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Journal of the Air Force Association

AIR FORCE MAGAZINE

AN AIR FORCE FOR THE FUTURE

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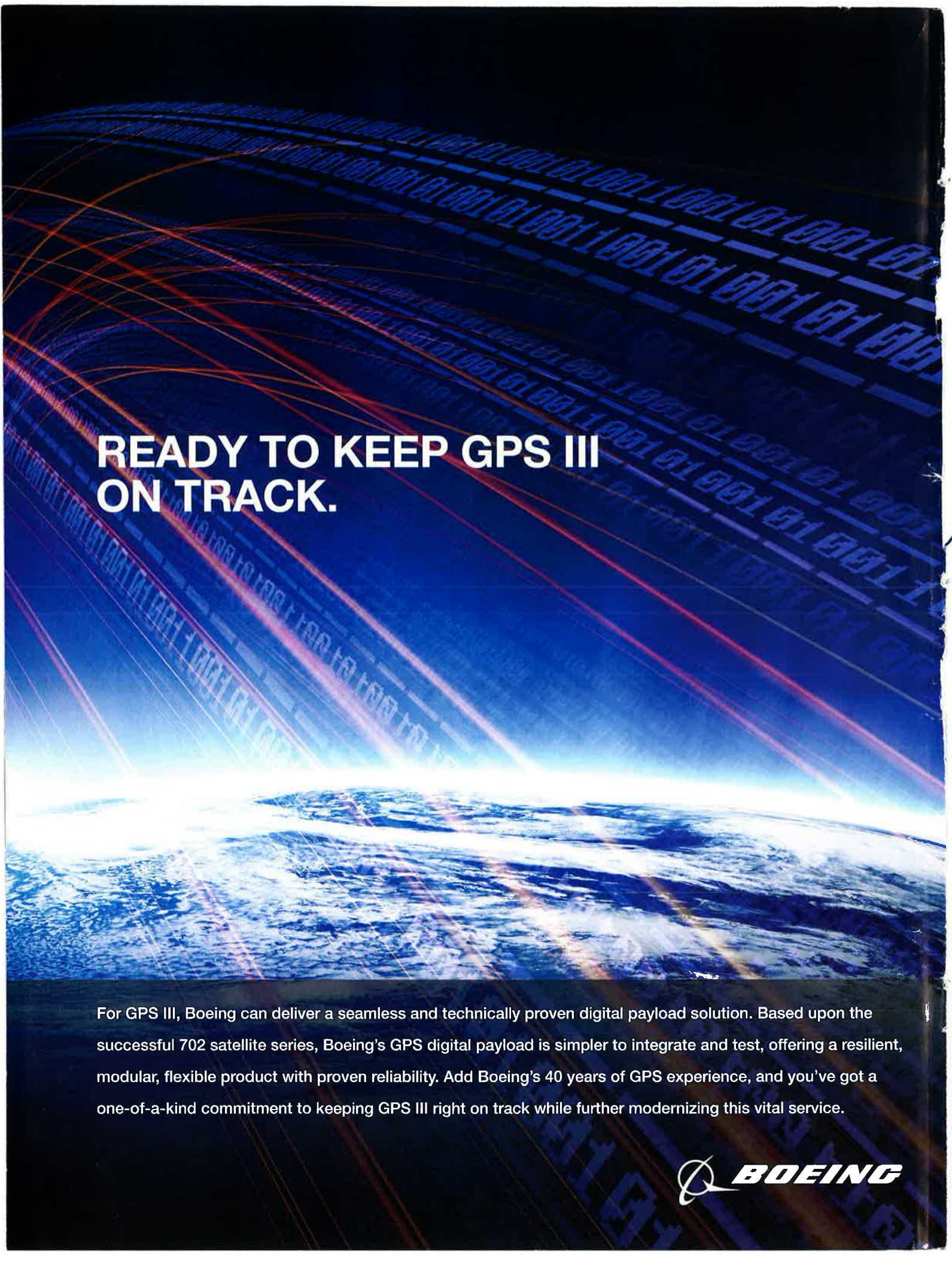
Rise of the Machines

AFA's National Teacher of the Year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AIR FORCE MAGAZINE
April 2016, Vol. 99, No. 4

FEATURES

About the cover: Engineer 2nd Lt. Krystin Shanklin tests out Google Glass. USAF photo by Richard Eldridge. See "An Air Force for the Future," p. 20.

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By Adam J. Hebert, Editor in Chief

An Air Force at War on the Home Front

In early March, top Air Force leaders detailed the diverse and increasing challenges USAF faces worldwide.

"We've been watching China flex its muscles," noted Chief of Staff Gen. Mark A. Welsh III at a March 3 hearing with the Senate Armed Services Committee, before mentioning new and evolving threats from Russia, North Korea, Syria, and ISIS.

The nation expects the service to fight terrorists flawlessly overseas, prepare for major theater war, bring readiness up to par, maintain competitive pay and benefits, and modernize what is now the smallest and oldest Air Force ever.

The Air Force is trying to cram 10 pounds of requirements into a five-pound sack.

These are all reasonable expectations. The problem is that Air Force funding does not match the needs, giving USAF a five-pound sack to hold 10 pounds of requirements. Things are predictably spilling out, and the results are messy.

Despite the limited relief provided by last year's Budget Control Act, spending is still limited by law. The Defense Department "submitted a defense budget that is actually less in real dollars than last year, despite the fact that operational requirements have grown," noted Sen. John McCain (R-Ariz.), SASC chairman, at the hearing.

The Air Force budget is $3.4 billion short of what is actually needed for Fiscal 2017. There are shortfalls across many accounts, including in personnel where USAF seeks to grow its end strength from 311,000 airmen to 317,000 or perhaps even 321,000 by the end of next year. The disparity between mission and money forced the Air Force into tough choices that have drawn the ire of many, most prominently McCain.

McCain is particularly incensed about USAF's plans for new equipment, including its strategy for acquiring the B-21 bomber and developing a replacement for Russian-built RD-180 rocket engines. It was on the topic of fighter and attack aircraft where tensions really boiled over, however—in particular USAF's plans to slow F-35 purchases while eventually retiring the A-10 Warthog.

"We don't have enough people in the Air Force to continue to operate all the equipment we have today and to stand up a new fleet of F-35s," Welsh told McCain at the hearing. "With additional manpower and funding to cover the activity, we could certainly do [both], and I'd be a very happy air chief if we got that increase. But today we do not have the manpower to do both."

McCain was unimpressed. "The only problem, General, with your statement about the A-10 is you have no replacement for it," he stated.

Welsh attempted to explain that the A-10's current capabilities will be absorbed by F-16s, F-15Es, B-1s, and other aircraft. These systems already perform the majority of the Air Force's close air support missions.

What followed was an extraordinary exchange between a uniformed service Chief and the head of a powerful defense committee, whose state hosts A-10s at Luke Air Force Base.

As McCain astoundingly interrupted Welsh 14 times in a few short minutes, the senator said the general's explanation "flies in the face of reality, ... is really unfortunately disingenuous, ... and every Air Force pilot that I know will tell you the most effective close air support system is the A-10. ... Why would you want to retire the least expensive, most accurate [CAS] system?"

"I don't want to retire it, Senator, but the Air Force has to get bigger to do all this," Welsh replied.

"But you haven't got a replacement for it, General."

"Sir, we will be glad—"

"For you to sit here and say that you do absolutely flies in the face of the facts," McCain interrupted. "So enough said, General, OK?"

"OK, chairman," Welsh replied.

"It's really embarrassing to hear you say something like that," McCain countered.

The A-10 was raised again, by Sen. Lindsey Graham (R-S.C.), who asked the Chief if he wanted to keep or retire the Warthog.

"I'd keep the A-10," said Welsh, who flew the jet early in his career. "I'd build a new low-threat CAS platform. I'd replace the A-10 with [the new aircraft] when it was fielding. And I'd use the other money to build manpower to stand up the F-35 [for] the Air Force. We need the capability. We're stressed, ... and I think it's a logical plan. We just don't have the money to do it."

Meeting a few days later with defense reporters at the Pentagon, Air Force Secretary Deborah Lee James noted that "if we have to live within the existing toplines, this is going to create problems because here we're talking about how many of these choices that we've put forth in the budget are not popular. ... It's a question of what kind of a military do the American people want, going forward."

McCain's committee confirmed both James and Welsh for their positions, and charged them with organizing, training, and equipping the Air Force. USAF is forced to make tough decisions to fit its expanding requirements into a shrinking budget, and is then raked over the coals for making those tough decisions.

