who would present the Air Force and the Thunderbirds in a favorable light. Prospective guest flyers must pass a full flight physical and fill out elaborate forms explaining how they'll use the experience to broaden public understanding of the Air Force.

Such flights give a real appreciation for the demands of high-performance flying. What looks graceful and powerful from the ground is a rough-and-tumble experience that ranges from shaking and jarring to crushing G forces and weightlessness. In the full Thunderbirds routine, pilots will experience up to nine Gs—nine times the force of gravity, making a 200-pound pilot feel like he weighs 1,800 pounds—and up to three negative Gs: that free-fall sensation like an extended drop from the top of a roller coaster. While enduring these forces, pilots must have their heads on a swivel, keeping constant attention to their instruments, where they are in a given maneuver, where they are relative to the ground, and the other jets, which can be flying as close as 18 inches away.

Petz, the narrator, noted a friendly rivalry with the Blue Angels and said

that while the Navy jets pull a maximum of 7.5 Gs in their F/A-18s, the Thunderbirds pull nine Gs. "We're a little tougher," he joked.

To cope with the physical demands, pilots must spend up to two hours exercising each day. In fact, the Thunderbird show manual for host facilities spells out that the pilots must have free access to a fully equipped gym for the duration of their visit.

The exercise helps the team present a fit appearance. Both officers and enlisted wear a unique, close-fitting uniform. MSgt. Chrissy Best, a Thunderbirds public affairs specialist, said the first time her father saw her in her dark blue uniform, "he asked me, 'how do you work in that?'"

The team practices at its home base at Nellis during the week and deploys on the weekends. Hammond said, "I wouldn't say we are always changing the show, but we are always refining it," making small tweaks that "improve transitions, make things more efficient." A recent add was the inscribing of a heart in the sky as the jets trail smoke.

The ground crew is part of the performance, making exaggerated, precise, squared-off movements as they check the aircraft, remove the chocks, and send the jets on their way.

Despite the lighthearted atmosphere of air shows, flying with the Thunderbirds is inherently risky, given the speed and close proximity of the jets when maneuvering in formation. During the team's 63 years, some 20 Thunderbirds aircrew have died in accidents—three during air shows. The worst was in 1982, when four Thunderbirds, practicing the diamond formation loop, crashed together at Indian Springs Auxiliary Field (now Creech Air Force Base) near Nellis.

The most recent accident was in June, when Thunderbird 6, Maj. Alex Turner, suffered a mishap shortly after a flyover of the Air Force Academy graduation. Turner ejected safely, apparently having been able to trim the F-16 to land largely intact in a field near Colorado Springs, Colo. After any accident, the team usually stands down until the cause is identified and corrective action—if any is needed—has been taken. In 1964, the F-105B was removed as the team's jet after only six performances because a fatal crash indicated the aircraft was unsuitable for the maneuvers demanded.

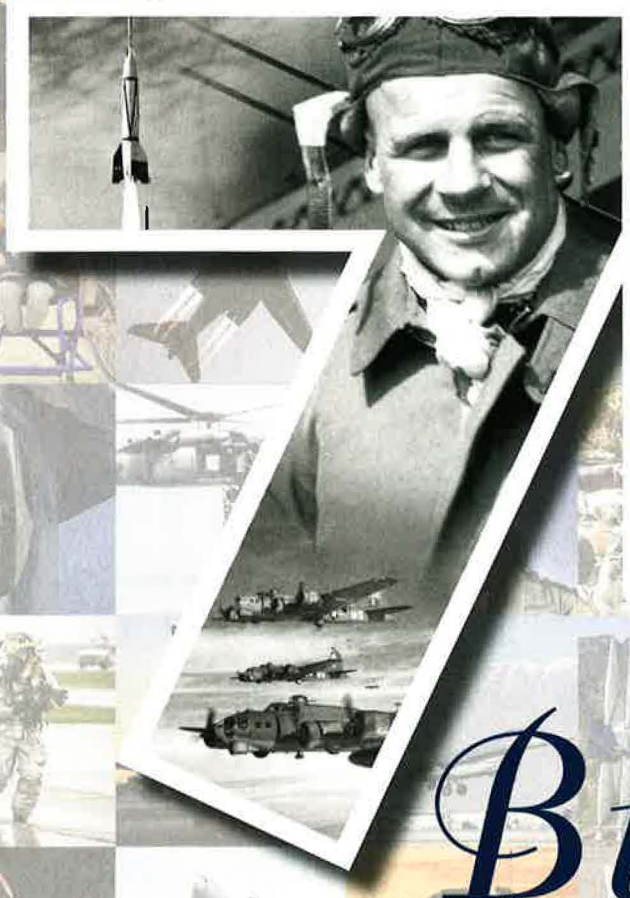
Today's 11 F-16s—eight of which go on the road—differ from combat aircraft only in the addition of the smoke generating system (taking the place of the gun), and the absence of some electronic warfare gear. In a national emergency, the jets can be reconfigured and repainted for combat within 72 hours, Hammond asserted. Most of the team's aircraft came from a combat unit at Mountain Home AFB, Idaho.

The F-16C has performed well with the Thunderbirds, but some of the jets are "nearing the end of their service life," Hammond said, and will probably need a service life extension to continue on in the role. Though realistic-looking computer imagery of the F-35 in the red, white, and blue livery have circulated in recent years, service officials say they've made no decision that the Lightning II will replace the F-16 on the Thunderbirds as it will in the USAF fleet.

For now, "we're here to display the combat might of the Air Force," Hammond said, and the F-16 "does that very well." ✪

Top: The Thunderbirds Bomb Burst maneuver inspired the design of the Air Force Memorial near Washington, D.C. Above: Flying high-performance jets always carries some level of risk. Twenty airmen have died during the team's 63-year history. In June, following a flyby of the Air Force Academy graduation, Maj. Alex Turner safely ejected after a experiencing a problem with No. 6 jet. It crash-landed remarkably intact near Colorado Springs, Colo. Here, crews load the jet 6 onto a trailer for transport to Peterson AFB, Colo.

AIR FORCE ASSOCIATION



70th

Birthday

1946 70 YEARS SUPPORTING THE AIR FORCE FAMILY 2016

The Yom Kippur

It has become popular to discount the value of Operation Nickel Grass, but its importance to Israel was clear enough in 1973.

Three times during the first 25 years of its existence, Israel had soundly beaten the armed forces of the neighboring Arab states, who wanted to wipe Israel off the map. In the Six Day War of 1967, the Israelis had greatly expanded their defensive depth by capturing the Sinai peninsula, the Golan Heights, and the West Bank of the Jordan River.

By 1973, the Israelis had grown dangerously overconfident. Israeli military intelligence rated the probability of war as "very low." The deployment of Israeli Defense Forces in the Sinai and on the Golan Heights was thin.

In an article published in July 1973, Yitzhak Rabin, former IDF chief of staff and a future prime minister, cited a "widening gap of military power in Israel's favor" and said that "Israel's military strength is sufficient to prevent the other side from gaining any military objective."

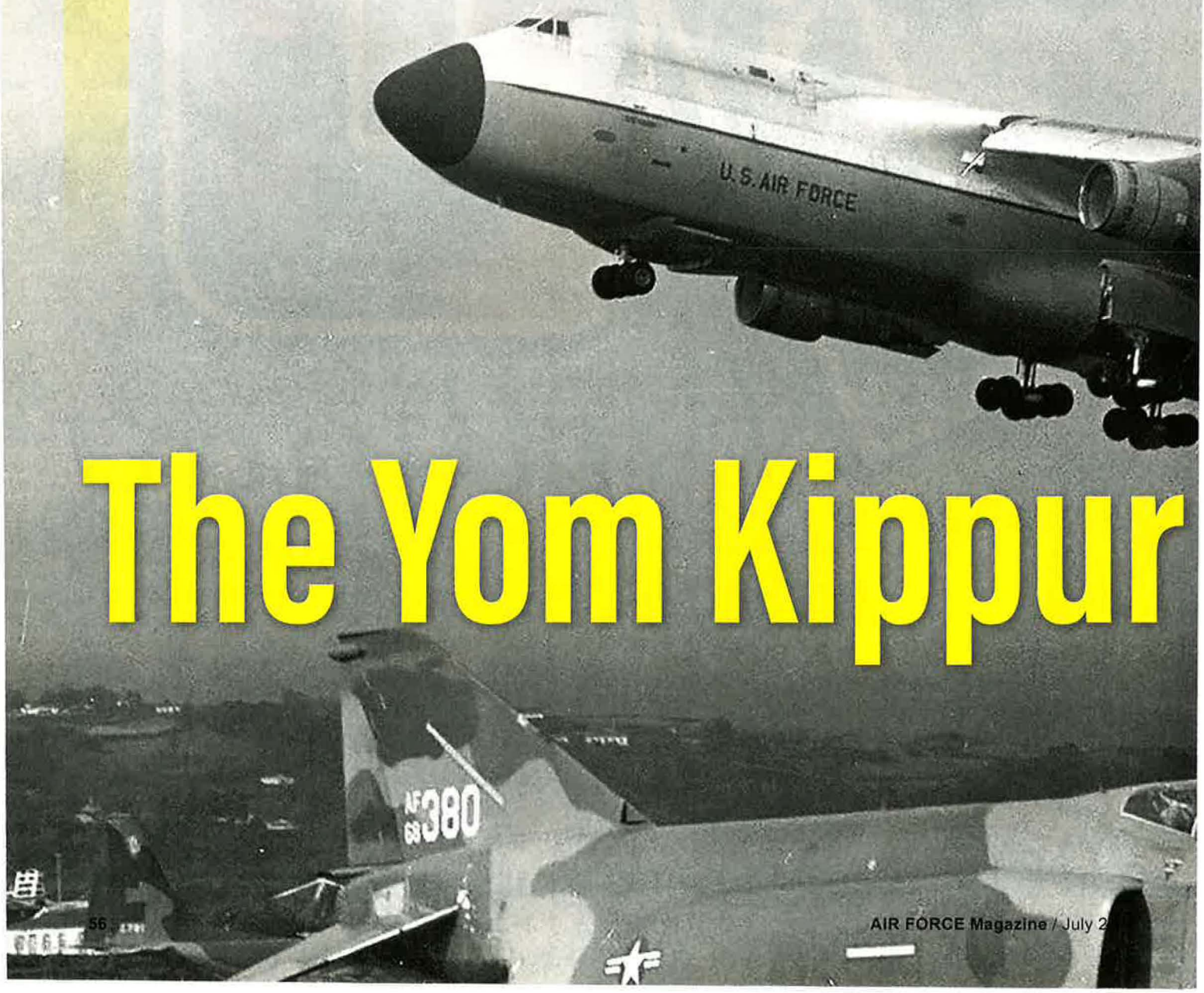
Israel ignored warning signals that Egypt and Syria were preparing to reopen the conflict. In March 1973, Egyptian Premier Anwar Sadat told *Newsweek* that "everything in this country is now being mobilized in earnest for the resumption of the battle, which is now inevitable." As late as the evening of Oct. 5, Israeli intelligence had raised no alarm.

When Egypt and Syria attacked Oct. 6—on Yom Kippur, the holiest day of the year in Israel—the IDF was not mobilized and was caught by surprise.

In a reversal of the experience in previous wars, the Israelis were thrown back on both fronts with heavy losses. Within the week, the Israeli Air Force projected a "red line," only three or four days away, beyond which it could no longer conduct combat operations.

Thus the ensuing Israeli comeback was regarded as little short of a miracle. The Arabs faltered and fell back. When the fighting ended Oct. 26, the IDF was inside Egypt, 60 miles from Cairo, and within artillery range of the Syrian capital, Damascus.

The cease-fire lines imposed by the United Nations took away some of the Israeli gains, but the Arab offensive had failed and Israel had won again.



At the time, it was widely acknowledged that a US Air Force resupply airlift, Operation Nickel Grass, had been a significant factor in the outcome. It was not until later that it became popular to discount the importance of Nickel Grass.

THE STRIKE ON YOM KIPPUR

After the 1967 war, Israel had been willing to return most of its captured territory in exchange for a guarantee of peace. Among the Arab states, only Jordan agreed. The others held to a manifesto adopted at an Arab summit in Khartoum: no peace with Israel, no recognition of Israel, no deal with Israel.

Sporadic shelling and commando raids continued for several years, but there was no major conflict until 1973 when Egypt and Syria decided to strike. Both of them were equipped with current Soviet weapon systems, including MiG-21 fighters, Su-7 fighter-bombers, T-62 tanks, and SA-2 surface-to-air missiles.

Egypt was the stronger partner but Sadat did not tell President Hafez al-Assad of Syria—father of today's Syrian leader Bashar al-Assad—everything. Assad's own intentions were simple: He wanted to regain the territory lost in the Golan Heights and hoped to do so in a combined, all-out attack on Israel.

Sadat's strategy was convoluted. He needed the Syrians to tie down the IDF in the north while Egypt invaded the Sinai, so he did not disclose to Assad that his actual objectives were limited. Sadat planned for his army to cross the Suez Canal, advance for about 10 kilometers, and occupy a small section of the Sinai desert.

In Sadat's mind, this would achieve two things. It would restore the self-respect of the Egyptian armed forces, and it would compel the superpowers to pressure Israel to return more of the Sinai to Egypt without any concessions by Sadat.

Between them, Egypt and Syria had about 800,000 combat troops, 700 combat aircraft, and 3,800 tanks. Israel had 375,000 troops, 360 combat aircraft, and 2,100 tanks. However, less than half of the Israeli forces were mobilized. The frontiers were defended mostly by short-term conscripts who were supposed to hang on until the experienced reservists got there.

Vastly outnumbered in population, Israel could not afford a protracted war of attrition. By necessity, the strategy was to strike swiftly, with emphasis on airpower and armor. There was no real plan for defensive war. Owing partly to the perception of Israeli invincibility, stocks of ammunition and war materiel were low.