The Air Force is at war or trying to keep the peace around the world—but also battling with lawmakers at home over cost-saving measures that can never be popular.

Congress has the power to improve things. If lawmakers wish to preserve the world's best Air Force, they should overturn the Budget Control Act spending caps. They should approve the top supplemental modernization and readiness spending increases USAF asked for in its March unfunded priorities "wish list." And they should empower the Air Force leadership make the tough calls Congress requires them to make. ✪

By Megan Scully

Wishing for More F-35s

Air Force officials want to add back the five F-35As trimmed from the budget request for next year, if Congress can find the money for the stealthy fighters in a constrained budget.

The jets, the price tag for which would total $691 million, topped the Air Force's Fiscal 2017 unfunded priorities, an annual wish list the military service chiefs send to Capitol Hill as debate on the defense authorization and appropriations bills get underway.

The lists typically serve as a guide—and a justification—for lawmakers who seek to fund pet programs that did not make the Pentagon budget request. The Air Force had been expected to request 48 F-35As for next year, but budget pressures forced service officials to scale purchases in 2017 back to 43.

The bipartisan budget deal in place for Fiscal 2017 leaves the Air Force with about $3.4 billion less than it had planned on spending next year, a number that service officials say forced them to make difficult choices on premier investment programs.

Some of those decisions, like the cuts to the F-35, are being met with stiff resistance on Capitol Hill.

"We've, of course, detailed the investments that we've made and we've tried to detail the tough choices that we made for budgetary reasons, none of which are popular as you know," Air Force Secretary Deborah Lee James said March 7 of her discussions with lawmakers on the budget request. "They're not popular with us, either. And that's precisely what makes them tough."

The budget deal, which spanned 2016 and 2017, averted more stringent spending constraints but nonetheless capped the Pentagon's base budget at levels lower than what the military leaders have said the services need to fulfill requirements now and in the future.

But the Defense Department enjoys one perk not afforded to other government agencies: a budgetary overflow valve of sorts in the form of the war spending account, which is not subject to constraints and, as such, has been increasingly used to pay the Pentagon's day-to-day bills.

That could make it a little easier for lawmakers to find funds for priority programs like the F-35, the cuts to which have already sparked criticism on Capitol Hill.

"This budget-driven decision will likely increase the cost of this already costly aircraft, while exacerbating what defense experts call the modernization bow wave for other critical Air Force programs over the next 10 years, which the Air Force admits it cannot afford at current funding levels," Senate Armed Services Chairman Sen. John McCain (R-Ariz.) said during a March 3 hearing on the Air Force's budget request.

McCain has been critical of cost overruns, technological problems, and other issues with the F-35 program, but he has largely backed the Lockheed Martin-built fighters, which will replace old Air Force, Navy, and Marine Corps fleets. Arizona's Luke AFB is an F-35 training center.

The Air Force, which once famously submitted a 17-page list of unfunded priorities that totaled $17 billion, kept this year's list short and sweet, likely in an attempt to focus congressional attention on the items the service needs the most.

Aside from the F-35s, the Air Force seeks $724 million to replace eight more C-130Hs with more modern C-130J aircraft. The Pentagon requested $1.4 billion for 14 C-130Js and variants next year.

Air Force officials also desire $88 million to update F-16 fighters to make them more survivable and $145 million to grow service end strength to 321,000 airmen, up from about 307,000 today. Air Force leaders have long bemoaned the small size of the force, which has 200,000 fewer Active Duty airmen than during the days of Desert Storm.

But the biggest item on the unfunded list is $1.2 billion for facilities, sustainment, restoration, and modernization accounts, particularly focusing on information technology.

In making their pitch for the 2017 budget proposal on Capitol Hill, Air Force leaders have run head-on into lawmakers not pleased with various puts and takes in the request—a side effect, James says, of the more austere spending environment.

"In periods of rising budgets, and when there is more for programs and more for all parts of the budget, that's just, as a general proposition, an easier sell than when you are in tougher times, when budgets are either leveling off or decreasing," she said during the Pentagon briefing March 7. "Because it's very, very difficult to make these tough choices."

But at least one lawmaker—and Air Force veteran—says he sees the service in hotter water than the Army or Navy as they make their own budget pitches before the congressional defense committees. Fights over the A-10 retirement, which the Air Force has at least shelved for next year, and a Russian-built rocket engine have only made the service's job more difficult.

"It just seems that we fight more with the Air Force than anybody, and I'm in the Air Force, or used to be, anyway," South Carolina Republican Lindsey O. Graham said during the March 3 hearing.

Megan Scully is a reporter for CQ Roll Call.

Bring back the missing five F-35s.

USAF photo by MSgt. Donald R. Allen

letters@afa.org

Airbus Advantage

The February issue, with its tanker update, Reaper program details, and superb Phillip Meilinger essay on air supremacy, stands out as especially informative. The article "Tanker Time Is Tight" *[p. 24]* notes that Boeing hopes to recoup its KC-46 investment through foreign sales. Such sales also would serve to keep the line warm in the event of a need to exceed the original 179 plane buy. Although the article states that Boeing has but one foreign tanker customer, Japan, the picture is not quite that bad—Italy took four KC-767s as well. The point is well-taken, however. As "Tanker Time" relates, Airbus has won quite a few of the recent tanker competitions. The 767-based tanker has sold less than 10 planes to customers other than the US Air Force.

A little comparative analysis may shed some light on Airbus' seeming invincibility. Airbus offers tanker designs based on the 737-sized A319/320 as well as the roughly 777-sized A-330. These meet a wide range of customer requirements. More importantly, Airbus' offerings are flying. Potential buyers can try them out and look at real data. Thus Boeing with its sole 767 offering is at a disadvantage; figuratively speaking, the customer sees an empty ramp where putative 737- or 777-based tankers might go up against their Airbus counterparts.

As slots are opening up on the 737 and 777 lines as customers wait for the new 737 MAX and 777X, now might be a good time for Boeing to offer credible tanker prototypes of both designs. A choice of three distinct aircraft types —737, 767, and 777—would not only outstrip the Airbus product line but also give the 767 a new context as a midsize tanker. To be sure, a Boeing design win other than the 767 would not meet the goal to recoup 767-based tanker costs. But a full product line would signal that they are in the tanker business with both feet and might also position them well for the KC-Y and KC-Z competitions.

Steven Agoratus
Hamilton, N.J.

You Think That's Bad

I was reading "Don't Fear the Reaper" *[February, p. 18]* when the caption on p. 21 caught my eye: "Airmen at the JB Langley-Eustis, Va., DCGS often worked 14-hour days, six days straight." It brought back a memory from my time at Schriever Air Force Base. Some years back, at a wing commander's call, the 50th Space Wing commander announced the satellite control squadrons would be working 12-hour shifts. One squadron stood and cheered! They had been working 14-hour shifts, so for them 12 was a relief.

Capt. Douglas M. Clapp,
USAF (Ret.)
Greensboro, N.C.

In terms of drone pilot shortages, certainly no manpower shortages can or should be shored up with contractors. It may be time for the Air Force to re-evaluate the warrant officer. The drone program should be advanced with its own manning and career track and career advancement opportunities. The Army has used the warrant officer very effectively and efficiently. I believe the Air Force would benefit greatly in terms of costs and careers.

Lt. Col. William Sullivan,
USAF (Ret.)
Seffner, Fla.

In Iraq, the Army had Air Force and Navy pilots flying Army aircraft and transporting Army generals. The Army is downsizing and it would make economic sense to seek to have some of the soon to be unemployed Army soldiers learn to fly UAVs. They are trained, have discipline, and it would just make sense to move them over to the Air Force.

Second thought is about Total Force. For goodness sake, we were working on making Total Force a reality at least 26 years ago. We failed in that endeavor because Active Duty leaders gave it mere lip service. They failed to realize that a majority of Reserve and Guard members were once Active Duty members and not second-class citizens.

Thomas Sullivan
Olympia, Wash.

Bring It

Congratulations on the very fine article by Elise Steinberger addressing the physiological requirements for being a fighter pilot *["What It Takes," February, p. 52]*. But please do not forget that these requirements are not the only requirements for being a fighter pilot. The fighter-bomber pilots, before they strap on their G-suits to carry the iron to places like Hanoi, men like Jim Kasler and Leo Thorsness, had to strap on their mental armor. "Yea, though I fly through the valley of the shadow of death, I will fear no evil, for I am the meanest son of a bitch in the valley." The chaplain at the end of the runway, reading from the Good Book and praying for your safe return,

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reminds these pilots that this would be a good time to trot out your "A" game.

Col. Roger Smith,
USAF (Ret.)
Fort Walton Beach, Fla.

TACP in Vietnam

Your article on TACPs bought back a flood of memories *["Wingman: From the Mud Up," February, p. 74].* Fresh out of ground radio school at Keesler Air Force Base in March 1969, I was sent to Bien Hoa Air Base with the 19 TASS and then on to Phu Loi with a TACP attached to the 3rd Brigade, 82nd Airborne Division. When the 82nd left Vietnam in the fall of that year, I went to the Sidewinder FACs, a TACP assigned to the 3rd Brigade, 1st Infantry Division at Lai Khe, and from there to a tactical operations center at an NDP near the Cambodian border a few klicks away from 5,000 NVA regulars. On Christmas Day, 1969, during a "cease-fire," an LRRP unit came under fire from a larger force of VC. Using the FM radio to communicate with the ground troops, I directed an airborne FAC to the coordinates on the VHF and scrambled fighters from Bien Hoa. The radio coordination among the ground troops, the FAC, fighter aircraft, and Bien Hoa was credited by the brigade commander with saving the lives of every member of the LRRP and in destroying and/or repelling the VC. The brigade commander was going to recommend me for the Bronze Star for meritorious service but the paperwork never got filed due to the closure of the NDP at Minh Thanh and turning over Lai Khe to the ARVN early in 1970—a disappointment to this day. But the satisfaction of knowing I helped save the lives of the LRRP members more than compensates. Obviously, this was well before the TACP became an actual specialty. I am happy to see the recognition it deserves.

James T. Ryan
Lakewood Ranch, Fla.

They Can Bid (or Not) If They Want To

In the February issue *["Air Force World: McCain Calls For Freeze on ULA Payments," p. 16],* you indicated that Senator McCain was calling for an audit of ULA's business systems because he does not believe their explanation as to why they didn't bid on a launch request. In the United States, I believe that it is still a company's right to decide which business opportunities they wish to pursue.

Further, I believe that on numerous occasions the senator has gone on about the amount of waste that occurs in the DOD. I am certain that he is aware that an unscheduled audit is not free, but costs a sum that could be construed as "waste" if it is spent as a result of an individual's vituperous agenda against a business.

As a side note, he should be aware that the Defense Contract Management Agency accomplishes periodic audits on a regular basis. Perhaps he could be provided with the most recent one. This might help eliminate some of the "waste" that he so often criticizes.

James H. Gill
Manhattan Beach, Calif.

What Is in a Name?

While Mr. Correll points out that Islamic scholars were upset with the naming of the military response to Sept. 11, there were also many Christians who were upset with the term "Infinite Justice" *["The Lost Art of Naming Operations," February, p. 54].* My Methodist minister and I were questioning the use of biblical terminology by a nation that prides itself on religious freedom at war with radical Islam, which prides itself on religious intolerance. "Enduring Freedom" did much better in capturing the values of our society in the struggle for liberty and toleration.

Sean M. Mallory
Edinboro, Pa.

Just completed John Correll's artful treatise on the lost art of naming operations. What immediately came to mind, for one who flew some of those air-evac missions, was the memorable repatriation of US Vietnam POWs in what eventually became known for its more appropriate appellation of Operation Homecoming. This noteworthy and moving enterprise began life as the less elegantly named Operation Egress Recap.

Col. "Red" Martin,
USAF (Ret.)
Wimauma, Fla.

Author John Correll has hit the target—a "shack." It is a shocking reflection on today's military that the operations do not have a resounding military overtone. I flew in Rolling Thunder and in Barrel Roll, Steel Tiger, and Tiger Hound. And no one who flew there will ever forget Route Pack 6. Sure sounds a lot better than Just (be)Cause.

Winston Churchill realized this, stating that operation names should have a nobility about them—he said it would be

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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.

demeaning to tell a grieving mother her son died in "Operation Bunnyhug." It's not generally remembered that the British-Canadian beaches at Normandy were named after fish—Sword(fish), Gold(fish) and Jelly(fish). Churchill wasn't buying Jelly Beach, but to keep the J it was renamed Juno.

The rot actually started in the early '70s with aircraft call signs. I can remember a cross-country from George Air Force Base in 1973; while filing my flight plan at an intermediate stop at Cannon, I commented to the pilot next to me in base ops that I didn't like my call sign of Vomit 94. He was from Nellis and replied: "What are you complaining about? My call sign is Tyrd 23."

You can't make this stuff up.

Jonathan A. Hayes
Corvallis, Ore.

Fascinating article about operation code names. Early in my Air Force career, I read through a copy of AFR 205-1. In the appendix was a listing of code names that were assigned to each Majcom and other Air Force activities. I was impressed because I recognized several code names that I had read about in Air Force news releases prior to coming on Active Duty. One code name I did not recognize was Hasty, which was assigned to Air Training Command.

Several years afterward, I was a weapons control systems (WCS) instructor at Lowry Air Force Base (deceased, R.I.P.). At that time, ATC was attempting to save money by streamlining fundamental electronics instruction. The code name assigned was Hasty Spark. Later, a certain unnamed brigadier general commanding Lowry Technical Training Center decided he did not like the word Hasty, and changed the name to Bright Spark. We instructors looked at each other, shrugged our shoulders, and referred to the new code name by its initials.

A question to the community: Does anyone remember the code names assigned to Air Force Systems Command? I spent many years at Edwards Air Force Base, but cannot remember the Majcom code names.

MSgt. Michael R. Betzer,
USAF (Ret.)
Lancaster, Calif.

Airmen Deaths

As a former Air Force officer, I was shocked and saddened by the deaths of six US airmen killed by a suicide bomber in Afghanistan *["Editorial: Six Airmen in a Forgotten War," February, p. 4]*. Two of the victims—TSgt. Joseph Lemm and SSgt. Louis Bonacasa—resided in my area and both were stationed at Stewart ANGB, N.Y., my final PCS from 1967-68, which was then called Stewart Air Force Base. Their deaths raise some disturbing questions.

After pledging that all US troops would leave Afghanistan by the end of 2015, President Obama said 9,800 will remain, but in "noncombat" roles. Really? Then why were four OSI staffers and two security NCOs outside the wire patrolling a village near Bagram Air Base on an "advise and assist mission" instead of staying on base as garrison forces? Didn't the Taliban realize their "noncombat" status or did they fail to get the memo? What does noncombat really mean in the real world of war? Was this an extension of the AF's "in lieu" program that assigns airmen to perform tasks normally done by soldiers and marines? If so, how long will this program continue and how many more airmen will die or suffer wounds?

Sergeants Lemm and Bonacasa and their four colleagues are among more

Boeing photo

A ground crew makes the final checks on the X-51A Waverider scramjet before its second test flight in 2011. Former Air Force Chief Scientist Mark Lewis said the Waverider was a huge success that wasn't built on. Additional test flights could have yielded a great deal of hypersonics knowledge for little cost.

"Fuel efficiency is big to me," he said in his Orlando speech. As aircraft age, efficiency will be a big driver of whether to pursue re-engining, he said. The Air Force recently took delivery of its last F117 engine for the C-17 fleet, which is considered to be at middle age. Everhart said AMC will host an industry day soon to explore the possibilities, and "everything's on the table."

The C-5M is a poster child for re-engining, he said. The upgraded aircraft take off more reliably, require less repair, get to altitude faster, can operate off shorter runways, and require fewer air refuelings to get where they're going.

"We can take off from Dover [AFB, Del.] ... and go all the way to Incirlik, Turkey," with a max load. "It's pretty remarkable," he said.

The Air Force has struggled for years with how to pay for new F-35s while simultaneously upgrading existing fourth generation fighters. Carlisle said 1,763 stealthy F-35s remains "the right number," but F-16s "are going to be around a long time" and will need an upgrade. The F-16 was to get an omnibus improvement called the Combat Avionics Programmed Extension Suite (CAPES), but only pieces of it are still in the budget. Some 52 aircraft will get an active electronically scanned array (AESA) radar to meet an "urgent operation need" from US Northern Command to meet air defense requirements, but "there are more things that I'd like to do" to the venerable Falcon, he said.

Meanwhile, Carlisle said he will "continue to push" to build 80 F-35s a year.