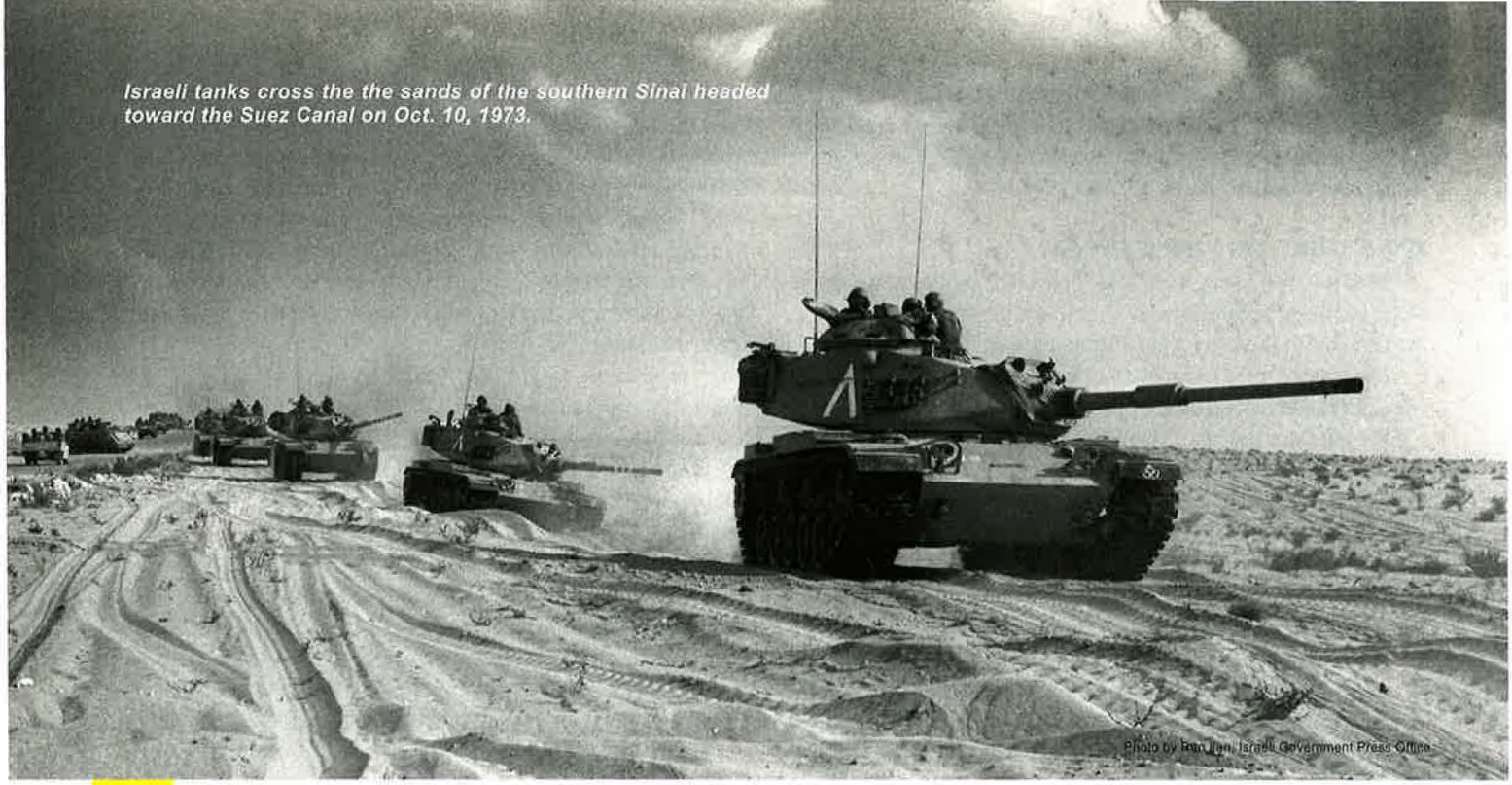
Sadat chose Yom Kippur as the date for the attack for several reasons. Everything, including the government offices and the

Airlift

By John T. Correll

A C-5 takes off from Lajes Field, Azores, en route to Lod Arpt., Israel, during Operation Nickel Grass.

Harry Heist via Air Mobility Command Museum



Israeli tanks cross the the sands of the southern Sinai headed toward the Suez Canal on Oct. 10, 1973.

Photo by Ron Ilan, Israeli Government Press Office

radio stations would be closed. Key facilities would be running with minimum staff. In actuality, this did not hamper mobilization as much as Sadat expected.

As Foreign Minister Abba Eban explained, "The call-up of Israeli reserves faces two logistic difficulties: delay in locating reservists and congestion of communications. On Yom Kippur, an Israeli reservist can be found either in his home or in a synagogue, and the roads are open and free."

The Syrians would have preferred to attack in the morning, with the sun at their backs and in the faces of the Israelis. The Egyptians, looking east, wanted an afternoon attack for similar reasons. The strike was set for 2 p.m.

At 4 a.m. on Yom Kippur, Prime Minister Golda Meir received the late-breaking but definite intelligence that Israel would be attacked that afternoon. Mobilization orders went out but it was too late for reinforcements to reach the front. IDF chief David Elazar proposed a preemptive strike, but was overruled by Meir and Defense Minister Moshe Dayan.

Meir notified the United States of Israel's predicament. Accounts differ on what exactly was said in several exchanges that day, but the understanding was clear that if Israel hoped for US aid, it must not strike first.

ISRAEL IN DIRE STRAITS

At 2 p.m. on Oct. 6, a Saturday, hundreds of Egyptian fighters and fighter-bombers streamed across the Suez Canal, followed by 100,000 soldiers and 1,350 tanks. They promptly overran the string of small, isolated Israeli fortifications manned by fewer than 500 troops. Most of the Israeli tanks were posted well back into the Sinai.

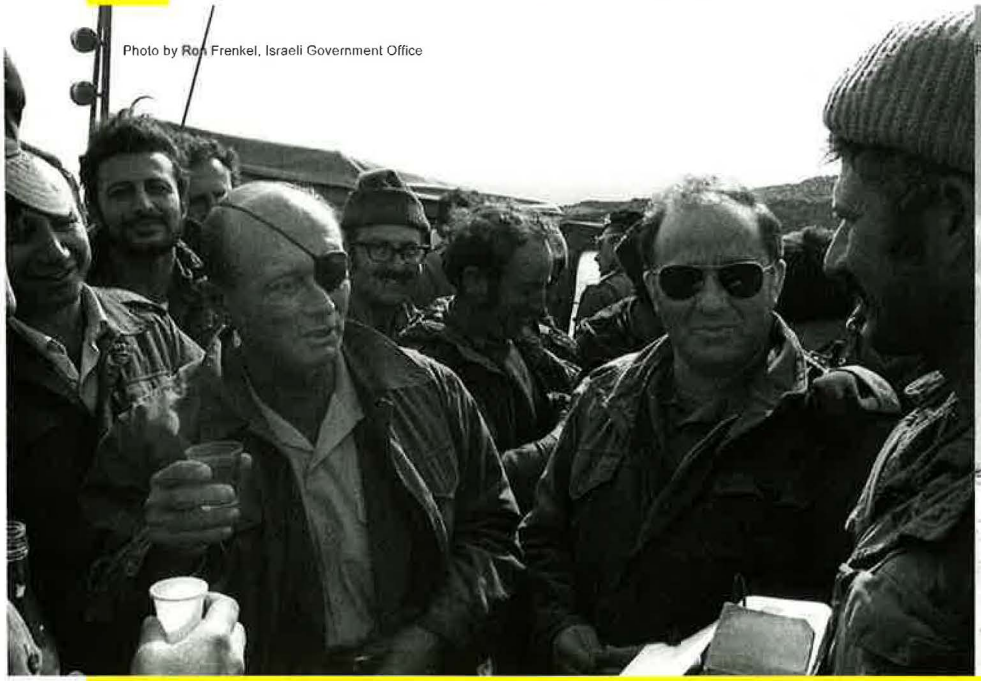


Photo by Ron Frenkel, Israeli Government Office

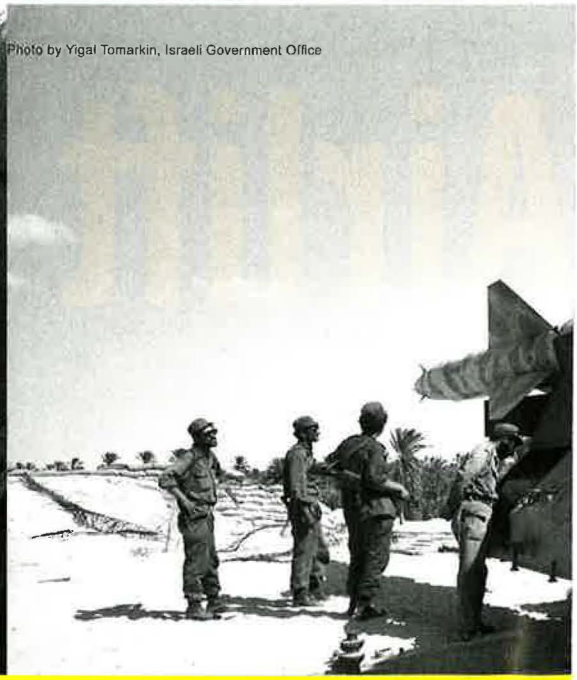
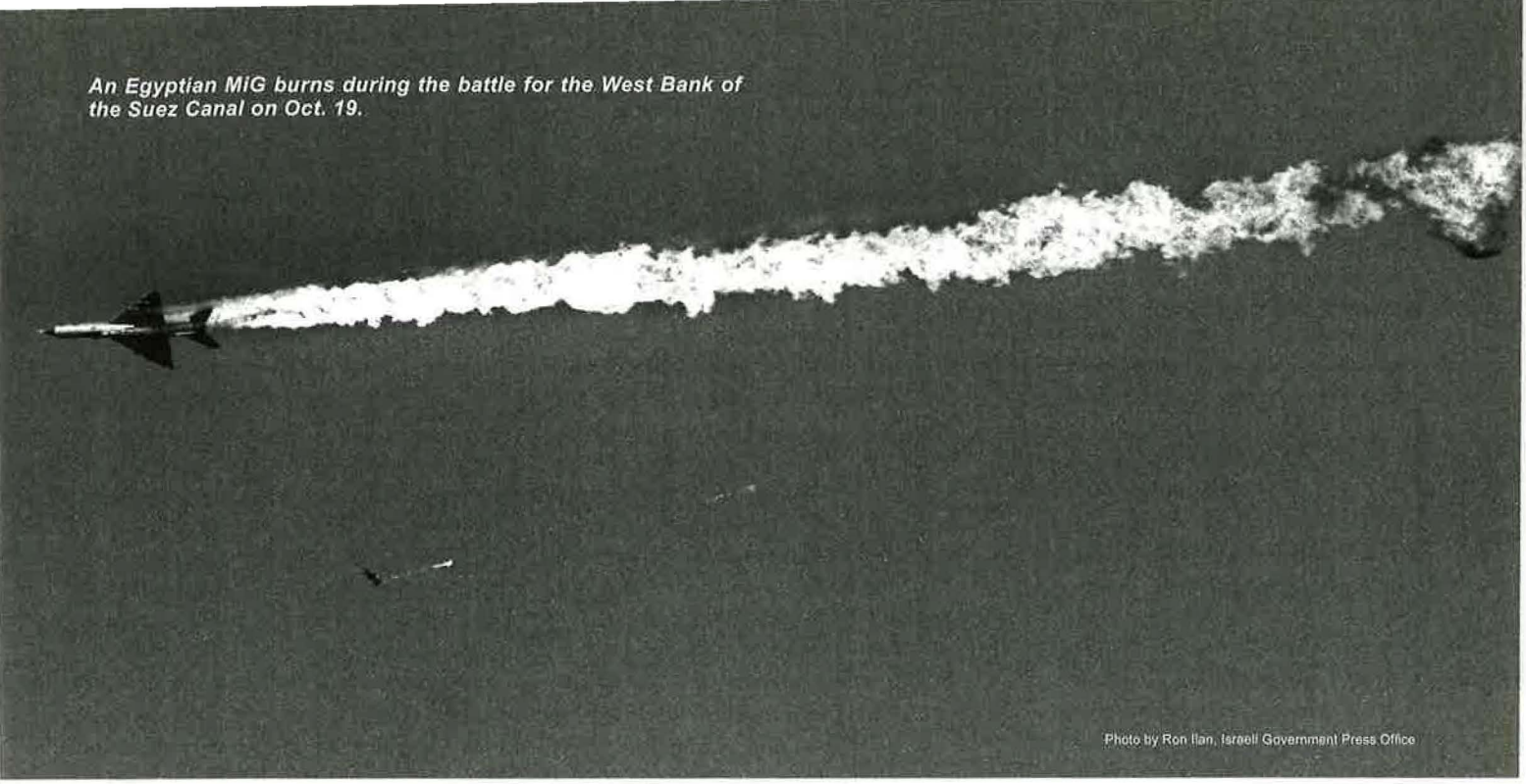


Photo by Yigal Tomarkin, Israeli Government Office



An Egyptian MiG burns during the battle for the West Bank of the Suez Canal on Oct. 19.

Photo by Ron Ilan, Israeli Government Press Office

In the north, Syria had an eight-to-one advantage in tanks and even greater superiority in numbers of infantry and artillery. By the middle of the day on Sunday, the Syrians held half of the Golan Heights and were a few kilometers from the Jordan River and the Israeli population centers in Galilee. All of Israel's defensive positions along the Suez Canal had been captured or abandoned.

By Monday, the Israelis were reeling as missiles supplied by the Soviet Union took a heavy toll on aircraft and tanks. The IDF was running out of artillery shells and the Israeli Air Force warned that its capability to sustain combat would be exhausted within the week.

Defense Minister Moshe Dayan, optimistic when he spoke to the press on Saturday, had turned to despair. He said that the IDF should form a fallback line in anticipation that the Sinai front would crumble. On Wednesday, Elazar told Dayan the goal should be "to reach a cease-fire in place. Things won't get any better than they are now." The Egyptians, exuberant in their success, rejected the suggestion of Soviet advisors that they accept a cease-fire.

According to some reports—disputed by others—Dayan persuaded Meir to authorize the assembly of 13 tactical nuclear weapons for delivery by Jericho missiles and F-4 aircraft if needed for the last-ditch defense of Israel. It is also reported—and denied by senior US decisionmakers—that American aid was prompted by fear that without it, the Israelis might resort to the nuclear option.

Coincidence or otherwise, the US decision to resupply Israel came at about the time Israel was supposedly considering nuclear weapons, and once the resupply promise was made, there was no more talk of nuclear weapons.

Meanwhile, the Soviet Union initiated a resupply airlift to Egypt and Syria and the other Arab states sent forces to join the war, as did Cuba, North Korea, and Pakistan.

THE AIRLIFT FORMS UP

As the situation deteriorated, Meir, having duly refrained from a pre-emptive attack, bombarded the United States with appeals for help. At her insistence, the Israeli ambassador in Washington called Henry Kissinger every few hours.

Kissinger had been Secretary of State for less than a month but he had kept his old job as national security advisor as well. Responsibility for response to the Yom Kippur War would fall largely on Kissinger because President Richard M. Nixon was engulfed in a political crisis.

The Watergate scandal and calls for Nixon's impeachment were at their peak. This was also the week that Vice President

Far left: Defense Minister Moshe Dayan (l) and Northern Command Gen. Yitzhak Hofi share a drink with Israeli soldiers on the Golan Heights on Oct. 21. Left: Israeli soldiers inspect an Egyptian army SA-2 missile on the West Bank on Oct. 26.

Syrian tanks, armored vehicles, and engineering equipment littered the countryside, abandoned by the retreating Syrian troops on the Golan Heights on Oct. 13.

Photo by Israel Government Press Office

Spiro T. Agnew resigned following charges of bribery, tax fraud, and other crimes committed while he was governor of Maryland.

Kissinger notified the Israelis Oct. 9 that Nixon had agreed to replace all of Israel's losses, including aircraft and tanks and to fully resupply all of the expended ammunition, equipment, and consumables.

The question was how to get it there. El Al, the Israeli airline, could and did pick up some of the cargo, but was woefully inadequate for the entire job. US commercial carriers, wary of Arab reprisal, refused to participate unless the US declared an emergency and activated the Civil Reserve Air Fleet.

That left Military Airlift Command, which was now expected to produce an instant airlift, even though its aircraft and crews were committed to other purposes. It would have taken longer except Gen. George S. Brown, the Air Force Chief of Staff, and Gen. P. K. Carlton, the MAC commander, saw the requirement coming and began preparations on Oct. 7, the day the war started. Brown also had Air Force Logistics Command move munitions, spare parts, and equipment for Israel from its warehouses to MAC pickup points around the country.

In 1973, MAC had two strategic airlifters, the C-141 StarLifter and the huge C-5A Galaxy. Configured for the Middle East run, the C-141 could carry about 25 tons, but the forthcoming airlift would depend critically on the C-5, carrying 80 tons and capable of handling outsize cargo such as main battle tanks.

The Air Force liked the C-5 but it was constantly assailed by defense critics and whistleblowers for cost overruns and technical deficiencies. "The C-5A is a joke," said an article in the *New York Times*.

The C-141 could not be refueled in flight. The C-5A was equipped for refueling but the capability was not used in 1973 because of concerns about the effect on the aircraft's wing. The C-5 could fly nonstop to Israel, but with a much-diminished load. A midway refueling point would be essential.