Lockheed Martin F-35 program manager Jeff A. Babione told reporters in Orlando the company expects to provide USAF with everything it needs to declare initial operational capability with the strike fighter in time for its target of August-December. Seven of the 12 minimum aircraft required are already at Hill AFB, Utah, and Lockheed Martin should deliver "five or six more" by August. Declaring the aircraft ready for combat operations will rest with Carlisle. USAF still needs "a few things from us" before IOC, Babione said. Those include a more mature Autonomic Logistics Information System (ALIS) and the Generation III helmet.

The Air Force must still go through a process of defining tightly just what electronic warfare/electronic attack is, and who has responsibility for it. Former Chief of Staff retired Gen. Larry D. Welch chided the service, saying, "We don't know who owns it, where it fits. It's not cyber." He doesn't believe USAF should necessarily create a new warfighting "domain" for EW/EA, "but I do know the Air Force has been particularly remiss in not doing enough electronic warfare." USAF's shortcomings are particularly evident given the gains in EW/EA by Russia, China, and the US Navy, Welch said.

Though he did not respond directly to his predecessor's remarks, Welsh suggested that the F-35 has strong electronic attack capability and said it has EA equipment "built into" it, while the Navy EA-18G Growler has had to have external equipment purpose-built for the mission.

Welsh also noted that there has been a defensewide look at EW/EA for over a year, but that a clear definition still eludes USAF. "A single broad term ... actually confuses things," he asserted in a press conference. "So we're trying to clearly define the mission area, the requirements within it, and who should have the lead for each of those things."

STRATEGIC DETERRENT

The Air Force needs a new Ground-Based Strategic Deterrence by 2030 because the existing Minuteman III fleet of ICBMs has reached the end of its useful service life, Rand said. The Air Force needs the B-21, LRSO, and GBSD to meet its nuclear deterrence obligations.

While the Navy has won a special set-aside account for replacement of the Ohio-class nuclear missile submarine, James has requested but not gotten similar status for USAF's legs of the nuclear triad. In fact, Carter said at an AFA conference that "you can't create new money by relabeling it." Nevertheless, James said "we're still in discussions" about a set-aside account that would not compete with USAF's massive conventional system modernization effort.

"I think we're making progress; we're not there, yet," she said. ✪

AFCENT's Rapid Evolution

By Brian W. Everstine, Pentagon Editor

The rise of ISIS means today's Air Force operations in the Middle East are dramatically different from just last year.

Lt. Gen. Charles Q. Brown Jr., commander of US Air Forces Central Command, keeps a chart in his office at Al Udeid AB, Qatar, that he calls his "EKG chart."

The lines on the graph jump up and down, like those for a heart monitor. This EKG chart tracks which aircraft are deployed to help in the fight against ISIS. The line drops when a squadron returns home and jumps back up when more aircraft deploy. There are peaks and valleys, as aircraft from the US Air Force and coalition partners deploy to the area of operations and return.

"That's the reason the chart for me is so important, because I can actually articulate well in advance and start having the discussion," Brown said. He knows: "There will be another valley, and I want to make sure we are prepared for that valley."

In February, despite B-1s returning to the US the month before, the coalition had a peak of aircraft assigned to the fight, Brown told *Air Force Magazine* at AFA's Air Warfare Symposium in Orlando, Fla. This includes the US aircraft carrier USS *Harry S. Truman* and French aircraft carrier *Charles de Gaulle*. A brief drop is coming, however, as the carriers leave before the Air Force's oldest bomber joins its newest war. B-52s will deploy to the Central Command area of operations in April, with upgraded B-1s returning in August, said Gen. Herbert J. "Hawk" Carlisle, commander of Air Combat Command.

The Air Force's operations in the Middle East have changed so dramatically that what was standard procedure is now out of date. The AFCENT Brown took over in June 2015 is completely different from the current command, he said.

"Sometimes back in the day is last week, or back in the day yesterday," Brown said in Orlando. "Because ... your facts and assumptions based on your deployment experience have completely changed, which drives how we plan and execute our air operations. We're always looking at what's changing dynamically" within the area of responsibility.

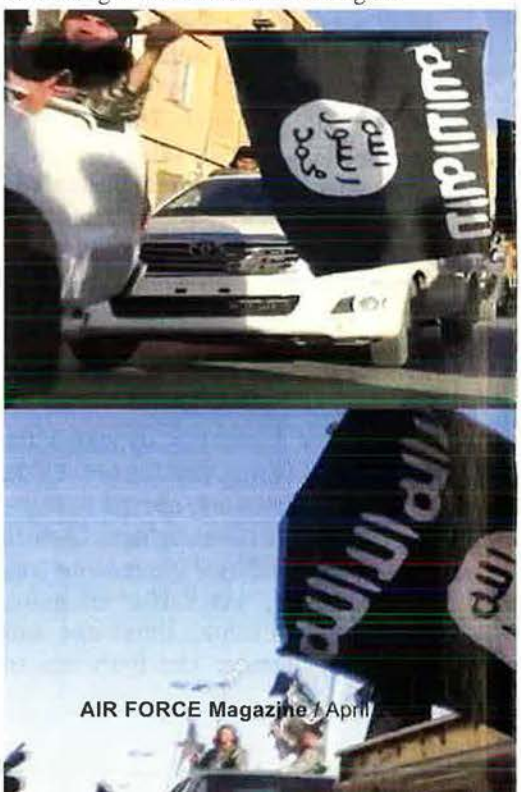
Since Operation Inherent Resolve began in June 2014, the coalition's pace against ISIS has continued to increase. As of early February, it has flown approximately 10,000 strikes, employing 37,000 munitions, with an overall count of 80,000 sorties, including refueling and surveillance. These are "indeed having an effect" on ISIS, including recent strikes on the group's oil infrastructure—meaning they are having financial problems in addition to losing territory.

The beginning of the campaign had a largely singular focus: preventing the fall of Baghdad to ISIS. At that time, ISIS was rapidly gaining ground, moving through areas in large convoys and flying black flags. This made them prime targets for air strikes. Since then, the group has adjusted. They are hiding in population centers, going underground, using civilians as cover, Brown said.

"Before, I don't think they understood airpower," Brown said of ISIS. "Now they do. When they hear airplanes and understand we're close by, they take precautions."

The coalition has needed to change how it operates—relying on long-term surveillance and intelligence to develop targets. While this has made targeting harder in some ways, it hasn't slowed the pace of operations, Brown said. Every month since July 2015, the coalition has exceeded the monthly average of air strikes from the first 10 months of the campaign. In January 2016, coalition aircraft dropped 2,695 bombs, some 200 more than January of 2015.

"The effect did not happen overnight," Brown said. "It's taken time to understand this adaptive enemy and over time we've been able to watch and learn more about this particular adversary. ... Time has given us the ability to precisely strike an increasing number of lucrative targets."



USAF photo by TSgt. Nathan Lipscomb

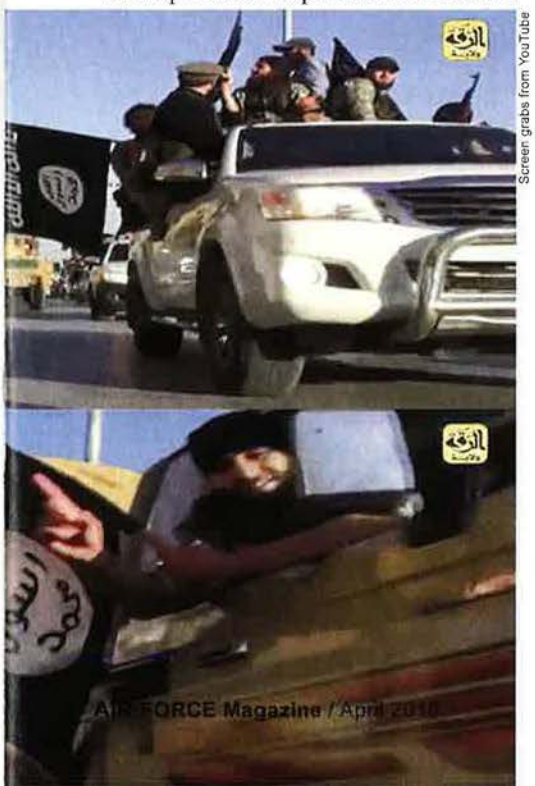
Photo by Dan Higgins

Above left: An A-29 Super Tucano taxis at Hamid Karzai Arpt., Afghanistan, in January. Above: Lt. Gen. Charles Brown speaks at AFA's Air Warfare Symposium in Orlando, Fla.

These operations have continued, despite the more-recent Russian "distraction" in the neighborhood, Brown said.

CHECK OUTS

Russia's operations in western Syria have largely avoided their stated goal of attacking ISIS and instead assisted the regime of Syrian president Bashar al-Assad to reclaim territory, including the large city of Aleppo. Even with the additional aircraft crowding the skies, Russia and the US have been able to stay professional and show a "mutual respect" to avoid any incidents, Brown said. The US and Russia speak daily to ensure communication lines are open, and there are regular larger-scale video conferences with top Defense Department and Russian Ministry of Defense officials to keep the process open, with a recent one occurring on Feb. 29.



Screen grabs from YouTube

Left: Screen grabs from a video of an ISIS military parade in Raqqa, Syria, in July 2014, just after the beginning of Operation Inherent Resolve.

Russia, when it first deployed to Syria in September 2015, would fly close to US aircraft to "check them out," Brown said, but that practice died down when a Turkish F-16 shot down a Su-24 in November. Russia was then wary of US and coalition aircraft, but Brown said he believes Russia is sure of the coalition's professionalism in the sky. The coalition does not worry about Russian or Syrian aircraft during missions, and "we have and will continue to operate where we need to," he said.

The basis for deconfliction came in October, when the two countries agreed on a memorandum of understanding on flight operations. During this debate, Russia repeatedly asked for more information on US operations and even combat search and rescue assistance. That request was rejected because "we have barely enough" assets to do CSAR for ourselves, Brown said.

The Air Force has positioned combat search and rescue forces in Turkey, Iraq, and Kuwait to quickly respond to potentially dangerous missions into ISIS territory. USAF has even kept pararescuemen airborne during certain strike missions because of how ISIS operates, Brown said.

The operations in Iraq and Syria have continued while Central Command remains committed to other responsibilities. The command has a US air liaison team in Riyadh, Saudi Arabia, to help in that country's air war against Houthi rebels and other extremist groups in Yemen. The Air Force is also flying air refueling support "daily" to aid aircraft in that campaign, said Gen. Carlton D. Everhart II, commander of Air Mobility Command, at the Orlando symposium.

The biggest commitment outside of Operation Inherent Resolve, however, remains in Afghanistan.

US air advisors have faced some "fits and starts" in training Afghanistan's fledgling air force, but the service is on the right path as Afghanistan fields A-29 Super Tucano light air support aircraft and MD-530 helicopters. The country is accepting more cadets into its air academy and has improved its "esprit de corps" during continued operations.

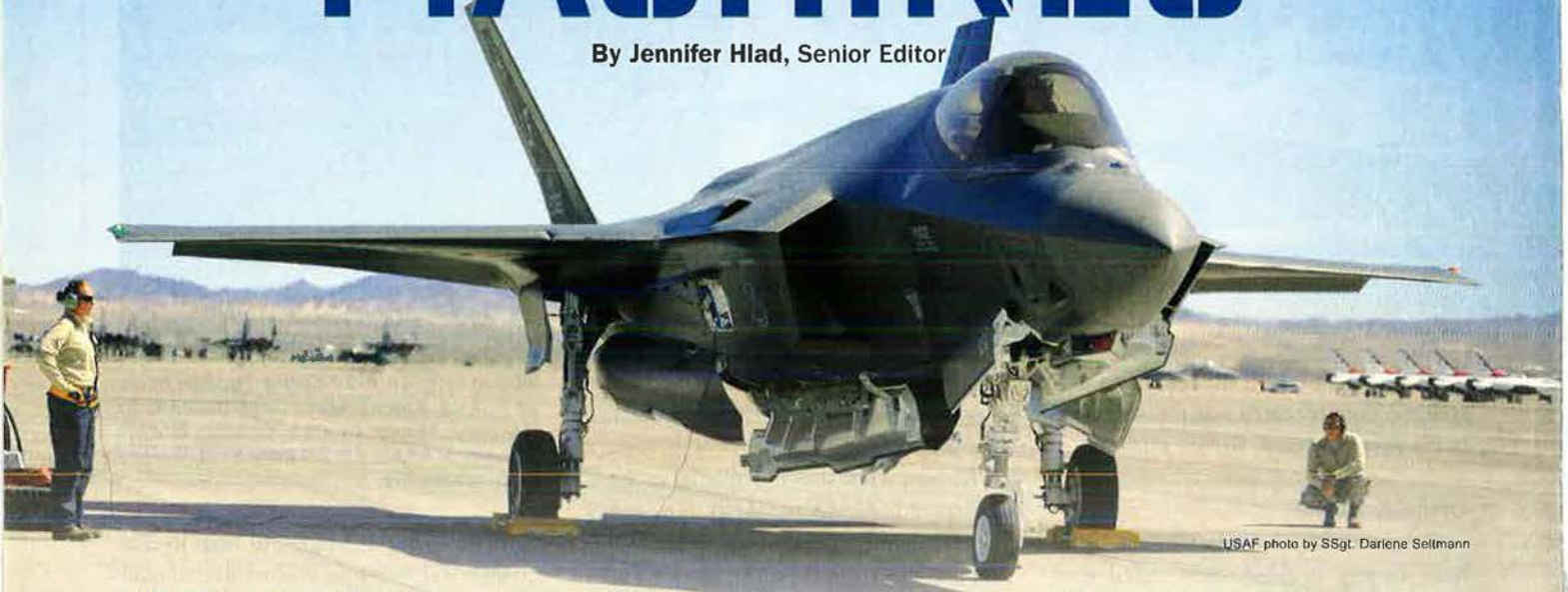
The US is still busy flying air strikes in Afghanistan, with a recent dramatic increase in kinetic support in early 2016.

After President Obama expanded the ability of commanders in Afghanistan to target ISIS forces, the US in January flew 51 sorties that resulted in a weapons release. There were 128 US bombs dropped in Afghanistan that month: the highest number of bombs dropped in Afghanistan since October of last year.

The US has not deployed more assets or changed its operational tempo, but now with the authority to go after ISIS in Afghanistan is doing so regularly, Brown said. ✪

RISE OF THE MACHINES

By Jennifer Hlad, Senior Editor



USAF photo by SSgt. Darlene Seltmann

SSgt. Leah Curtin and SSgt. David Cruson run through a preflight check of an F-35 at Nellis AFB, Nev.

An Air Force F-35 pilot commanding a flight of "uninhabited stealth wingmen" is tasked to destroy ballistic missiles protected by an advanced air defense system. She infiltrates the battlespace, getting constant updates on the threats' locations from cyber and space assets. She sends her wingmen farther into enemy airspace for better targeting information, then releases long-range semiautonomous weapons, validating the targets are destroyed through data displayed in her helmet.

This scenario, laid out by Secretary of the Air Force Deborah Lee James at AFA's Air Warfare Symposium in Orlando, Fla., illustrates how she and others envision integration and autonomy in future air warfare. But though much of the technology exists or is in development today, questions remain about exactly how and when it can be employed.

Certainly, multidomain operations are already happening in Operation Inherent Resolve. Lt. Gen. John W. "Jay" Raymond, the Air Force's deputy chief of staff for operations, noted that a January strike on an ISIS cash collection point—televised on CNN and elsewhere—required persistent ISR, position navigation and timing, the ability to link up and synchronize communication systems, weather satellites, GPS to put the bomb on target, and other data.

"We have done such a great job ... of integrating these capabilities into the fight, we cannot live without them. The question was: What would you do without GPS? It would be a really bad day," Raymond said. "When the light switch goes on and space needs to be there, we need to make sure it's there. ... What we need to be able to do is be able to protect and defend those capabilities."

That won't necessarily be easy, said Winston A. Beauchamp, the deputy undersecretary of the Air Force for space.

"The secret is out regarding the US and allied dependence on space," he said. "The advantages that we derive from space give us both an information advantage that is a qualitative and quantitative edge over adversaries—[and] also makes an irresistible target for potential adversaries."

John G. Clark, director of focused technology roadmaps for Lockheed Martin Skunk Works, said that while remotely piloted aircraft provide more persistent information than in the past, and technology like F-35 sensors can provide important data, information doesn't get shared across

The question is not necessarily: How much military automation is possible? The question may be: How many wartime functions does USAF want to automate?

Student sensor opera operations on an MC

the battlespace. The Air Force needs to determine how to better take advantage of that information, he said.

"I think that RPAs have really helped pierce maybe a bubble, allowing us to think differently," but there is still a long way to go in terms of getting the information out and exploiting it to win the war, Clark said.