There is no official explanation for naming the airlift "Nickel Grass," but it was most likely the work of an airman in the planning chain who whimsically borrowed the words from a bawdy World War II fighter pilot ballad that began, "Throw a nickel in the grass. ..."

NICKEL GRASS

The European members of NATO, intimidated by Arab threats to cut off oil supplies, would not allow the airlifters to fly over their territory or use their bases. There was one exception. With some arm-twisting by Kissinger, Portugal agreed to let the airlifters refuel at Lajes Field in the Azores islands, some 800 miles west of Europe and 3,163 miles from Lod airport near Tel Aviv.

Air Mobility Command Museum photos

Right: Israeli soldiers guard a USAF C-5 at Lod airport. Far right: A 155 mm artillery piece is unloaded at Lod during Operation Nickel Grass. C-5s were needed to carry outsize cargo, such as this self-propelled howitzer.

The first US airlifter into Lod was a C-5 on Oct. 14. It arrived ahead of its support equipment, still on the ground at Lajes aboard an airplane that had aborted on takeoff. Without the 40K loaders—akin to super forklifts and able to hydraulically extract 40,000 pounds of cargo—the first C-5 had to be unloaded manually. Everybody pitched in and got it done in three-and-a-half hours.

Because of the missile threat, only one C-5 was on the ground at Lod at any one time. A rhythm soon developed. The crews turned around the C-141s in 55 minutes, the C-5s in just under two hours. Ninety minutes after an airlifter landed, the first cargo trucks were on their way, reaching the Golan Heights in three hours and the Sinai in 10 hours. Some of the airlifters landed at an additional field at El Arish in the Sinai.

One of the main limiting factors was the bottleneck at Lajes. During a 24-hour period, no more than six C-5s and 36 C-141s could pass through in each direction, a total of 84 flights.

Departing from Lajes toward Israel, the airlifters flew precisely down the centerline of the Mediterranean, a zigzag course that avoided violating European airspace to the north or Arab airspace to the south. They were supported by US Navy ships en route, including carriers posted at 600-mile intervals and providing air cover to within 200 miles of the Israeli coast, where IAF fighters took over.

In addition to the airlift, the United States sent replacement F-4 Phantom fighters, taken from the Air Force wing at Seymour-Johnson Air Force Base in North Carolina and from the Navy's Sixth Fleet. Training at the Navy's fighter weapons school at Miramar, Calif., was almost halted when A-4 Skyhawks were provided to Israel.

TURNAROUND

When the initial C-5 landed at Lod, Israel had already seized control of the fighting as reinforcements poured into the battlefronts. The Israelis, knowing that resupply was on the way, were not constrained to conserve bombs and bullets.

The Syrian forces were first to founder, held on the far side of the Jordan by Israeli airpower and then pushed back to the 1967 cease-fire line by the strengthened Israeli ground forces. By the morning of Oct. 10, the Syrians had been completely ejected from the Golan Heights and the IDF was advancing toward Damascus.

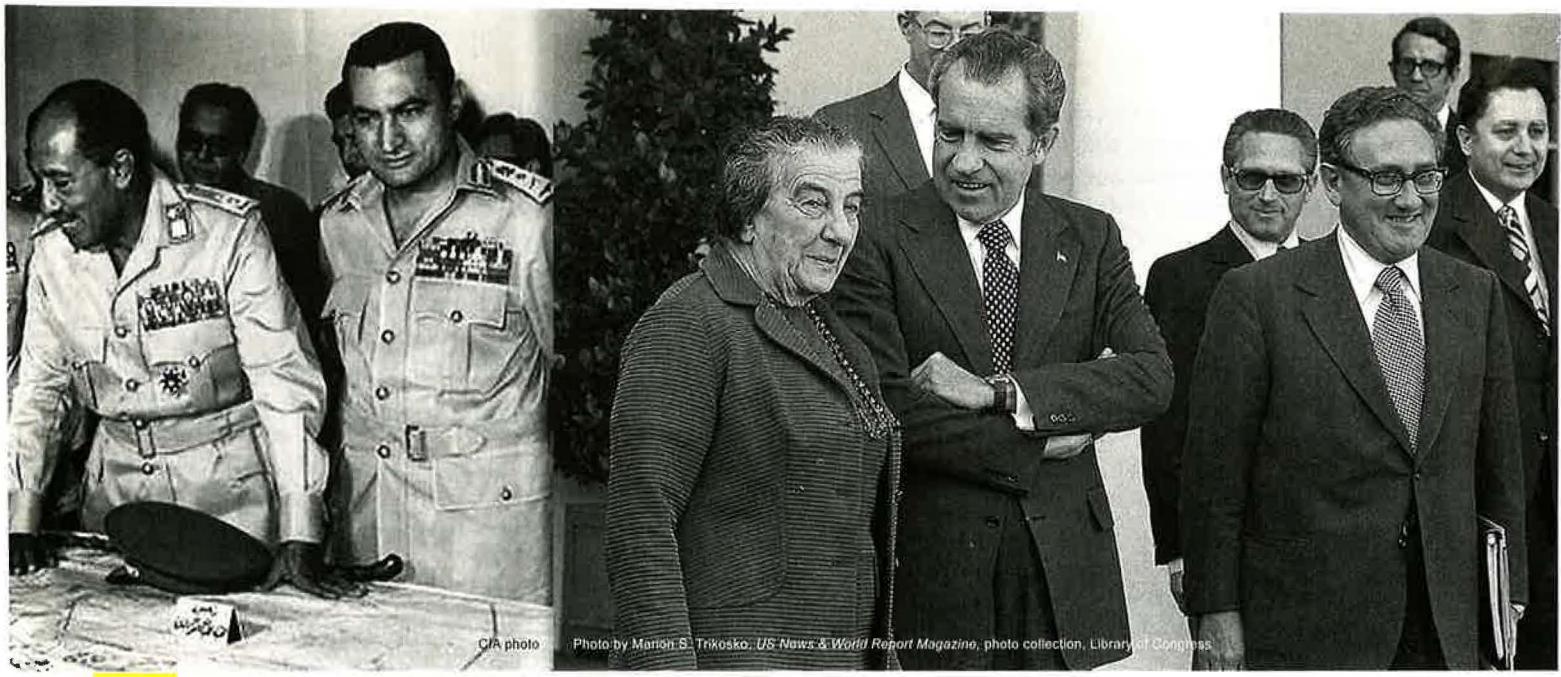
The Egyptians were across the Suez Canal on a broad front but only about nine miles deep into the Sinai. Assad clamored for Sadat to push on and relieve the pressure on Syria. Sadat felt an obligation to do so and besides, he had not yet inflicted as many casualties on Israel as he thought he must to ensure credible bargaining power.

The Egyptian army did not want to proceed beyond coverage from their SAM sites along the canal, but Sadat insisted on an attempt to take the strategic Mitla and Gidi passes in the Sinai. That was a big mistake.

In the ensuing battle, Egypt lost more than 260 tanks, compared to 10 lost by the Israelis, who were no longer worried about a shortage of ammunition and artillery shells and who made good use of antitank missiles brought from the United States by El Al a few days earlier.

The Israeli counterattack crossed the Suez Canal into Egypt Oct. 16. By Oct. 24, the Israelis on the Egyptian side had encircled the Egyptian Third Army on the Sinai side. Now it was the Arabs who were in desperate need of a cease-fire. The Israelis were rolling and did not want to stop.

Meir complained that UN cease-fire resolutions on Oct. 22 and 23 were passed with "indecent speed to avert the total destruction of the Egyptian and Syrian forces by us." The United States supported the resolutions because, Kissinger said, "if Sadat fell, the odds were that he would be replaced by a radical, pro-Soviet leader."



Above left: Egyptian President Anwar Sadat (l) and Deputy Minister of Defense Hosni Mubarak, commander of the Egyptian air force, study war plans on Oct. 1. Above: Israeli Prime Minister Golda Meir (l) with President Richard Nixon (c) and Henry Kissinger (r) outside the White House in November 1973. Meir spoke of the planes filled with materiel for Operation Nickel Grass as a miracle.

In Israel there was considerable opposition to a cease-fire but the Israelis, dependent on resupply from the airlift, could not ignore pressure from the United States. "Every morning we shoot off what arrived the previous night," said IDF chief Elazar.

The Arabs took their revenge by declaring an embargo on oil shipments to the United States and any European country that supported Israel.

DEFCON 3

Sadat, on the verge of losing his entire Third Army, called on the United States and the Soviet Union to send in their own armed forces to stop the Israelis.

Soviet leader Lenoid Brezhnev, apparently oblivious to the unintended effect, dispatched a hotline message to Nixon Oct. 24 proposing a joint US-USSR force. If Nixon did not agree, the Soviet Union would "consider the question of taking appropriate steps unilaterally."

The United States could not let the threat of unilateral Soviet intervention in the Middle East go unchallenged and responded by increasing the readiness level of US armed forces from the peacetime normal Defcon (Defense Condition) 4 to Defcon 3.

This angered West European leaders, especially British Prime Minister Edward Heath and German Chancellor Willy Brandt, who accused the United States of raising the risk of war without consulting them. Brezhnev, however, backed down and on Oct. 25 sent another message talking only about "dispatch of observers." US forces resumed Defcon 4.

On Oct. 25, the United Nations adopted its third and final cease-fire resolution, which demanded that the belligerents return to the positions they held on Oct. 22. This time the cease-fire held and active combat stopped on Oct. 26.

Israel withdrew its forces from Egypt and Syria. Egypt kept the foothold on the east bank of the Suez Canal, enabling Sadat to save face and claim a degree of victory. Syria did not regain any part of the Golan Heights.

The Nickel Grass airlift continued until Nov. 14 to fulfill Nixon's promise to completely make up for Israel's losses. It lasted for 32 days, with the C-5s delivering 48 percent of the tonnage although flying only 25 percent of the missions.

"It is ironical but it is a fact that the job really could not have been done without the huge C-5A transports—the very airplanes that have been somehow transformed into a scandal by the hyperactive anti-defense lobby," Joseph Alsop said in the *Washington Post*.

CHANGING INTERPRETATION

A Reader's Digest article in July 1974 proclaimed Nickel Grass "the airlift that saved Israel," and the designation stuck. With the passage of time, though, memories dimmed of the days when Israel was running out of ammunition and supplies and looking at an uncertain outcome of the conflict.

"The popular belief of Americans is that this airlift saved Israel," said Uri Bar-Joseph of Haifa University in 2009. "Israeli experts, on the other hand, claim that although Operation 'Nickel Grass' contributed a major morale boost, it had little significant impact on the IDF's fighting capabilities during the war."

"Overall, American arms transfers made a rather modest contribution to Israel's military victory in the Yom Kippur War," said David Rodman in the *Israel Journal of Foreign Affairs* in 2013. He added that "the US prevented an overwhelming Israeli victory in the Yom Kippur War."

Meir, who experienced the stark reality of the war from a position of critical responsibility, saw it from an altogether different perspective.

Speaking in Washington three weeks after the cease-fire, she said that, "For generations to come, all will be told of the miracle of the immense planes from the United States bringing in the material that meant life to our people." ✪

John T. Correll was editor in chief of Air Force Magazine *for 18 years and is now a contributor. His most recent article, "Operation Barbarossa Stalls Out," appeared in the June issue.*

AIR FORCE STRATEGY AND INHERENT RESOLVE

By Robert J. Elder Jr.

In this war, airpower is the weapon of choice because of its inherent flexibility.

The 2016 American political campaign has scarcely touched on the strategy underlying the fight against the self-styled ISIS, or Daesh. Some candidates, hoping perhaps to capitalize on a perceived national impatience with the progress of Operation Inherent Resolve, have loudly called for "carpet bombing" and other indiscriminate tactics.

The multinational effort to defeat Daesh isn't simply about body counts, physical destruction, or even about reclaiming territory, however. The publicly stated goal, according to the White House, is "to degrade and ultimately destroy [ISIS] through a comprehensive and sustained counterterrorism strategy so that it's no longer a threat to Iraq, the region, the United States, and our partners."

The means to this end are a variety of asymmetric capabilities. It's an all-of-government strategy, combining elements of American military power—chiefly in the form of kinetic attacks from the air, coupled with a relentless intelligence, surveillance, and reconnaissance enterprise—along with the nation's diplomatic, economic, and political clout.

It is the Air Force, however, that has been the principal military instrument in this fight. The Air Force's victories over the last 25 years and longer have paved the way for ultimate success against ISIS.

"There is no doubt coalition airpower has and continues to dramatically degrade Daesh's ability to fight and conduct operations," said Lt. Gen. Charles Q. Brown Jr., head of US Central Command's air component. Speaking at a Pentagon press briefing Feb. 18, he went on to explain that the US-led coalition is "making progress in the defeat of Daesh."

The role of the Air Force—and of coalition partner air forces in Operation Inherent Resolve—has been to deny ISIS safe haven. Air strikes against ISIS terrorists in Syria and Iraq have killed their leaders, reduced their ability to support their troops, and restricted their ability to operate openly. Strikes on their headquarters and rear areas deny them sanctuary and the means to plan, prepare, and carry out attacks.

Airborne ISR assets are being used to strengthen the coalition's ability to understand the Daesh threat, and share vital information with Iraqi and other regional partners, giving them the tools they need to effectively counter Daesh

USAF photo by SSgt. Corey Hook

An F-15 flies over Iraq in March as part of the war against ISIS.

efforts to control territory. Finally, airpower plays an important strategic role in the international campaign to debunk the Daesh "strong caliphate" narrative. As their headquarters, bomb factories, and banks blow up, ISIS finds it harder to sell a narrative of victory to recruits.

This is a new fight in many ways. The lack of collateral damage and civilian casualties inflicted by the coalition is remarkable, especially in light of the numbers of air strikes and the fact that the targets are often in extremely difficult urban terrain. The aircrews make what they do look easy, but it is extremely demanding. That Russian air attacks have been far less discriminate and precise underscores the professionalism of USAF's effort.

The complexity of this fight is missed by most. The mix of factions in the battlespace includes Russians, Syrian regime fighters, Iranians, Iraqis, Kurds, Turks, and other non-Daesh groups, making the identification process a chronic challenge, particularly since ISIS fighters no longer make themselves an easy target. They've merged with the populace, making it tough to distinguish whether a potential target is a civilian or an enemy combatant. Consequently, for a time, more than half of USAF air missions returned with ordnance still on the racks, if a positive target ID was impossible. Nevertheless, as Brown has said, "We're conducting the most precise air campaign in history. We're able to attrit Daesh [and] its capabilities anytime, anywhere."

INHERENT CAPABILITIES

The Air Force has a long history of creating and carrying out innovative strategies to meet a wide variety of military challenges. These creative solutions date to before its establishment as an independent service. Its success stems largely from the fact that USAF assesses problems differently from other entities, due to the inherent characteristics of its forces—speed, range, flexibility—and the benefit of operating in almost boundless domains.

This unique world view is often called the "Airman's Perspective." At the beginning, USAF only operated in the air domain, but now operates in the air, space, and cyberspace.

The Air Force has historically operated interdependently with its service partners to help indigenous forces, deny adversaries the ability to achieve their military objectives, and restore regional stability. All this is true in Operation Inherent Resolve. Brown recently noted increased effectiveness in striking logistics, command and control, and weapons manufacturing areas.

"In fact, we've had notable success in targeting Daesh's financial resources," he said during the February Pentagon teleconference with reporters.

"Successful strikes on oil facilities and on monetary centers have resulted in Daesh cutting pay to their fighters," while sharply reducing the amount of money available to fund its operations, he asserted. The coalition is beating ISIS by degrading its leadership, logistics, and operational capability and denying the resources needed to plan and carry out attacks. This is a critical point: OIR is a full-spectrum campaign to achieve a lasting victory over Daesh, not just to defeat its fighters.