What the US doesn't need is "more data for data's sake," said John Goolgasian III, the director of the National Geospatial-Intelligence Agency's Source Operations and Management Directorate.

As the ability to find new targets expands, Goolgasian said he'd like to see an automated process to track activities in "white space." The idea is that someone would be alerted to abnormal activity in an area that may not have been a known focus before, instead of the military trying to collect and analyze everything.

Sensing, not collection, will drive the focus for analysis, he said.

"What I want is information that I can derive from this to provide to you to make your job easier, faster, and to hold targets at bay longer, from space," Goolgasian said.

Eric S. Mathewson's projected scenario is somewhat different from James'. A retired colonel who served as the director of USAF's Unmanned Aircraft Systems Task Force at the Pentagon, Mathewson foresees an Air Force that no longer needs to deploy large numbers of people to launch and fly aircraft, and instead can place command and control nodes anywhere it wishes, sending automated technology to fly and fight.

The US is "in the midst of a revolution in military affairs," and remotely piloted aircraft are "the poster child of the revolution."

AUTOMATION IS NOT AUTONOMY

RPAs and automated technology "will change the paradigm of war," Mathewson said.

"Automation is key," he said. "Without automation, we're wasting our time."

Yet there is a difference between automation and autonomy, said Lani Kass, senior vice president and corporate strategic advisor for CACI International, who has served as senior policy advisor to the Chairman of the Joint Chiefs of Staff and special assistant to the Air Force Chief of Staff.

"You don't worry that your car came from a fully automated assembly line," because that assembly line is still controlled by a human, she said. "I believe you will change the nature of war, not just the conduct of war, if you completely remove a thinking, ethical human being from the control."

Mathewson acknowledged the strong cultural resistance to fully automated systems, but said if we can control platforms from anywhere in the world, it does not make sense to risk lives and equipment to forward deploy troops for something like launch and recovery.

"Why not just push a button someplace and let the thing take off?" he asked.

David A. Deptula, dean of AFA's Mitchell Institute for Aerospace Studies, said he can't see anyone moving to automate the decision to use weapons.

"You still have a human consenting to the employment of those weapons," he said, noting that a pilot in a fifth generation aircraft doesn't designate all the targets, but he or she does consent to the employment of weapons.

"We're not going to turn the employment of weapons over to a machine ... without any oversight," Deptula said. "Technologically, it's possible, but policywise, I daresay it ain't going to happen."

Still, Mathewson argued that while the US has "the luxury of control" in today's fights, a large-scale war in the style of the world wars would not allow that level of control.

"If you write the program and you launch the aircraft, you're basically making that consent," he said. In a major force-on-force fight, "why do we limit ourselves?"

Right now, the US limits its use of RPAs and cyber tools because of ethics concerns, but Kass said the argument that the use of a certain weapon helps grow terrorists can be applied to virtually anything.

"Even if you covered [an enemy] in foam, you would have an argument that the child who watched his or her mother or father being covered in green goop is going to grow up to be a terrorist," Kass said. "That argument can be made in relation to any weapon system that you choose."

Because of those fears, and the Judeo-Christian principle of minimizing casualties on both sides, the US tends to tie its own hands on policy, she said.

In the cyber realm, Kass pointed out, the approval required to use a "cyber tool" against an enemy "is the equivalent of allowing the release of a nuclear weapon." The idea is that "if we open that Pandora's box, ... there is no end to what the enemy could do to us."

However, that box has already been opened, she said.

"We aren't opening that Pandora's box, the same way we didn't open Pandora's box on reconnaissance-strike complex. We are using American ingenuity and American technology to ... project power without projecting vulnerability," Kass said.

USAF photo by SrA. BreeAnn Sachs

tors practice tactical
-1 simulator.

Photo by Dan Higgins

Above: Air Force Secretary Deborah Lee James speaks at AFA's Air Warfare Symposium in Orlando, Fla. James sees a future where automated weapons are increasingly vital.

Ranges and Readiness

By Brian W. Everstine, Pentagon Editor

The Air Force's long climb back to full-spectrum readiness hinges on investments. The service is spending heavily on keeping aircraft healthy and keeping pilots flying. The Fiscal 2017 budget request, unveiled in early February, also includes $235 million for ranges—one aspect of training that has been neglected as budgets have constricted.

"We have to be ready for it all, and with respect to those future high-end threats, this is the only test range where you can bring it all together—not only all the kinds of aircraft that you see on the ramps out there, but the satellites you don't see and the cyber you don't see," Defense Secretary Ashton B. Carter said during a Feb. 4 visit to the Nevada Test and Training Range at Nellis AFB, Nev. "So it's an enormously important installation. That is reflected in our budget, where we're adding $1 billion more for training of this kind over the next five years in the Air Force budget. ... [We're] investing in these training ranges so that they will continue in the future to be the very best training ranges."

DEDICATED INVESTMENTS

The service has 34 traditional air-to-ground and electronic combat ranges, including crown jewels at Nellis and other bases, such as Hill AFB, Utah, and Eglin AFB, Fla., along with small "backyard ranges" across the service. The Air Force's Fiscal 2017 budget requests the $235 million down payment to begin modernizing and updating its training ranges. The funding mostly will go to needed infrastructure, such as communications and improved threat emitters.

"The problem we have is if we don't invest in readiness today, we risk losing the fight today. If we don't invest in readiness and capability for the future, we risk losing the fight 10 to 20 years from now. That's the balance we're trying to lock," Air Force Chief of Staff Gen. Mark A. Welsh III warned Congress in March 2015.

The new $1 billion investment builds up flight hours, weapon systems support, critical skills, and the training infrastructure—including ranges—to get aircrews ready to face a task of defeating one high-end enemy in one realm, denying another, and performing homeland defense missions, said Lt. Gen. James M. "Mike" Holmes, the deputy chief of staff for strategic plans and requirements, in a Feb. 12 briefing with reporters after the service unveiled its budget plans.

"Really it's building a fifth generation training enterprise to build what will be a fifth generation Air Force," Holmes said. "And the training enterprise has to catch up."

The Air Force's ranges are a "giant training device" that must continue to evolve, said Col. John Galic, the director of range operations for Air Combat Command. The massive swaths of land are more than just a safely cordoned-off area for aircraft to fly and drop bombs. The service uses the protected airspace to train pilots on current needs, such as close air support, to be ready for combat in the Middle East or wherever they may be called on to take action.

However, investments in expensive equipment, such as high-tech threat emitters designed to replicate surface-to-air missiles and electronic warfare, has declined. This helped contribute to a lack of high-spectrum readiness across the force.

"The emerging threats have to translate into a realistic training environment," Galic said in an interview with *Air Force Magazine*. "It has to be guided, we have to make careful but dedicated investments. The piecemeal investment has not worked in the past. Sequestration was not easy on the Air Force."

RAND Corp., in a 2011 study, warned that over the long term, there needs to be an investment strategy to allow for enough lead time to support an evolving training need, leadership to connect the training needs with national security requirements, and adequate plans for the long-term sustainability of the range infrastructure.

"It is also becoming imperative for the service to justify its range use more deliberately," RAND reported. "Ranges are under pressure not just because of scarce funding, but also because external entities are seeking greater access to the

DOD photo by TSgt. Michael R. Holzworth

DOD is investing heavily to modernize USAF's training ranges.

SrA. Corban Caliguire and TSgt. Aaron Switzer call for an A-10 strike during close air support training at the Nevada Test and Training Range. The Fiscal 2017 budget boosts training range investment, something that has been neglected in recent years as budgets constricted and sequestration squeezed the Air Force.

Capt. Matthew Mendenhall uses a live-virtual constructive training system at Eielson AFB, Alaska, in preparation for a Red Flag exercise. The LVC environment blurs the lines between simulation and live flight.

USAF photo by SSgt. Shawn Nickel

land and airspace the ranges occupy. These pressures can constrain the types of activities conducted at the range or lead to the return of associated land and airspace to other uses."

While the money has not necessarily been there, the service has conducted multiple reviews to produce a plan on how to best improve the ranges so pilots can train to and be ready for high-threat environments. This includes an enterprise-wide range plan conducted by Air Combat Command in 2014 that looked 10 years into the future and was "designed to steer our range evolving efforts," said Galic.

"Going forward in FY17, we are going to begin to undergo a significant investment in many of our legacy systems," he said.

The service's budget documents request new joint threat emitters for current ranges, upgraded legacy threat emitters to "more closely emulate current peer adversary capabilities," and new threat emitters that mimic enemy capabilities. The budget also seeks increased funding to be able to fund contract support for a "predictive readiness assessment" tool to build the contractor support for predeployment training.