The Air Force is providing ISR, mobility, detection and warning, precision navigation and timing, protected communications, and direct attack capabilities to protect US and its partner ground forces. This effort improves the coalition's effectiveness and cuts down the enemy's ability to conduct successful operations. The air component is also empowering the ground force by defending it and supporting it with precision firepower.

"As the air component, we are actively working to keep Daesh on the defense [and] enable ground forces to maneuver against as little resistance as possible," Brown said May 27. "We will do our part to persistently strike targets in the deep fight and will continue to integrate coalition airpower with ground force maneuver."

This isn't a new concept. Gen. Henry H. "Hap" Arnold made the case for an independent Air Force following World War II. President Harry S. Truman and then-Gen. Dwight D. Eisenhower strongly advocated for an independent USAF as well, desiring to make permanent what had become a co-equal status for the air arm among the other services. Having a seat at the table was the only way Air Force commanders could present commanders with options only it could deliver.

According to Air Force historian Herman S. Wolk, Arnold explained in 1941 why Air Force capabilities, considered independently, led to development of alternative military strategies.

"The development of the Air Force as a new and coordinated member of the combat team has introduced new methods of waging war," Arnold wrote. "Although the basic principles of war remain unchanged, the introduction of these new methods has altered the application of those principles of war to modern combat." He explained that the ground force had previously been the only "decisive" arm of the military, but "today the military commander has two striking arms. These two arms are

capable of operating together at a single time and place, on the battlefield. But they are also capable of operating singly at places remote from each other." The "great range of the air arm," he said, "makes it possible to strike far from the battlefield and attack the sources of enemy military power." The Air Force's mobility "makes it possible to swing the mass of that striking power from those distant objectives to any selected portion of the battlefront in a matter of hours."

Vietnam was an example of the Air Force conducting operations using two different "striking arms." The conflict involved large numbers of ground forces, supported from the air, and was generally not considered an air-minded campaign. The main measures of effectiveness were casualty ratios, not the attainment of operational or strategic objectives. As a result, instead of becoming a means to avoid attrition warfare, airpower became an enabler of force-on-force conflict.

That changed with Operation Linebacker II, where US airpower was used to attack strategic targets independently of the ongoing force-on-force conflict, with the objective to drive the North Vietnamese to the negotiation table, put an end to the Vietnam conflict, and bring home the nation's prisoners of war. In this context, airpower was immensely successful.

Learning the lessons of Vietnam, the Air Force worked aggressively to develop integrated conventional-bomber operations, and F-15 fighters allowed the US and its allies to dominate the skies over Iraq during Operation Desert Storm in 1991. The Air Force conducted a 38-day air campaign that set the stage for ground forces to clear out Kuwait and occupy southern Iraq in only 100 hours.

ALTERNATIVE USES

Daunting casualty estimates—based on a traditional combined arms methods—drove Gen. H. Norman Schwarzkopf Jr. to look for an alternative approach. Then-Lt. Gen. Charles A. Horner and his staff provided that alternative in the form of a preinvasion air campaign. This air-minded alternative clearly reduced the risk to US ground forces and offers another parallel for airmen to consider when explaining today's counter-Daesh operations.

In the aftermath of Desert Storm there were two important, but now largely forgotten, alternative-uses-of-airpower success stories. Airmen led the enforcement of no-fly zones over Iraq during operations Northern Watch and Southern Watch. The result: US Air Force and Navy airpower prevented Saddam Hussein from developing weapons of mass destruction and protected much of the Kurdish and Shiite populations from attack for 12 years, with no US casualties. The extraordinary success of both these operations offers a wealth of insights that can be applied today.

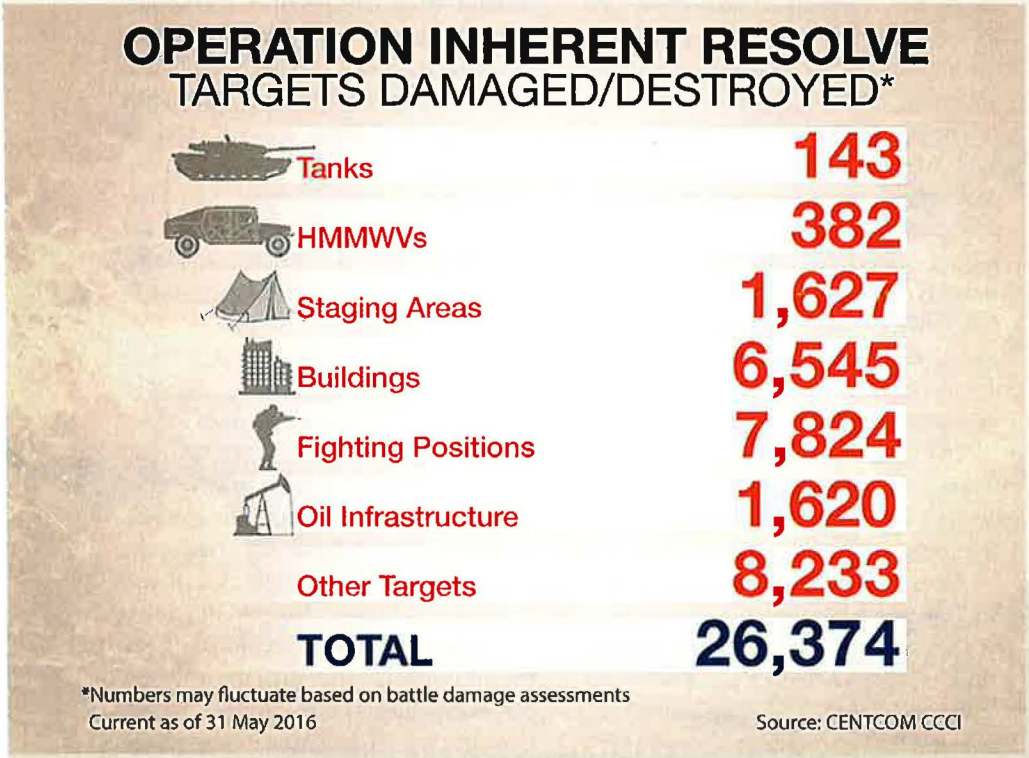
Later in July 1995, the international community threatened air strikes against Bosnian Serbs if they attacked the remaining UN "safe areas" in Bosnia. This included Gorazde, Tuzla, Bihac, and Sarajevo. Croatian forces entered the fighting in early August. Operation Deliberate Force began Aug. 29, 1995, with attacks against Bosnian Serb military targets in response to a Bosnian Serb mortar attack on civilians in Sarajevo. NATO conducted air strikes over 11 days, ending Sept. 14, 1995. The threat of attacks from the air—as well as from Bosnian and Croatian ground forces—compelled a return to the bargaining table, leading to the Dayton Peace Agreement.

In the Balkans, both Air Force "striking arms" were used effectively. Airpower caused indigenous forces (Bosnians and Croats) to pose a threat to a much more powerful ground force and also backed up the diplomatic instrument of power. Bombing by itself didn't produce the outcome, but without these air strikes it's unlikely Serbia would have negotiated with NATO. Thus, Bosnia offers two important lessons to apply to the counter-Daesh operations: Airpower can empower indigenous ground forces to fight successfully and can underpin the effectiveness of other instruments of national power.

In March 1999, NATO initiated Operation Allied Force to compel Slobodan Miloševic to stop the ethnic cleansing of Albanians in Kosovo and force the withdrawal of Serbian forces from the province.

The alliance initially designed the air campaign to destroy Serbian air defenses and high-value military targets, but it increasingly used air attacks against Serbian units on the ground. Strategic targets were Danube bridges, factories, power stations, telecommunications facilities, and a political party headquarters.

Allied Force marked the first operational use of B-2 bombers—they flew from Whiteman AFB, Mo., to their targets and back—and the return of B-52s to high-altitude bombing. A RAND report stated, however, that "damage to Yugoslav military forces and the



'resurgence' of the Kosovo Liberation Army generated little pressure" and that strategic targeting had much more effect. The Kosovo operations clearly demonstrated the ability of airpower to increase the effectiveness of US and partner diplomatic, informational, and economic instruments of power, just as it does in today's operations.

Only two years later, Operation Enduring Freedom gave airmen an opportunity to reinforce long-established lessons of airpower. On Oct. 7, 2001, American and British forces began an aerial bombing campaign targeting Taliban forces and al Qaeda. Early combat operations included air strikes from B-1, B-2, and B-52 bombers flown from the continental United States and Diego Garcia, extended by tankers based in the Middle East. Also in the fight were carrier-based F-14 and F/A-18 fighters operating in the Arabian Sea off Pakistan—helped to their targets by extensive USAF aerial refueling—and American and British Tomahawk cruise missiles. Later, land-based fighter aircraft flew sorties into Pakistan from both the Middle East and Central Asia.

From the first day of the conflict, strategic airdrop provided humanitarian aid, clearly indicating the US was fighting the Taliban government and al Qaeda, not the people of Afghanistan. In early November, planners at CENTCOM advocated the need to introduce US ground forces because they felt the indigenous forces couldn't prevail against the Taliban without ground reinforcement. This argument is being made today regarding Daesh.

But on Nov. 9, 2001, the Northern Alliance—a loose-knit group of tribal militias—emboldened by airpower, and with the support of Special Forces and joint terminal attack controllers, fought against the weakened Taliban and captured Mazar-i-Sharif, taking control of Kabul just four days later as the Taliban fled the city. Coalition forces later that month established their first ground base in Afghanistan, near Kandahar, with strategic airlift as the only source of logistics for several months.

The first lesson for airmen from these Afghanistan operations is the immense value of long-range strike, including bombers and fighters, and range-extending tankers. The second lesson is the capability of airpower to dramatically increase the effectiveness of indigenous ground forces against more powerful forces. Airmen also learned the value of special operations forces in support of airpower when conducting operations with indigenous forces.

LESSONS LEARNED

Another valuable lesson is that airpower is inherently flexible—it can deliver both bombs and humanitarian aid. All these lessons are applicable today. These recent historical lessons explain how success can be achieved against ISIS if air-centric strategies are given time to achieve their objectives.

While lessons can also be learned from Operation Iraqi Freedom, one common misperception that should be dispelled is the notion that ground forces entered southern Iraq without the benefit of air superiority. Few are aware of Operation Southern Focus. It began in the summer of 2002 and ensured air superiority over southern Iraq when Iraqi Freedom's ground operations began in March 2003. Southern Focus was the name used to describe Southern Watch operations to attain air superiority before the ground force invaded.

The centerpiece of this strategy was a change in the rules of engagement. Certain targets were off limits during Southern Watch, but under Southern Focus, the list of acceptable targets was expanded. This enabled a more effective use of airpower.

Over time, the Iraqis realized they were no match for US airpower and grounded their fighter force—even burying some of it in the vain hope it would survive to be dug up and fly again. As a result, when ground forces entered southern Iraq, they did so without fear of bombardment from the air. Clearly, the air component had achieved air superiority. This aspect of Iraqi Freedom is also a useful example to highlight the impact of rules of engagement on airpower's effectiveness.

In northern Iraq, there was a partnership between airpower and special operations forces. The Air Force worked with the Kurds to protect the oil fields. The original plan called for a ground invasion from Turkey, but when that option was withdrawn, planners developed and successfully implemented a scheme employing airpower, special operations, and the Kurdish Peshmerga (an indigenous militia force).

The fear of Scud launches also was answered by an airpower/special operations solution. The Air Force put a blanket of ISR over the western Iraqi desert where Scud transporter/erector/launchers had operated in the first Gulf War. SOF units stealthily reconnoitered sites identified by the Air Force as possibly harboring Scuds. As a result, the Iraqis launched no Scuds into Israel during the 2003 invasion.

Operations in Iraq Freedom offer numerous lessons for today's fight. First, useful synergies result when airpower and special operations operate interdependently to attain asymmetric effects. Second, airpower can empower a small or weakened ground force to be significantly more effective, as the Kurdish Peshmerga demonstrated in northern Iraq. Third, airmen are innovative: They find ways to ensure the protection of US and partner ground forces. Finally, studying military history, particularly since the dawn of airpower, is one of the best ways to understand current Air Force operations and set the stage for future innovation.

The Air Force is applying the airman's perspective to offer alternative approaches to issues facing the nation today. As in the past, USAF capabilities are underpinning a number of strategies that are proving effective. To paraphrase Brown's recent statement: Regardless of the pace of operations on the ground, the US will use coalition airpower—with its operational reach and flexibility, its precision and lethality, and its constant presence and responsiveness—to pressure, to destroy, and to eventually defeat Daesh. Hap Arnold's vision remains alive today. ✪

Retired Lt. Gen. Robert J. Elder Jr. is a research professor at George Mason University, Virginia. He was commander, 8th Air Force, the bomber component of US Strategic Command, and was commandant of the Air War College and vice commander of Air University. He holds a doctorate in engineering from the University of Detroit and is a former president of the Association of Old Crows. This is his first article for Air Force Magazine.

The P-51's Turbulent Development

By John Fredrickson

The legendary aircraft's designers overcame significant developmental pains creating the iconic fighter.

The iconic P-51 Mustang is rightly regarded as a marvel of engineering, but its path to becoming one of the legendary fighters of World War II was anything but smooth. Its development was beset with serious technical, bureaucratic, and manufacturing complications, but these were each overcome in turn, allowing the fighter to become an icon of World War II.

The program only survived because executives at North American Aviation (NAA) and Army Air Forces chief Gen. Henry H. "Hap" Arnold were convinced of its ultimate potential.

James H. "Dutch" Kindelberger, president of NAA, had strong business ties to European countries under Nazi threat in 1940, stemming from their earlier purchase of trainer airplanes. As German forces advanced on France and England, these nations wanted to know: Could North American build P-40 Warhawk fighter airplanes on license from Curtiss-Wright?

Kindelberger counteroffered to design and build a brand-new airplane that would leapfrog the aging, prewar P-40 design. Engineers at North American had been privately mulling the prospect of a new fighter for months. A deal was struck, but France disappeared into the Third Reich before the new model could be delivered.

No new fighter would have saved France from the Nazis, but a new fighter might give Britain's Royal Air Force a much-needed edge in fending off invasion.

Joining Kindelberger on what would become the Mustang program was Edgar O. Schmued, a talented German-born aircraft designer. He'd served in World War I and then joined General Motor's Brazilian operation during the 1920s. Special arrangements were made for Schmued's immigration to the United States.

Kindelberger and Schmued envisioned an aircraft that would be an agile, sturdy, fast, and lethal fighter with formidable air-to-ground capabilities.

Company records reveal that the design of the new fighter was heavily influenced by a little-known two-seat trainer aircraft labeled NA-35. It first flew only five months before initial design work commenced on NA-73, the internal designation for what would evolve to become the P-51.

The NA-35 was to embody a series of precedents. It was the first North American aircraft to be powered by a liquid-cooled engine, an innovation that yielded a greatly diminished frontal area for the fuselage. Schmued, the chief designer, incorporated a recently invented laminar-flow wing specification. A single sheet of smooth aluminum made up the entire upper wing surface, ensuring minimal drag and a clean airflow.

Freelance pilot Vance Breese deftly handled the maiden flight on Dec. 9, 1939. Breese was one of a number of Southern California test pilots who earned rich

rewards for taking new models aloft for the first time.

Work began on a second NA-35, but the demand for a small trainer was deemed to be tepid. Further work languished in 1940 because other projects at NAA took priority.