In addition to buying new equipment for the ranges, the service is investigating what it will need in the future.

"We are also studying the technology required to create synthetic threats in the live environment," Air Force spokesman Capt. Mark Graff said. "If successful, this capability would allow more relevant and realistic training with a reduced need for ground infrastructure."

GOING ONLINE

While the service wants to emulate real-life threats during actual flights over its training ranges, the next generation capabilities of its fifth generation fleet will come up against potential adversaries developing high-tech anti-aircraft capabilities. This means more USAF training needs to take place in the cyberspace-enabled live-virtual constructive (LVC) environment that blurs the lines between simulation and real flight.

The Air Force also is working to build a multilevel, multidomain system at Nellis so pilots at Red Flag can face next generation threats, while working with space and cyber assets. This will combine the newest threat emitters and increased use of virtual reality.

Air Combat Command began looking long-term to develop plans for the live-virtual constructive training during the tenure of Gen. Gilmary Michael Hostage III. Pilots in training cannot fire air-to-air weapons and see how they react to kills in flight, so this is where the virtual construct needs to come in, Hostage, then ACC commander, said at an AFA event in July 2014. The service's premier training exercise, Red Flag, is great for high-level training, but it has limits.

"Fifth generation has brought us capabilities and lethalities that are straining my ability at Red Flag to produce that same realistic environment," Hostage said. "I can't turn on every bell and whistle on my new fifth gen platforms because A, they're too destructive, and B, I don't want the bad guys to know what I'm able to do."

"We have a comprehensive LVC, live-virtual constructive flight time, we need to put together; we have to understand what the virtual ranges of the future look like," Welsh said at the 2014 AFA Air & Space Conference. "We have got to get serious about how we are going to train at the high end, because it's impossible to fund a physical plant that will let you do that for Generation Five airplanes. Just can't do it and we also don't have the capability to do it in the real world and the cyber and space areas. We have to figure out how to do it virtually and get serious about putting this plan together."

The budget request is part of a five-year plan to build a next generation training apparatus. USAF still needs the traditional ranges and threat emitters to ensure tangible parts of the aircraft work, such as making sure bombs work properly and the aircraft can still detect certain threats. However, this is less of a challenge to the Air Force's newest fleets.

"If you just train an F-35 against one legacy threat emitter, that just emulates one regular threat," Holmes said. "He's kind of yawning through the training and you aren't really testing the airplane."

Because the Air Force let its range and simulator infrastructure atrophy, there needs to be investments to bridge the gap between a real cockpit flying over a range and a simulator cockpit taking part in the training.

"With a lot of our fifth generation systems, a lot of our training has to be done

USAF photo by TSgt. J. T. May III

SSgt. Michael Sheehan, a ground radar operator technician with the 266th Range Squadron, operates a man-portable aircraft survivability trainer at Saylor Creek Range at Mountain Home AFB, Idaho. The 266th RS runs threat emitters and range training for more than a dozen exercises.

in the simulator because we don't want it out in the open where anybody can watch and see what we're doing," Holmes said.

The Air Force needs to spend money to integrate these parts of training and improve network defense, he said.

"We need to work to tie all of these together to build a realistic environment, to train and try things," Holmes said "All that comes together, over the [next half-decade]. We have a five-year plan to address the gaps that we allowed to build because we didn't have the money."

In March 2015, Red Flag at Nellis began to integrate this virtual reality aspect of training. During Red Flag 15-2, hundreds of airmen in simulators at Nellis, at the Distributed Mission Operations Center at Kirtland AFB, N.M., and at various home stations helped take down enemy forces by providing ground surveillance and assisting in targeting.

"The benefits to the warfighter of integrating 'virtual' into Red Flags are that it allows us to bring in more of the combat-realistic threat envelope, and we're now able to maximize the air tasking order with the most amount of 'Blue Forces' in both the virtual and live sides of a joint air operations area that is 1,200 by 1,100 nautical miles, compared to the Nevada Test and Training Range, which is about 100 by 100 nautical miles," said Lt. Col. Kenneth Voigt, commander of the 505th Test Squadron at Nellis, in an ACC news release.

During this Red Flag a year ago, there was an all-virtual JSTARS, emulating a "real" E-8, to track live trucks on the range and pass along the targeting information to live F-16s and F-15s. Additionally, the exercise used both live and virtual Patriot missile units to increase the air defense presence in the exercise and save money by not sending as many real-life Patriots to the range.

Future exercises will likely use only virtual Patriot missile batteries, which

A B-2 on the flight line at Whiteman AFB, Mo., before a mission for Red Flag 16-1. The large training exercise now integrates virtual threats, equipment, and space to increase realism.

USAF photo by A1C Michaela Slanchik

will save more than $1 million per exercise, according to the ACC release.

"Over the course of time, if it can adequately replace the live play, we'll save money," said Col. Jeffrey Weed, commander of the 414th Combat Training Squadron, in the release. "But from the Red Flag perspective, this is about advanced training." The more opportunities the Air Force gives aircrew, Patriot operators, and JSTARS teams "to participate and learn to fight together, the better off our forces will be. And it's that training focus that's driven us to this LVC arena in great detail," said Weed.

MANUFACTURING THREATS

The Air Force spends about $300 million per year on basic operations and maintenance of its ranges. The Active Duty ranges, including the Nellis range used for the service's highest-level training at Red Flag exercises, rely on contractor personnel with a small amount of military and Air Force civilian management.

The ranges used by the Air National Guard rely more on military personnel for operations, including a team of Guardsmen that are one of a kind in the ANG. The 266th Range Squadron at Mountain Home AFB, Idaho, is responsible for running threat emitters and range training for not only the A-10s and F-15Es that call Idaho home, but for more than a dozen larger-scale training exercises across the country and anyone else who comes to visit the 9,600 square-mile range complex there, said Lt. Col. Scott Downey, the squadron's commander.

The squadron's 144 full-time Guardsmen can operate a "whole stable of threats," with about 20 different threat emitters the team can use to test pilots on the range.

While Downey won't go into specifics of what the team can do, they replicate different types of anti-aircraft artillery, electronic warfare, and "several different generations" of surface-to-air missiles. The team packs up their equipment on trucks and hits the road for about 15 exercises per year, along with local operations from the close-by squadrons. The team's operations tempo has jumped in recent years, almost doubling what they were tasked to do within the past several years, Downey said.

In early February, F-35As visiting from Hill Air Force Base trained with the 266th RANS for the first time.

SSgt. Joshua Lee with the 266th RS launches two GTR-18 training rockets at an Idaho ANG A-10 at the Mountain Home Air Force Base training range. Below: TSgt. Ronald Warren attaches fuse cables to the training rockets.