FIVE FEET TEN, 140 LBS

Kindelberger informed the board of directors at their July 1940 meeting that he'd abandoned NA-35 and sold the design to Vega for $100,000, where it became the Vega 35. A handful of additional -35s were produced before the resources of Vega were commandeered to produce military airplanes. The Vega 35 remains noteworthy because the diminutive craft, with a mere 150 horsepower, was an essential precursor to the Mustang.

Kindelberger let Schmued handpick his staff for NAA's highest priority project, the new British fighter. The team started laying out the new airplane on May 5, 1940. Kindelberger instructed Schmued to build the new airplane around a pilot five feet 10 inches tall, and weighing 140 pounds, and work out from there. Schmued found such a man already on the payroll, sat him in a chair, and then began calculating the requisite man-machine interfaces.

San Diego Air and Space Museum photos

Above left: P-51 designer Edgar Schmued. Above: James Kindelberger, president of North American Aviation. Kindelberger let Schmued handpick his design team for the desperately needed fighter.

Schmued possessed ample project management skills to reliably track progress and quickly react to problems as they arose on any aspect of the design. The team devoted themselves to NA-73 and nothing else. Only on Sundays did they wrap up their work early—at 6:00 p.m.—to acknowledge the weekend.

DOD photo

P-51s in formation. The highly maneuverable fighter was ideal for escort missions and a match for the Luftwaffe's fighter aircraft.

The new British fighter would benefit from four important design features that would be validated by wind tunnel testing:

- A new laminar-flow wing design would remain efficient even under wartime abuse.
- Elegantly crafted fuselage contours to further minimize drag.
- Low frontal area of the fuselage, made possible by the liquid-cooled engine.
- An innovative engine cooling system placing the radiators behind the pilot, producing the P-51's distinctive air scoops aft of the cockpit and under the fuselage.

By building its own design, NAA could employ the "design-for-production" methodology, ultimately yielding higher production rates at lower unit cost.

American combat aircraft of the World War II era were most frequently powered by radial engines. The pistons were typically arranged in a circle around the propeller shaft, and each was exposed to the oncoming airflow so heat could be dissipated by metal fins, an approach similar to many modern-day motorcycle, chain saw, and rotary lawn mower engines.

The pistons on a liquid-cooled engine, however, were neatly lined up in a row behind the propeller. While rotary engines required wide, drag-inducing "faces" and a broad fuselage, the choice of a liquid-cooled engine allowed a slim, slippery nose design for the P-51.

Heat dissipation is a vital aircraft design consideration. Only about 25 to 30 percent of the energy derived from aviation gasoline becomes shaft horsepower. Placing the radiators (oil and coolant) at the bottom of the fuselage and aft of the pilot proved to be the secret ingredient that yielded a notable performance advantage.

In 1971, at a symposium celebrating the conception and development of the Mustang, Schmued explained that the expansion of the air as it passed through the radiators actually produced additional thrust.

Schmued recalled some problems. For one, none of the established foundries in the Los Angeles area would take on the enormous magnesium landing-gear casting work needed for the new fighter. Only a small shop would accept the challenge. Schmued placed a "watchdog" at the foundry to monitor the work. When the man arrived a few days later at North American with the casting, it was so hot it had burned a hole in the carpet of his car.

There was another problem with the same assembly. On a drawing, an engineer mistakenly specified a steel forging with a diameter of 4.97 rather than 4.997 inches. The part arrived undersized, putting the project behind schedule. The team wracked their brains in search of a solution and ultimately hit on the idea of using chrome plating to salvage the part and preserve the schedule.

There was excessive overtime on the project, but the end result was nothing less than a miracle. The design and shop fabrication of the completed prototype was completed on Sept. 9, 1940, a mere 117 days after project initiation.

Initial versions of the new fighter were to be powered by an Allison engine turning a Curtiss three-bladed propeller. It was best suited for flying at lower altitudes.

The Allison engine arrived late and didn't match the drawings. The wiring harness was positioned such that the motor mounts required rework before the engine could be installed.

After the delays, the prototype NA-73 quickly moved into flight test. Bearing the civil registration of NX19998, it first flew on Oct. 26, 1940. Breese was once again at the controls and recorded another successful first flight in his log book.

National Advisory Committee for Aeronautics photo

Unfortunately, the prototype ingloriously came to rest upside-down in a farmer's bean field on its fifth flight, Nov. 20, 1940. Company test pilot Paul Balfour had been forced down by a fuel-related engine failure. It seemed that a fuel valve had stuck or was never operated. Everybody was wringing their hands at the sight of the broken propeller shaft, scratched windshield, crushed vertical fin, and bent wing. Balfour had to be treated for injuries.

A mobile crane was summoned to retrieve the damaged airplane before sundown. It was decided to wash off the mud, replace all the damaged parts, and try again. Given the magnitude of the damage visible in photographs of the wreck, NA-73X was repaired amazingly quickly. The engine was ready for a test run on Dec. 31, 1940, and the aircraft next flew on Jan. 11, 1941.

North American was convinced at an early date that the Mustang design would be a watershed. Production of 320 Mustangs for the British Royal Air Force began as the company engineers desperately sought solutions to improve the high-altitude speed and performance of the Allison engine. As stipulated in the military aircraft export requirements, two examples (the fourth and 10th units

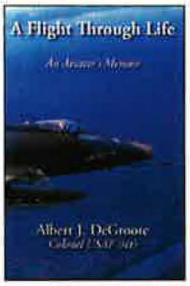
Photos by Alfred T. Palmer via Library of Congress

Right: A woman works on the landing gear of a Mustang at the NAA facility in Inglewood, Calif., in 1942. Far right: A P-51 under construction at the plant.

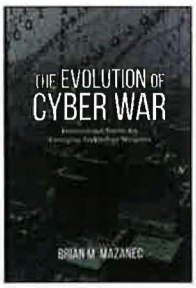
Books

Compiled by Chequita Wood, Media Research Editor

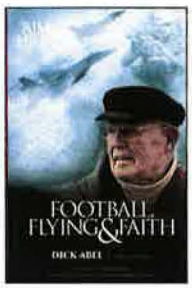
1916: A Global History. Keith Jeffery. Bloomsbury, New York (888-330-8477). 436 pages. $32.00.



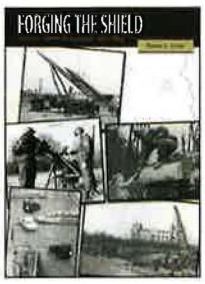
A Flight Through Life: An Aviator's Memoir. Albert J. DeGroote. Order from: Lulu.com, Raleigh, NC (844-212-0689). 304 pages. $19.96.



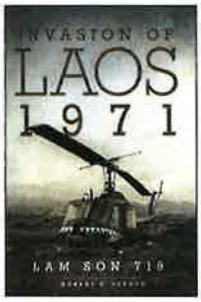
The Evolution of Cyber War: International Norms for Emerging-Technology Weapons. Brian M. Mazanec. Potomac Books, Lincoln, NE (800-848-6224). 329 pages. $34.50.



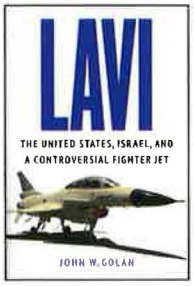
Football, Flying & Faith. Dick Abel. Tate Publishing, Mustang, OK (888-361-9473). 243 pages. $18.99.



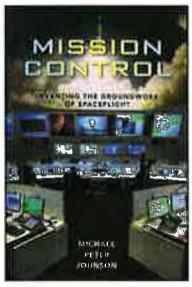
Forging the Shield: The US Army in Europe, 1951-1962. Donald A. Carter. Order from: GPO, Supt. of Documents, Washington, DC (866-512-1800). 513 pages. $76.00.



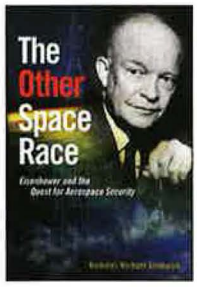
Invasion of Laos, 1971: Lam Son 719. Robert D. Sander. University of Oklahoma Press, Norman, OK (800-627-7377). 290 pages. $19.95.



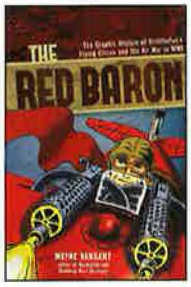
Lavi: The United States, Israel, and a Controversial Fighter Jet. John W. Golan. University of Nebraska Press, Lincoln, NE (800-848-6224). 416 pages. $39.95.



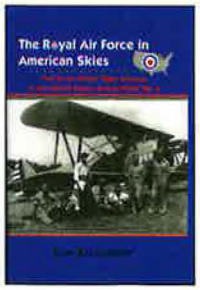
Mission Control: Inventing the Groundwork of Spaceflight. Michael Peter Johnson. University Press of Florida, Gainesville, FL (800-226-3822). 203 pages. $24.95.



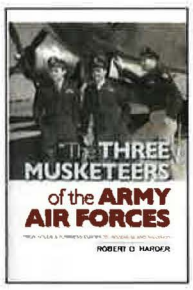
The Other Space Race: Eisenhower and the Quest for Aerospace Security. Nicholas Michael Sambaluk. Naval Institute Press, Annapolis, MD (800-233-8764). 316 pages. $44.95.



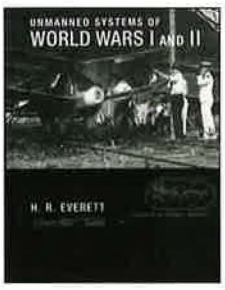
The Red Baron: The Graphic History of Richthofen's Flying Circus and the Air War in WWI. Wayne Vansant. Zenith Press, Minneapolis (800-458-0454). 99 pages. $19.99.



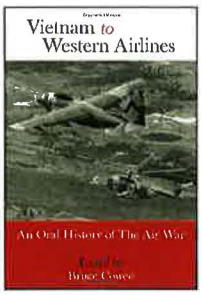
The Royal Air Force in American Skies: The Seven British Flight Schools in the United States during World War II. Tom Killebrew. University of North Texas Press, Denton, TX (800-826-8911). 443 pages. $32.95.



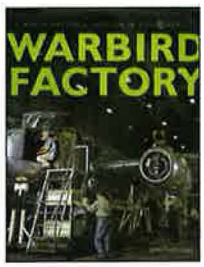
The Three Musketeers of the Army Air Forces: From Hitler's Fortress Europa to Hiroshima and Nagasaki. Robert O. Harder. Naval Institute Press, Annapolis, MD (800-233-8764). 254 pages. $39.95.



Unmanned Systems of World Wars I and II. H. R. Everett. The MIT Press, Cambridge, MA (800-405-1619). 757 pages. $79.00.



Vietnam to Western Airlines: An Oral History of the Air War. Bruce Cowee, ed. Order from: Alive Book Publishing at http://vietnamtowesternairlines.com. (925-837-7303). 536 pages. $36.95.



Warbird Factory: North American Aviation in World War II. John Frederickson. Zenith Press, Minneapolis (800-458-0454). 224 pages. $40.00.

By Robert S. Dudney

And the Winner Is ...

"The nation that's going to win [the next war] is not the one with the biggest army. It's not necessarily the one that has the most tanks or longest range artillery systems. The one that's going to win is the one with the best air force. ... It doesn't mean that airpower is pre-eminent, but it does mean it is equally as critical as land and maritime power, and if you don't have it, you will lose."—***Gen. Mark A. Welsh III, USAF Chief of Staff, remarks to an AFA audience, May 26.***

Bad Bottom Line

"The Air Force's projected force structure in 2030 is not capable of fighting and winning [against capabilities developed by rivals]. ... While near-peers have most of these capabilities today, advanced air and surface threats are spreading to other countries around the world."—***New US Air Force study, "Air Superiority 2030 Flight Plan," released June 1.***

Unleash the Hounds

"[To deal with cyber threats] we should take a look at the old-fashioned militia model that lets ordinary citizens come to their country's aid. This could be through the traditional National Guard ... but it could also be separate. In this theater of operations, it really doesn't matter how someone's hair is cut, or whether they can't or just won't do push-ups for you, or if they just like to sleep in until noon. A cybermilitia is worth exploring."—***Sen. Sheldon Whitehouse (D-R.I.), remarks to the Center for Strategic and International Studies, June 6.***

Other Than That....

"I think that [NSA turncoat Edward Snowden] actually performed a public service by raising the debate that we engaged in and by the changes that we made. ... What he did—the way he did it—was inappropriate and illegal. ... I know that there are ways in which certain of our agents were put at risk, relationships with other countries were harmed, our ability to keep the American people safe was compromised."—***Former Attorney General Eric H. Holder Jr., remarks on CNN's "The Axe Files" with David Axelrod, May 30.***

Breedlove Calculus

"We need to be careful not paint them [the Russians] as 10 feet tall, because they're not, and if we overstate, then we lose credibility. ... They may not be 10 feet tall but they're pretty close to seven feet tall."—***USAF Gen. Philip M. Breedlove, recently retired as NATO Supreme Allied Commander, Europe, interview with the*** **Wall Street Journal,** ***May 3.***

Not as Crazy as Canceling it

"I don't think it's a wild idea. I mean, the success of the F-22 and the capability of the airplane and the crews that fly it are pretty exceptional. I think it's proven that the airplane is exactly what everybody hoped it would be. We're using it in new and different ways, and it's been spectacularly successful, and its potential is really, really remarkable. And so going back and looking and certainly raising the idea—'Well, could you build more?'—is not a crazy idea."—***Gen. Mark A. Welsh III, USAF Chief of Staff, on congressional move to consider restarting F-22 production, remarks to an AFA audience, May 26.***

Lure of the Thunderbirds

"It [the Thunderbirds air demonstration team] is our No. 1 recruiting tool. It gives them [members of the audience] a sense of pride in their military and their country, and I think now we need that more than ever."—***Retired USAF Col. Pete McCaffrey, former Thunderbirds pilot, on the recent crash of a Thunderbirds F-16, Associated Press, June 4.***

Confucius Says ...

"In the South China Sea, China has taken some expansive and unprecedented actions that have generated concerns about China's strategic intentions. ... Unfortunately, if these actions continue, China could end up erecting a Great Wall of self-isolation."—***Secretary of Defense Ashton B. Carter, address to the Asia Security Summit in Singapore, June 4.***

Comrade Chic

"Kalashnikov is a global brand. We are certainly justified in thinking that clothes and souvenirs with our symbols will be in demand, as much as our primary products."—***Vladimir Dmitriev, marketing chief for the Kalashnikov firearm manufacturer in Russia,*** **New York Times,** ***June 6.***

Look at the Scoreboard

"They are a very weak enemy. Our al-Qassam soldiers hear them shouting in fear when they attack. War is about how religious you are—the al-Qassam soldier knows he is going to heaven so he fights to the end. The Israeli soldier wants to go back to his girlfriend."—***Hamas spokesman "Mostafa," referring to the Izzedine al-Qassam Brigades, the military wing of Hamas, in*** **Foreign Policy,** ***June 7.***

Tim Finnegan Meets the VA

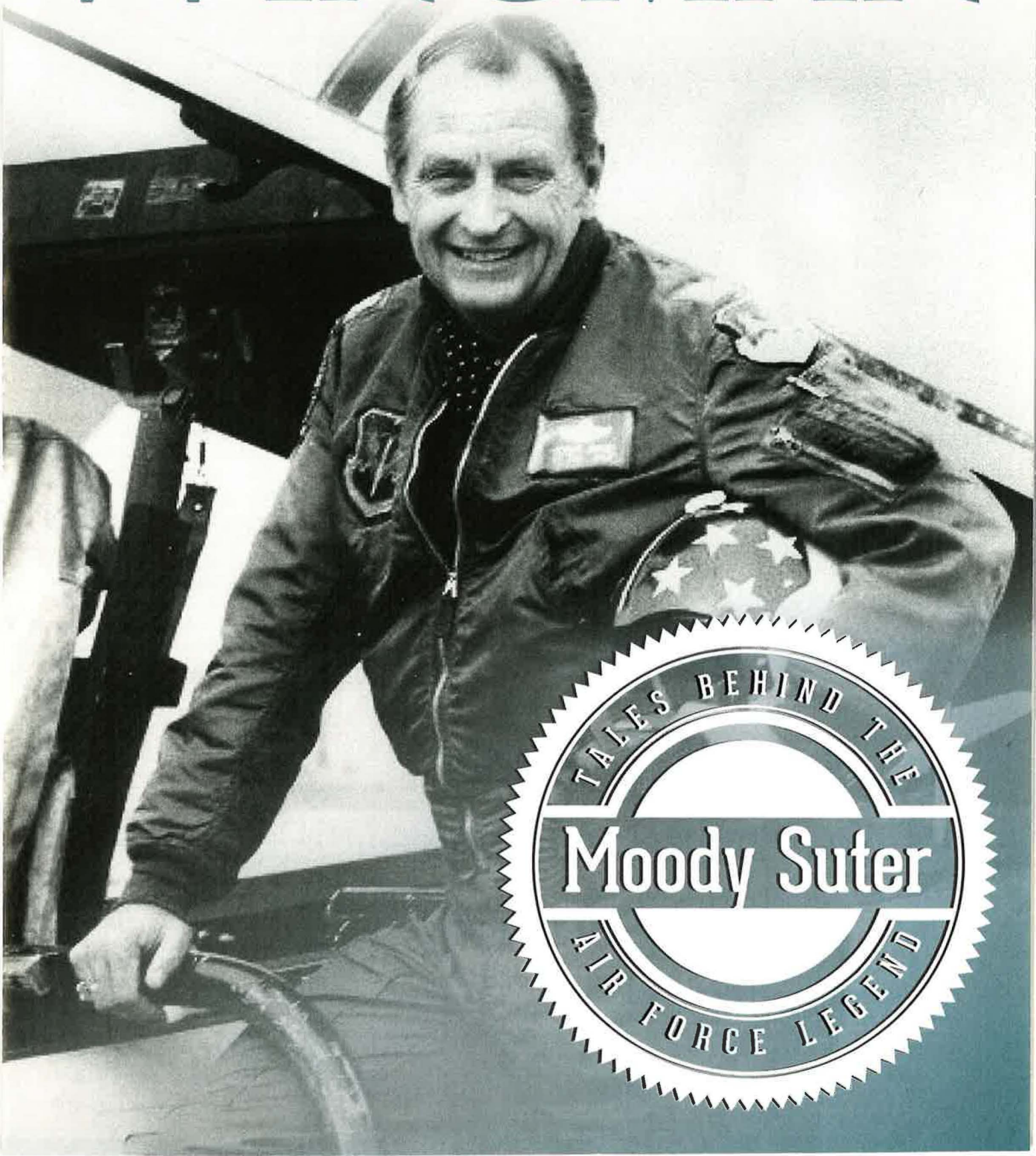
"It's a problem that should have been addressed years ago, as it has caused needless hardships for thousands of people who had their benefits terminated and their world turned upside down. ... We simply cannot have men and women who have sacrificed for this country see their rightful benefits wrongfully terminated because the VA mistakenly declares them dead."—***Rep. David Jolly (R-Fla.), after revelations that the VA had mistakenly classified 4,200 live veterans as deceased, statement, May 25.***

"Provocative and Destabilizing"

"We would consider an ADIZ [air defense indentification zone] ... over portions of the South China Sea as a provocative and destabilizing act which would automatically raise tensions and call into serious question China's commitment to diplomatically manage the territorial disputes of the South China Sea. We urge China not to move unilaterally in ways that are provocative."—***Secretary of State John F. Kerry, remarks during state visit to Mongolia, June 5.***

Published by the Air Force Association

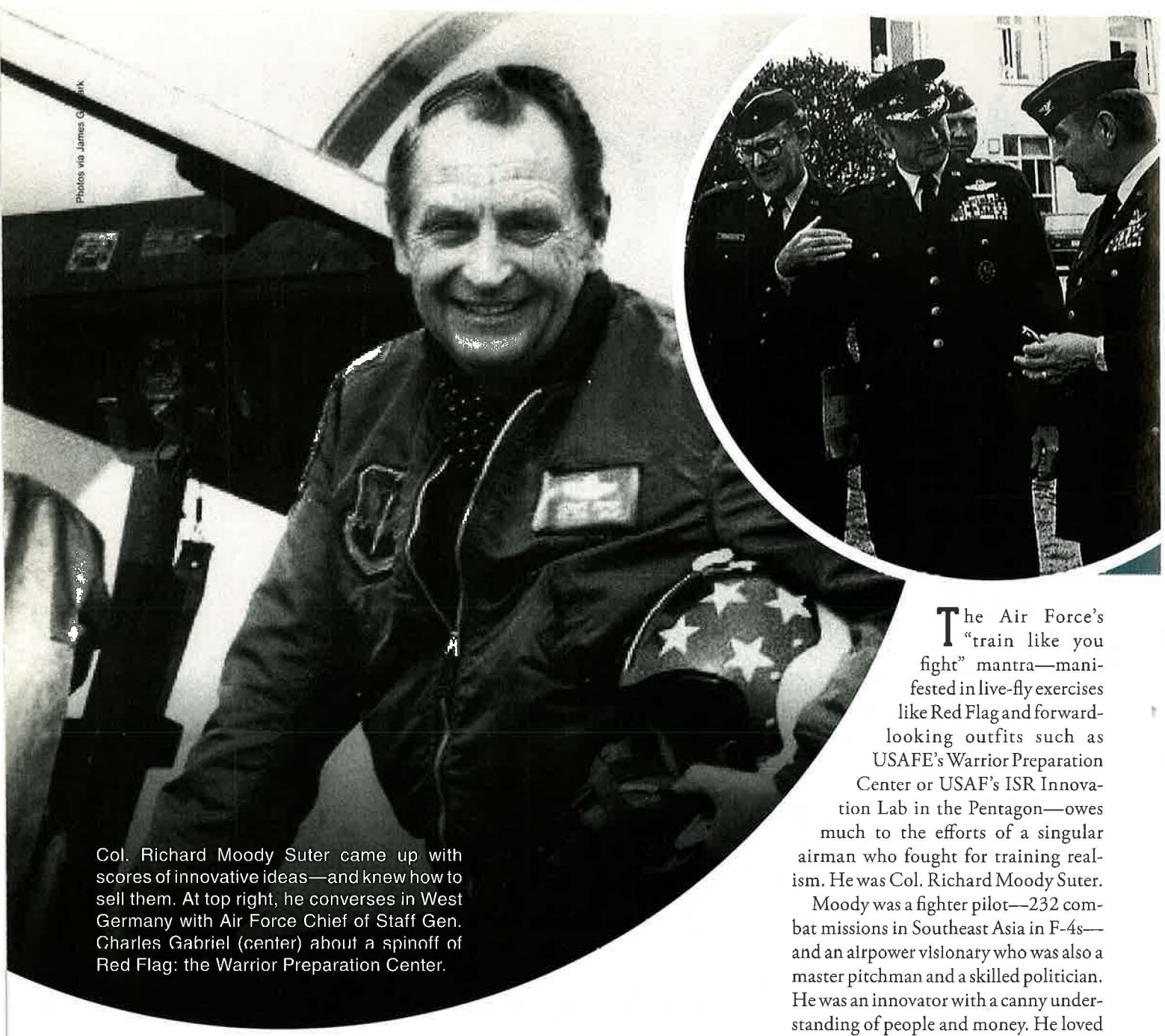
WINGMAN



TALES BEHIND THE

Moody Suter

AIR FORCE LEGEND



Photos via James Gabrunk

Col. Richard Moody Suter came up with scores of innovative ideas—and knew how to sell them. At top right, he converses in West Germany with Air Force Chief of Staff Gen. Charles Gabriel (center) about a spinoff of Red Flag: the Warrior Preparation Center.

Red Flag, USAFE—and the whole of today's Air Force—owe much to a singularly talented colonel.

The Air Force's "train like you fight" mantra—manifested in live-fly exercises like Red Flag and forward-looking outfits such as USAFE's Warrior Preparation Center or USAF's ISR Innovation Lab in the Pentagon—owes much to the efforts of a singular airman who fought for training realism. He was Col. Richard Moody Suter.

Moody was a fighter pilot—232 combat missions in Southeast Asia in F-4s—and an airpower visionary who was also a master pitchman and a skilled politician. He was an innovator with a canny understanding of people and money. He loved to say that "innovation without funding is called a static display."

As with all great ideas, Red Flag has many fathers, but if it wasn't Moody's original idea, he was at least the salesman who packaged the concept and sold it to the Air Force's senior leadership.

The idea was born deep in the basement of the Pentagon, among members of the "Fighter Mafia"—Charles A. Horner, William L. Kirk, and John A. Corder, who became generals, plus Suter and others—who went on to shape the Air Force we know today.

Drawn on bar napkins, the basic Red Flag concept was to provide realistic air combat training, pitting USAF pilots against dynamic "aggressor" forces. Statistics showed that a pilot's combat survival

The Visionary Moody Suter

By James G. Clark

rate increased dramatically after he had 10 missions under his belt—once the sights, sounds, radio calls, and sensations of combat became familiar.

GOLF COURSE OR HQ?

The Fighter Mafia wanted to give young fighter pilots something very much like those 10 missions without actually getting shot at. The idea was refined and developed into the Red Flag Concept Brief in early 1975.

At some point, Gen. Robert J. Dixon, head of Tactical Air Command, got the briefing. Moody claimed that he and Maj. Gen. James A. Knight Jr., the US Air Force Tactical Fighter Weapons Center commander, briefed Red Flag to Dixon on a golf cart in Las Vegas, although Gen. Charles A. Gabriel, then TAC's director of operations, insisted it was delivered in TAC Headquarters in May 1975. Wherever Dixon heard it, he latched onto the idea, and the rest is history. Red Flag went on to train generations of fighter pilots—sharply improving the air combat kill ratio in Vietnam and leading to lopsided aerial victories in Iraq and the Balkans.

Moody's influence went well beyond Red Flag, however. He conceived the idea for Checkmate—the Air Force's in-house operational-level think tank—and the Aggressors at the same time Red Flag was created. Checkmate spawned the theories that led directly to the successful air campaign in Desert Storm, while the Aggressors brought not only dissimilar aircraft to Red Flag exercises but an opposing mindset using adversary tactics and concepts of operation.

FIGHT TO WIN

In 1982, Kirk, the new director of operations for US Air Forces in Europe at Ramstein AB, West Germany, asked Moody to look into NATO command and control and planning for European air war. Suter's analysis was that the Air Force was in a defensive, "Maginot Line" mindset. It assumed the Russian Bear was 10 feet tall and, if not stopped cold, would come crashing through the Fulda Gap. NATO would then be forced to replay Dunkirk—pushed back to the English Channel.

Moody observed that if we enter a fight and expect to lose, we will. Instead, he maintained that NATO would prevail if we fight smarter and pick the time and place of the battle. The Air Force didn't have to outnumber the enemy, but had to develop a tactical advantage, he said. This was the impetus of the Warrior Preparation Center, or WPC.

The WPC was designed to be Red Flag for NATO commanders. Moody's criticism was that the Air Force trained the world's best fighter pilots at Red Flag but then put them under the command of generals whose thinking was shaped in the last war. He wanted to apply history's lessons, then plan and fight smarter, at every level from the cockpit to the Supreme Allied Commander, Europe. Moody personally led USAFE staff on tours of World War I and II battlefields, from Verdun to Bastogne, to walk the ground and learn from the sacrifice of those who came before.

VIEWGRAPHS & WHISKEY

In 1982, I encountered him at USAFE Headquarters late one night and chided him for missing the 10th reunion of the Aggressors at Nellis AFB, Nev., the month before. He recognized me and shanghaied me to his office, where with 27 viewgraphs and a bottle of "white whiskey," he explained his vision for the WPC. It was brilliant.

The next morning he appeared at my desk, asking what I was doing. A little worse for wear from the previous night, I explained that I was doing my job. Not anymore, he said. "You belong to me. General Bill Kirk gave you to me to build this WPC."

We borrowed money and creatively appropriated real estate located at the little known and little used Einsiedlerhof Air Station, just outside Ramstein. We learned that the Kaiserslautern Military Community commander, then Brig. Gen. Robert C. Oaks, and his facility board were going to meet. We found the meeting's slides beforehand and penciled in Colonel Suter's name on a number of buildings.

Oaks approved the minutes, only to find out weeks later what he'd approved,

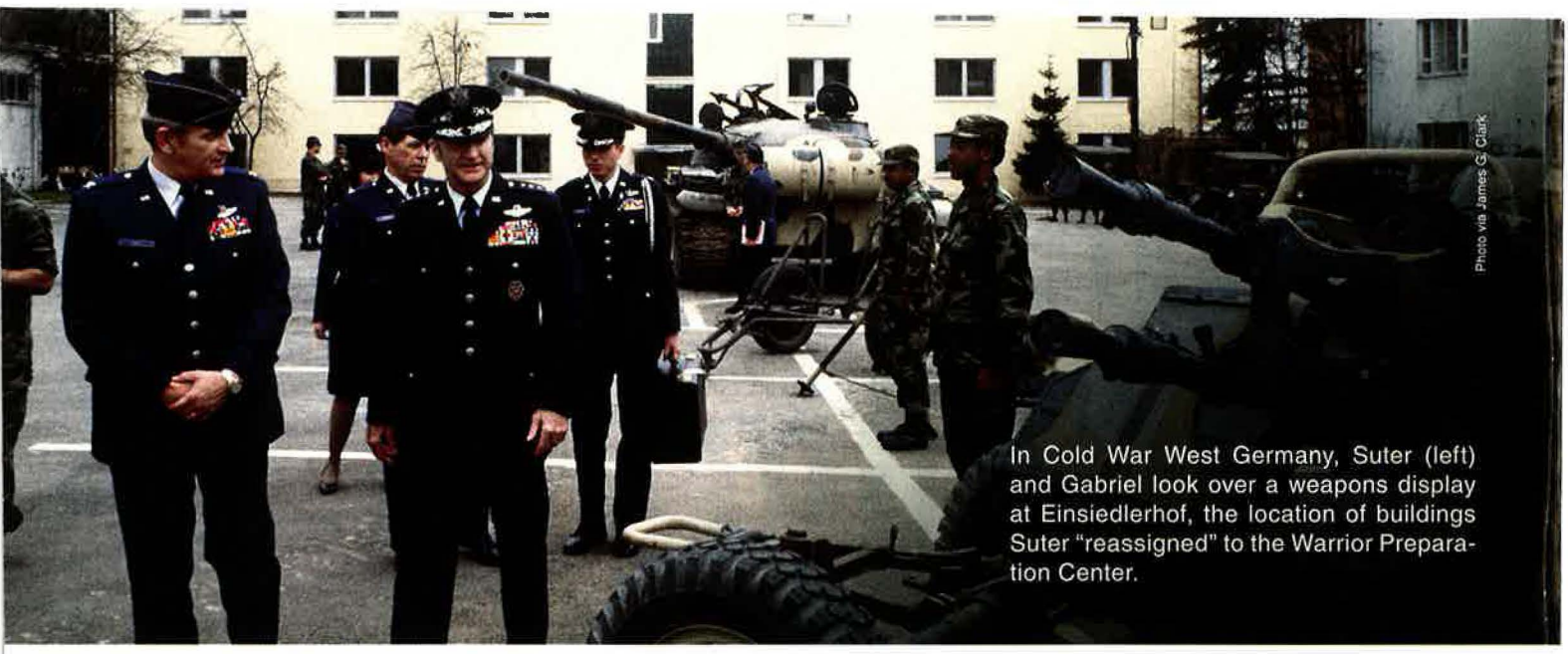


Photo via James G. Clark

In Cold War West Germany, Suter (left) and Gabriel look over a weapons display at Einsiedlerhof, the location of buildings Suter "reassigned" to the Warrior Preparation Center.

when Moody and I borrowed a truck and started moving into an old Army and Air Force Exchange Service Toyland and an Education Office. Suter always said he picked Einsiedlerhof because both Glenn Miller Band's successor group and the AAFES Class VI warehouse were there. He loved his music and wine.

In June 1990, Oaks returned to Germany as USAFE commander. Suter and I went through the receiving line at the reception following the change of command. Using my nickname, Oaks introduced us to his wife as "Moody and 'Snake,' the guys who stole those buildings at Einsiedlerhof."

Oaks later became one of the best advocates for the Warrior Preparation Center and its mission. He once told Suter, "I would give up an F-16 squadron to keep the WPC!"

Fortunately, the statutes of limitation have expired as to how we acquired the building, computers, and personnel for the WPC. The original cadre of personnel was easy to get: Most had been passed-over outcasts with nothing to lose (though we were all eventually promoted).

LOAN US $2 MILLION

Central to getting the WPC up and running was an April 1983 demonstration for USAF Chief of Staff General Gabriel. To pay for this demo, Major General Kirk had "loaned" a couple million dollars as seed money from the USAFE flying hour account. This had to be a temporary loan, only, so Moody and I flew to Washington, D.C., to meet with Gen. Jerome F. O'Malley, the vice chief, to secure official funding.

At the Pentagon, O'Malley's secretary, Eva "Topsy" Taylor, an old friend of Suter's—and whom we had taken to dinner the night before—showed us into O'Malley's office ahead of some two- and three-stars already waiting, saying, "He's looking for you." After brief pleasantries, O'Malley asked what he could do for us.

Moody said, "Bill Kirk and I have an idea that we want to pitch to the Chief but we need some seed money," about $2 million.

O'Malley immediately pushed the intercom button and told Topsy to call the financial management office to tell them "young officer Clark" would be coming down, and to transfer $2 million into the USAFE account for a program for General Gabriel.

I was amazed. Suter hadn't even told O'Malley what the money was for, but the general trusted Suter's and Kirk's judgment: no staff summary sheet, PowerPoint, integrated process team, off-site, or POM submission required.

Suter was a master marketer. He choreographed a brilliant proof of concept, borrowing buildings, computers, staff, Russian tanks, and equipment in order to give Gabriel an amazing pitch. Moody knew Gabriel well. We had an artist build a "visit book" before the general's arrival for the demonstration. We had a photographer following Gabriel during the visit with a Polaroid to take pictures. These we put in the book, along with the artist's conception of the building. We capped it off with a WPC coffee cup—inscribed with Gabriel's name, of course.

Moody knew Gabriel would put the WPC visit book on the table of his Pentagon outer office, where every visiting two- and three-star could see it and leaf through it. They all called to ask how they could help, and they did.

AIR FORCE PETTING ZOOS

One of the keys to the success of Red Flag and the WPC was the adage, "Know your enemy." One of Suter's best ideas was to have aircrews see the adversary's real equipment—MiG fighters, surface-to-air missiles, anti-aircraft artillery, etc. By hook, crook, and "don't ask," he rounded up examples of adversary equipment, allowing airmen to get hands-on familiarity with it. He put models of F-15 Eagles on wires behind the cockpit of the MiG, allowing F-15 pilots to see exactly where the MiG's blind spots were.

These hands-on facilities became known unofficially as USAF's "Petting Zoos." They were located at Nellis, the WPC, and Kadena AB, Japan. They were just one more example of Moody being Moody.

Thirty-three years later, the WPC is alive and well. It's the world's premier wargaming simulation center and home of the USAFE Air-Ground Operations School, training almost all NATO joint terminal attack controllers.

One of his innovations way ahead of its time was Allied Command Europe-89, ACE-89, the first theaterwide interactive war game exercise in Europe. Commanders participated in the games via a satellite-distributed simulation from their wartime headquarters. Suter took a page from his Red Flag playbook, deciding there should be face-to-face briefings and debriefings.

One of ACE-89's chief technologies was the "Hollywood Squares" secure

video conferencing, where the Supreme Allied Commander, Europe, could debrief his remotely located commanders every evening about lessons learned that day. It even allowed the "redo" of a 24-hour segment of the exercise. This innovation paved the way for today's live and virtual simulation and training.

Moody convinced Army Gen. John R. Galvin, then the SACEUR, of the new satellite conferencing technology's importance at a bar on Columbus Day 1988. In classic Suter style, he demonstrated the concept to the general on bar napkins, then somehow managed to get the Defense Advanced Research Projects Agency to pay for it.

THE TWO-FACED F-15

Not every idea was brilliant. As Kirk would say, out of Moody's thousand ideas a day, only 10 were worth a damn—but those were really good. (Kirk would often continue that, depending on the day, Moody Suter and Snake Clark could receive either an Article 15 reprimand or Meritorious Service Medal for doing the same thing.)

One of my favorites among Suter's less stellar ideas was Janus, named after the two-faced Roman god. In the mid-1970s, when he was commander of the 555th Fighter Squadron equipped with F-15s, Suter came up with the idea of a two-seat F-15 with the backseater facing rearward, the better to have check-six visibility and situational awareness. He even had the Air Force graphics shop draw up a concept painting, now lost somewhere in the Pentagon.

This particular vision wasn't shared by Dixon or Gabriel.

Suter retired in 1984 but still continued to challenge the establishment and status quo for more than a decade, providing valued counsel to a long line of USAF leaders.

In January 1996, I learned he had lung cancer and little time left. I took it upon myself to make sure Moody knew his place in Air Force history would be recognized. I thought naming the Red Flag building at Nellis after him would be fitting, but I also quickly learned it was 10 times harder to name a building after a living person than someone already deceased.

Thanks to the support of Gen. Ronald R. Fogleman, Gen. Joseph W. Ralston, and Lt. Gen. Lloyd "Fig" Newton, we accomplished the nearly impossible in a mere nine days. Fogleman, Air Force Chief of Staff, called me with the news of our success and offered to let me tell Moody myself.

I was about to do so, but no sooner did I hang up the phone than it rang again. Moody's old friend Natalie Crawford called to say he had just passed away.

The attendees at the dedication of the Red Flag building at Nellis, named in Suter's honor on July 11, 1996, looked like a "Who's Who" of the Air Force past and present. At the direction of Brig. Gen. T. Michael Moseley, then the 57th Wing commander at Nellis, the letters of Suter Hall are twice as large as the letters at the gates of nearby Creech AFB, Nev. But that's another long story.

In May 1997, the WPC command building was named Moody Suter Hall, and today, in the Pentagon's room 5E1012, the Moody Suter Innovation Lab continues to prototype advanced concepts for combatants.

MOODY'S PIRATES

Now, some 41 years after the first Red Flag exercise and more than three decades after creation of the WPC, Red Flag-trained aircrews fly over Syria and Iraq, JTACs direct close air support in Afghanistan, and NATO commanders are at the air operations center, vigilantly watching the emerging Russian Bear. Suter's influence and legacy are still alive and well in our Air Force, and he continues to shape our future.

My time with Moody was the high point of my 43 years in the Air Force service. When I pinned on colonel in October 1996, I used one of his eagles.

Gen. Michael Dugan, who would become Chief of Staff in 1990, summarized my career best when we first met in 1986. He asked me who I was, and when I told him, he replied, "You're one of Moody Suter's pirates." I think Moody would have been proud. ✪

James G. "Snake" Clark is a member of the Senior Executive Service and director of ISR innovation in the Air Force's Office of the Deputy Chief of Staff for ISR. Clark belongs to the Donald W. Steele Sr. Memorial Chapter (Va.) and, an as Active Duty lieutenant colonel in 1993, was named AFA's Member of the Year.

USAF photo by TSgt. Jose Lopez

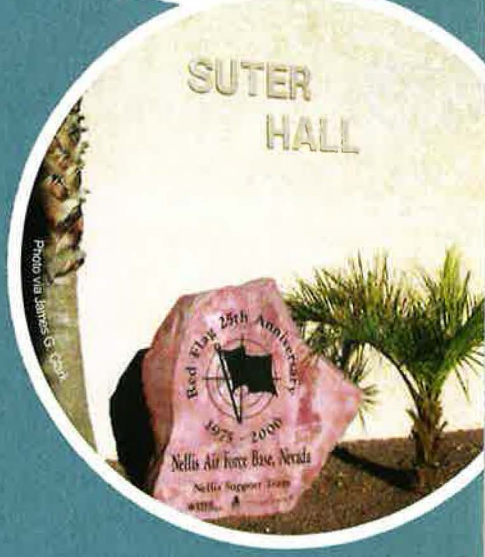


Photo via James G. Clark

LEGACIES

Moody Suter wanted to ensure USAFE and NATO would fight a smarter air war in Europe. At top: F-5Es from the 527th Tactical Fighter Training Aggressor Squadron, RAF Alconbury, UK, in 1983. Above: The Red Flag building at Nellis is named for him. Below: F-15s and F-16s of the 64th and 65th Aggressor Squadrons in 2008 illustrate another Suter idea: introducing enemy tactics into the Red Flag mix.

USAF photo

StellarXplor the Next St

By Richard J. Wendt and Rachel Zimmerman

AFA's newest STEM initiative can now point to a successful national deployment.

Teams from the same high school in California took home the top two trophies from StellarXplorers II, AFA's new national competition.

In April, 10 teams of high school students gathered at the Space Foundation's Discovery Center in Colorado Springs, Colo., for the national deployment of this program. StellarXplorers aims to inspire students to pursue an education in science, technology, engineering, and math by challenging them through a space-system design competition.

SIRIUS POTATOES

Team Sirius Potatoes and team Star Fleet took first and second place in the daylong StellarXplorers II. The two teams came from Palos Verdes Peninsula High School, in Rolling Hills Estates, Calif.

Rangeview High School's team Space Raiders, from Aurora, Colo., took third. This team had been last year's champion for the trial run of StellarXplorers, involving five Colorado teams.

StellarXplorers II opened registration for the 2015-16 school year last October. Twenty-seven teams signed up. Throughout the following months, students were challenged with space operations tasks, such as designing orbits and satellites and selecting launch vehicles. For orbit and satellite design, competitors used the Systems Tool Kit by Analytical Graphics, Inc. They also used an online space textbook, *Exploration of Space.*

Three online qualifying rounds took place early this year. Along with the top three winning teams, these seven top scorers advanced to the National Finals:

USAF photo by Kevin Gr

Photo by Richard We

Left: The StellarXplorers winning team from Palos Verdes Peninsula High School, Calif., poses with (far left) Richard Bundy, AFA's vice chairman for aerospace education, and (far right) Maj. Gen. Roger Teague. Right: The third-place team from Rangeview High School, Colorado, works together during the competition.

'ers: ep

- Team Carson 2, Boys & Girls Clubs of Carson, from Carson, Calif.
- Team AFJROTC Phantom Panthers, Huntsville High School, from Huntsville, Ala.
- Team Jets Engineering, James Clemens High School, from Madison, Ala.
- Team CHAPS, San Pedro High School, from San Pedro, Calif.
- Team Stellar Wolves, Vista Ridge High School, from Colorado Springs, Colo.
- Team Star Flyers, Dixie High School, from St. George, Utah.
- Team Galaxy Raiders, Kaiserslautern High School, from Kaiserslautern, Germany.

DEBRIEFING

The National Finals consisted of challenges similar to those in the qualification rounds.

The next day, each team gave a 15-minute debriefing counting for as much as 20 percent of its final score.

Judges for StellarXplorers were William A. Yucuis of AFA's Waterman-Twining Chapter, Tim Brock from the Central Florida Chapter, and from the Air Force Academy's Department of Astronautics, Col. Martin E. B. France, chairman, and faculty member Maj. Anna Gunn-Golkin.

After the competition, teams visited the Space Symposium Exhibit Hall at the Broadmoor resort, then attended a reception and awards ceremony and the Space Technology Hall of Fame dinner that evening.

At the awards ceremony, Maj. Gen. Roger W. Teague, director of space programs in USAF's acquisition office, and Richard B. Bundy, AFA vice chairman of the board for aerospace education, presented the StellarXplorers trophies.

VIPs in the audience included Gen. John E. Hyten, head of Air Force Space Command, and Maj. Gen. Stephen T. Denker, National Reconnaissance Office deputy director.

As reported by several news outlets, Regina Kim, the Sirius Potatoes team captain, said, "StellarXplorers has broadened our vision on aerospace engineering. Our team performed exceptionally well, and the competition allowed us to learn so much more about space, satellites, and engineering."

Tom Brown, director of the third-place team from Rangeview High Schol, commented, "StellarXplorers gives our students a unique opportunity to learn what is required to keep our country safe through the use of satellites, and our students can explore potential careers in aerospace."

Along with the Space Foundation—which this year expanded the technical support to accommodate twice the number of finalist teams from last year—StellarXplorers sponsors were the US Air Force STEM Outreach Office, Orbital ATK, Kratos Defense & Security Solutions, Inc., and Analytical Graphics, Inc.

Registration for StellarXplorers III is now open. Visit the website at www.stellarxplorers.org for information or to register a team.

Richard J. Wendt is president of Colorado's Mile High Chapter. Rachel Zimmerman is CyberPatriot's senior manager, program administration and events.

CHAPTER NEWS

By Frances McKenney, Deputy Managing Editor

Updates on AFA's activities, outreach, awards, and advocacy.

CENTRAL FLORIDA CHAPTER

The Central Florida Chapter hosted its 20th annual Scholarship Opportunity Program in March.

This event allows high school students and their parents to meet admissions representatives and cadets from the Air Force Academy and from the University of Central Florida AFROTC detachment. Twenty-eight local students and 35 parents attended the program this year.

The information session takes place on the first Sunday of the academy's spring break. This timing allows the area's academy cadets to join the AFROTC cadets, giving high school students an opportunity to ask questions of people from both commissioning programs.

At the latest gathering, Central Florida Chapter President Gary A. Lehmann welcomed students, parents, and cadets. Capt. Erik Mulkey, recruiting officer for the University of Central Florida's Det. 159, described the application process for the AFROTC High School Scholarship Program.

Rick Miller described the academy's preparatory school, for those motivated to attend the academy but needing extra time to be more competitive, and the Falcon Foundation Scholarship program to help potential academy cadets. Miller has mentored central Florida high school students—including his own children—through the prep school process that often leads to students becoming cadets at the Air Force Academy.

The highlight of the event was the one-on-one time high school students had with cadets from both programs. Not far from their days in high school themselves, cadets from the academy and the ROTC program brought the credibility of experience to the table. They stayed well beyond the scheduled event time to be certain all guests had their questions answered.

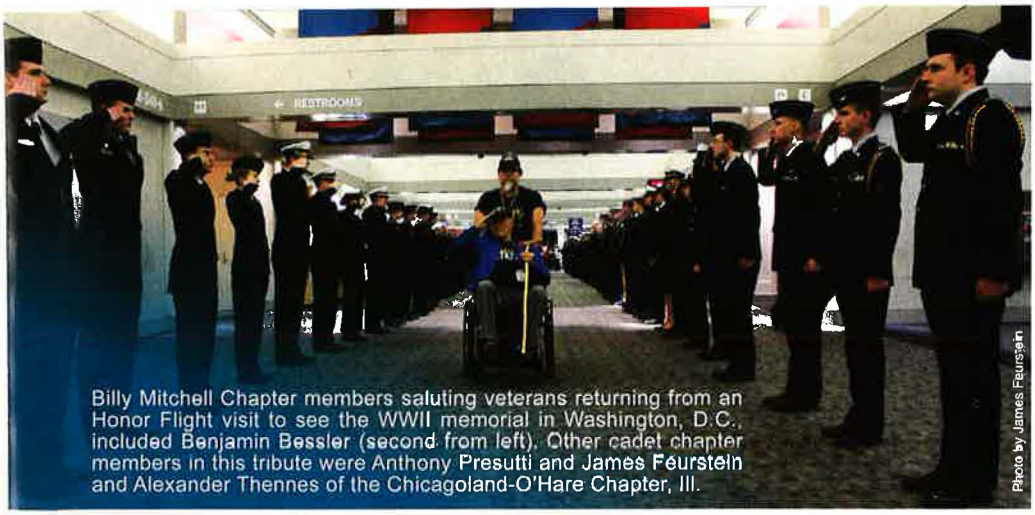
—Todd Freece, Central Florida Chapter executive VP

Photo by Todd Freece

Air Force Academy cadets Matthew Medla (left) and Joseph Stukey chat with guests at a Central Florida Chapter cadet-information program. As part of the event, Chapter Executive VP Todd Freece spoke about the academy's admissions requirements.

Photo via Michael Richardson

Sarasota-Manatee Chapter President Mike Richardson presents a space atlas to Nathanael Dudgeon, who received chapter recognition at a Florida science fair. Dudgeon is home schooled. Pine View High School student Henry Tingle also received a chapter award.



Billy Mitchell Chapter members saluting veterans returning from an Honor Flight visit to see the WWII memorial in Washington, D.C., included Benjamin Bessler (second from left). Other cadet chapter members in this tribute were Anthony Presutti and James Feurstein and Alexander Thennes of the Chicagoland-O'Hare Chapter, Ill.

Photo by James Feurstein

Photo via Paul W. Bekebrede

Photos via Larry Louden

Above: Lisa Oyler receives Missouri State and Harry S. Truman Chapter Teacher of the Year honors from Chapter President Paul Bekebrede (left) and VP Harry McLane. A teacher at Summit Technology Academy, Oyler coached the CyberPatriot VIII Open Division national champions. (See "CyberPatriot VIII," June, p. 70.)

At far left, Ty'Queyia Jenkins displays an AFA Outstanding AFJROTC Cadet award she received at Awards Night at Pine Bluff High School in Arkansas. Arkansas State President Larry Louden (right) made the presentation.

Marie Philavong (left) received an AFA Outstanding AFJROTC Cadet award at Greenwood (Ark.) High School's Awards Night. Louden is also the Lewis E. Lyle Chapter president. Philavong is a chapter member.

AFA Emerging Leader

Bradford J. Wilkins

Home State: Nuremberg, Germany.

Chapter: Gen. Charles A. Gabriel Chapter (Va.).

Joined AFA: 2013.

AFA Offices: CyberPatriot mentor, Chantilly High School (Va.), 2013-16; Chapter VP, education.

Military Service: N/A.

Occupation: Project engineer in information security.

Education: B.S., Ohio University; M.S., George Washington University.

How did you hear of AFA?

I didn't hear about it until I got to a CyberPatriot event. I didn't even know it was an AFA program. [Gabriel Chapter member] Gina Giles educated me.

How did you hear about CyberPatriot?

Through work. My company's main presence is in [Los Angeles], and our company mentors CyberPatriot teams there, so when one of the teams flew out here for Nationals, there were a bunch of people from my company here who went [to the National Finals competition site at National Harbor, Md.] to mentor them.

Why did you become an Emerging Leader?

The chapter president nominated me, and I wanted to get more involved in the STEM activities.

Has the Emerging Leader Program been helpful?

It's really helped me understand more about the organization and what it takes to run a nonprofit. It's just interesting to see all the initiatives AFA is doing: Wounded Airman Program, Air Force Memorial—those kinds of things. ... I've actually had executive experience before, at a small company. I've sort of wanted to do that type of thing. I don't necessarily aspire to be the big leader, but I want to effect change. I think it's neat to help the kids.

Screengrab from *USA Today* video

A hotel room cram course: When this team from Los Angeles made it to the CyberPatriot National Finals in Washington, D.C., Brad Wilkins (center) was a local mentor.

IRON GATE CHAPTER

In April, the Iron Gate Chapter joined the New York City United Service Organization in a USO fund-raiser on the banks of the Hudson River. It was part of the chapter's outreach to gain new members by trying different events and avenues to present the new face of the Iron Gate Chapter.

Sixteen people represented Iron Gate at the USO event, including Jonna Doolittle Hoppes, granddaughter of Air Force and aviation legend Jimmy Doolittle, an AFA founding father. The chapter representatives called themselves Team Iron Gate and wore custom-made t-shirts to proclaim it. The shirts were such a hit the chapter was able to sell them to visitors at the Iron Gate table set up at the fund-raiser.

Many chapter representatives ran or walked in the USO 5K, placing third, ninth, and 11th, despite the cold and a windy course and competition from some fairly young Active Duty men and women. *—Tom McCarthy, Iron Gate Chapter secretary*

It was so cold on the Hudson River in April that Miss New Jersey—Jessielyn Palumbo—wore a jacket. So did actor J. W. Cortes (left) from the TV series "Gotham." They congratulated Kyle Fisher (center) who won third place for the Iron Gate Chapter in the USO 5K.

All of them are winners, declared Carl Vinson Memorial Chapter President Dan Penny (far left). So he lined up with the whole Total Force group at the chapter's awards luncheon at Robins AFB, Ga., in April. More than 80 guests were present.

Reunions

reunions@afa.org

463rd Airlifters Assn and **316th Tactical Air Wing** (1965-75). Nov. 6-9, on the Queen Mary, Long Beach, CA. **Contact:** Phil Tenney (626-822-0262) (Jenneytenney@gmail.com).

507th TFG/ARW (AFRES), including current and former Okies. Sept. 23-24, Tinker AFB, OK. **Contact:** Janice Lyles, 15424 Bovee Road,Oklahoma City, OK 73165 (SHOkies.com).

C-7 Caribou Assn. Sept. 7-11 in Washington, DC. **Contact:** John Tawes (770-447-4336) (jtawes@gmail.com).

Reese AFB Pilot Training Class 70-05. Oct. 13-16 in Seattle. **Contact:** John Downs (360-829-7206) (reese7005@gmail.com).

CREATIVE IDEAS FROM JAPAN ...

"Are you a Lego master builder?" the Keystone Chapter asked airmen's kids at Kadena AB, Japan. This budding architect said, "Yes."

Children crowd around judges—including A1C Tyler Hill (right foreground)—at the Keystone Chapter's Lego Master Builder competition, designed to encourage an interest in STEM. The chapter has built events around themes that capture the Kadena community's attention.

Photos by Trevor Naismith

Located at Kadena AB, Japan, the Keystone Chapter has become one of AFA's most active groups.

Their past president, SSgt. Abraham Almonte—see his photo in "25 Years at War," January, p. 34—led the chapter in organizing innovative activities and earned two AFA membership awards last year.

But besides Keystone's 10K road race or its Airpower Week, perhaps the chapter's most important achievement was its handover to new leadership.

Keystone Chapter's president, TSgt. Brian R. Klatt—an aircraft armament systems instructor with Det. 15, 372nd Training Squadron—recently talked about this and other topics in an email with AFA's Bridget Dongu. Here's their exchange:

What are the challenges of an overseas chapter?

The challenges are vast but they are manageable.

Being overseas, we have a high turnover rate of our membership. This is good and bad for a couple of reasons.

It is good because our chapter knows when key members are moving so we can forecast a replacement. It is bad because our membership numbers change constantly.

Stateside chapters normally have what I like to call the "old timers." These members have valuable insight on how the chapter was run before and what events took place during a specific time of the year. This is great for continuity. Unfortunately we do not have this luxury, so we have spent countless amount of hours building "how to" binders that will help with our continuity.

Tell me about being located far from AFA National.

We have an outstanding membership base here in Okinawa.

Something unique about our chapter is we have keyed in on hitting the big "A" in airmen—meaning [we include] enlisted, officers, civilians. We also have quite a few retirees and spouses that make up our membership.

What advice have you for chapters like yours?

For all of the other small chapters out there: Build a feasible yearly activity plan. Don't commit to more than your chapter can handle, and with every event, plan, communicate, and execute. Any goal is achievable, but it will take hard work and dedication from your membership.

Bridget Dongu is AFA's senior manager of communications.

... AND FROM GERMANY

USAF photo by SSgt. Timothy Moore

Above: The Ramstein Chapter hosted speed mentoring—a variation on speed dating. The AFA Professional Knowledge Speed Mentoring session involved 19 SNCOs, retirees, and officers as mentors and 19 airmen and NCOs—including chapter member SSgt. Dustin Trimble, left—who were mentored. Below: The Ramstein Chapter donated funds to a USAFE-AFAFRICA Expeditionary Site Survey team for mementos for a trip to Norway to promote partnership missions. Here, Lt. Col. Guy Perrow (right) gives a challenge coin to Maj. Cato Eliassen at Andoya, Norway.

Photo via SMSgt. Bradley Williams

AFA's 70th

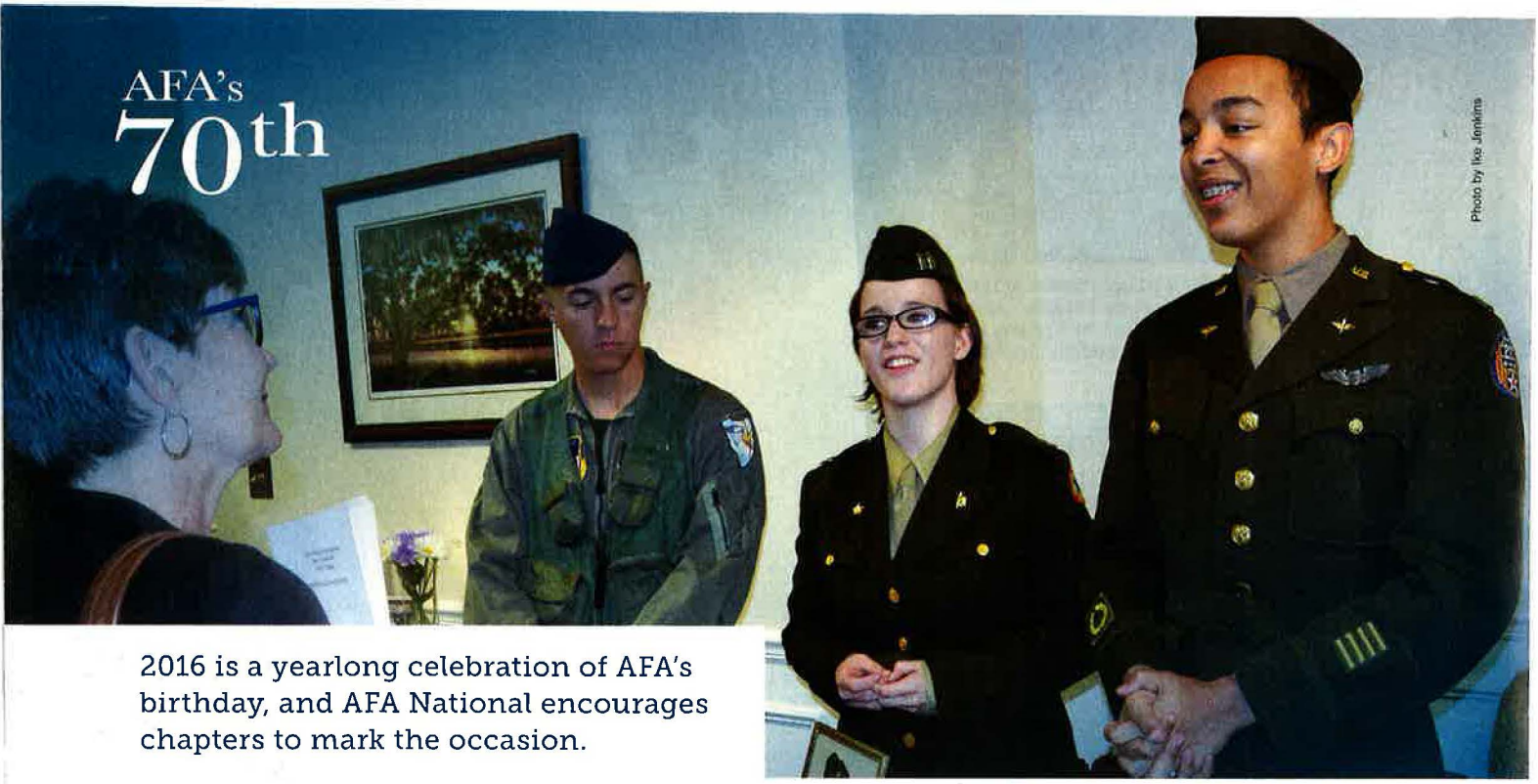


Photo by Ike Jenkins

2016 is a yearlong celebration of AFA's birthday, and AFA National encourages chapters to mark the occasion.

SWAMP FOX CHAPTER

With ingenuity from AFJROTC cadets to highlight AFA's 70th anniversary, the Swamp Fox Chapter hosted the South Carolina state convention in April at Shaw AFB, S.C.

Cadets from Crestwood, Sumter, and Lakewood high schools set up displays of memorabilia at the convention to illustrate the 70-years theme. Retired Gen. Gary L. North—the guest speaker and an AFA national director—joined State President Linda J. Sturgeon and AFA President Larry O. Spencer in judging the displays. Sumter's proved the best.

Sturgeon commented, "The uniforms were amazing. Along with the vintage items they had collected and labeled, the total display was creative." She was impressed that two cadets had even prepared speeches on the eras they represented.

At morning meetings, convention-goers listened to updates from Spencer and Col. Jason M. Brown, the US Air Forces Central Command director of intelligence.

Charleston Chapter's Shawn Gordon spoke to the group about CyberPatriot, AFA's national youth cybereducation program. (Read about Gordon's initiatives in "How to Find Mentors for CyberPatriot," January 2015, p. 72.).

Total Force top performers received honors at the awards luncheon that followed. Amy McMahon from St. Andrews School of Math and Science in Charleston County was named 2016 State Teacher of the Year, and AFROTC, AFJROTC, and Civil Air Patrol cadets and units received awards.

As luncheon keynote speaker, North described world threats and how the Air Force faces its challenges.

The 120 guests included US Rep. Mick Mulvaney (R-S.C.), Scott Jaillette, representing Sen. Lindsey Graham (R-S.C.), Sumter Mayor Joseph T. McElveen, and Rodgers K. Greenawalt, AFA's Southeast Region president. —*Bush Hanson, Swamp Fox Chapter president*

Top: South Carolina State President Linda Sturgeon (left) interviews Sumter High School cadets at the state convention's informal contest on the theme of AFA's 70th anniversary. Modeling part of their entry are (l-r): Levi Pate in a Vietnam War-era flight suit and Alexcia Harrison and Christian Clayborne in World War II-era Class As.

Photo via Jamie Thurber

In Massachusetts, Paul Revere Chapter members display an AFA anniversary cake shared with clients of the Edith Nourse Rogers Memorial Veterans Hospital in Bedford. L-r: President Jamie Thurber, Edie Singleton, Tanya Lambert, Tanya MacEwan, Anupa Kurian, 2nd Lt. Ryan Kramer, and State President Joe Bisognano.

Photo via Amy Gold

Flight suits, civvies, and steaming hot food: In Florida, Eglin Chapter commemorated AFA's 70th by inviting Community Partners to a party. That's Chapter Secretary Shirley Piggott chatting with a guest.