USAF photos by SrA. Benjamin Sutton

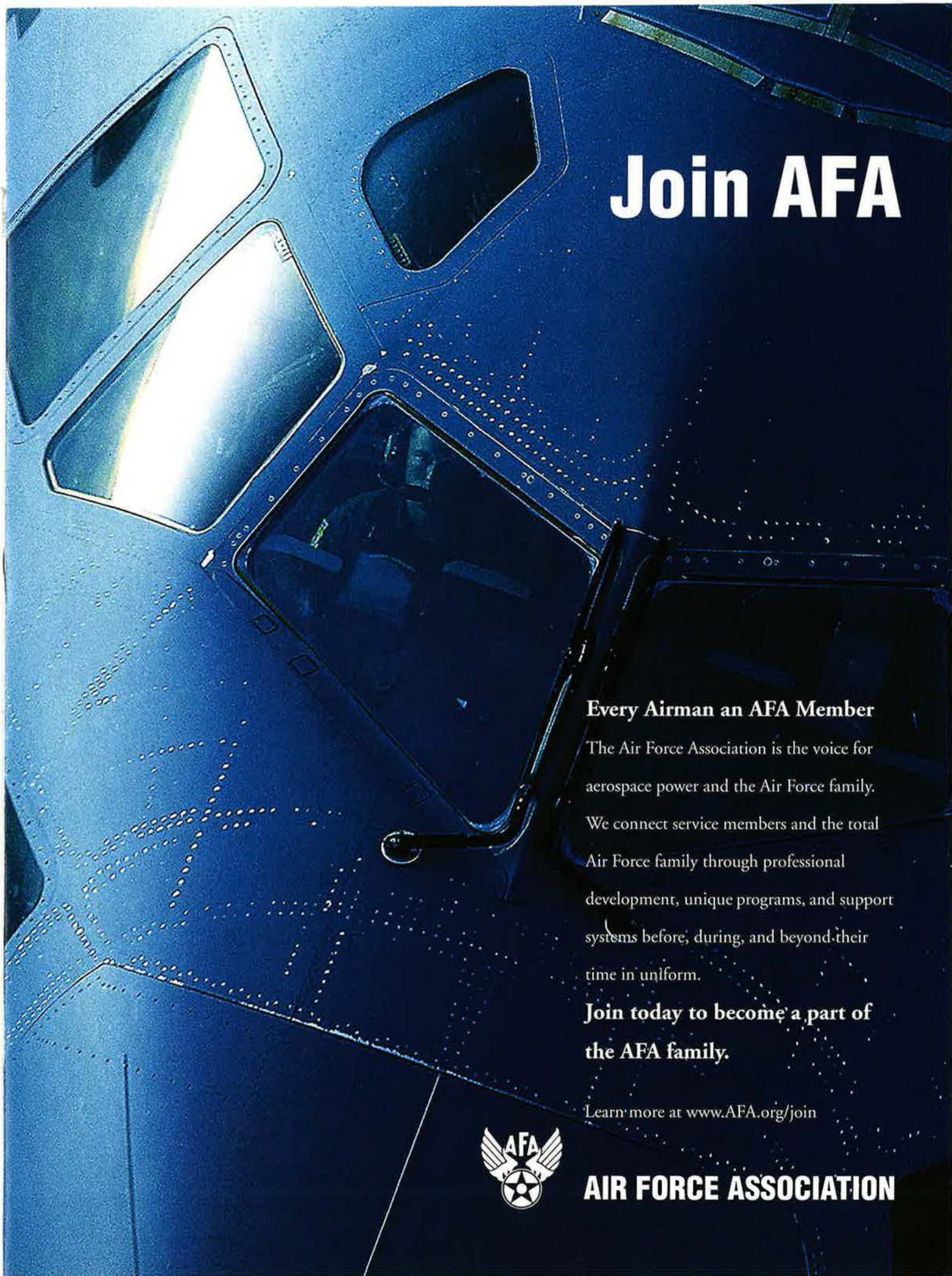
"Obviously fifth generation ... is a whole new ballgame," Downey said. "It's the first time we get to work hand in hand with the crews. We're getting good data on both sides."

This data will shape how the Air Force's Red Forces on the ground can test the next generation of pilots in the newest aircraft, so they can be ready for the most advanced threats in the world.

"We're in one type of low-intensity conflict, [but] we all know, as fliers, that we could be tasked to go into a whole new battlefield in 24 to 48 hours," Downey said. "We have been training to the more advanced surface-to-air threats."

USAF has begun shifting its attention back to high-intensity warfare, but it will take "eight to 10 years to recover full-spectrum readiness. We haven't been investing in the infrastructure over the last 10 to 15 years," Welsh said last year.

"Those things must be persistent, [a] consistent investment for us or we will fail down the road. That's what we are lacking right now," he said. ✪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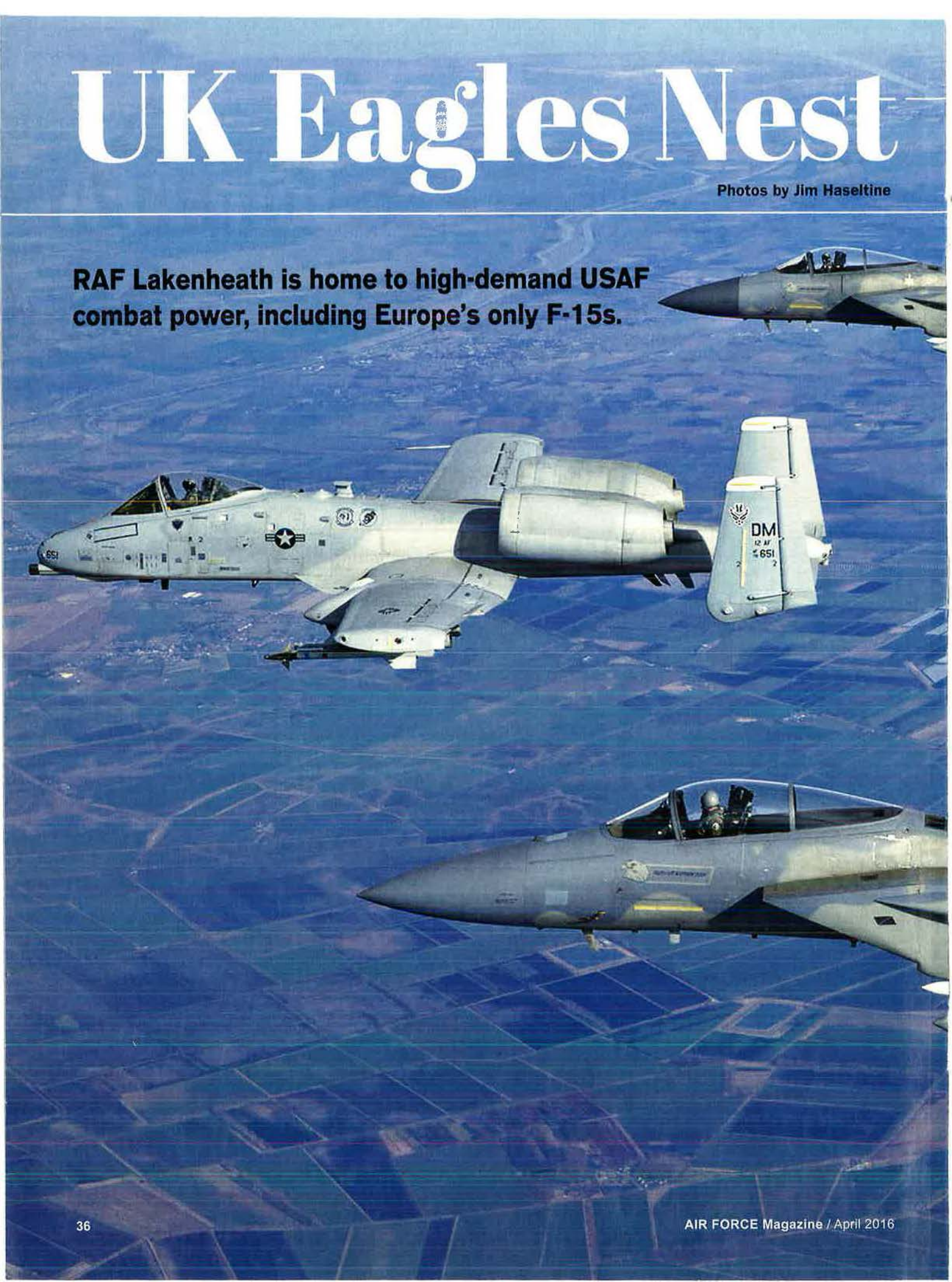
UK Eagles Nest

Photos by Jim Haseltine

RAF Lakenheath is home to high-demand USAF combat power, including Europe's only F-15s.



RAF Lakenheath, UK, is home to the only F-15 fighter wing in Europe. USAF's 48th Fighter Wing, with its famous Statue of Liberty patch, is tasked with air dominance, rescue, and ground attack to protect allies in Europe or wherever it may be called to action. In November, Lakenheath sent six F-15Es and six F-15s to Incirlik AB, Turkey, to help strike ISIS targets in Iraq and Syria and protect Turkish airspace. In addition to the F-15s, Lakenheath hosts rescue squadrons for combat search and rescue.

Here, two F-15Cs from Lakenheath's 493rd Fighter Squadron accompany an A-10 from Davis-Monthan AFB, Ariz., on approach to the base in England. The Warthog was on a theater security package deployment to Europe when it stopped in to train with the F-15s.

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|1| *An HH-60G Pave Hawk from the 56th Rescue Squadron at Lakenheath flies a training mission on the east coast of England in March 2015. The 56th RQS has deployed for combat search and rescue in Iraq and Afghanistan.* ***|2|*** *Capt. Aaron Stevens, top, breaks off in an F-15 from a two-ship formation with Capt. Brian Davis as they return from a training mission at Lakenheath. The base has three fighter squadrons, two flying the F-15E and one flying F-15C/D aircraft.* ***|3|*** *SSgt. James Coppess and SSgt. Benjamin Hewitt work on an F-15E's hydraulic system.* ***|4|*** *TSgt. Michael Delucy aligns a GBU-31 Joint Direct Attack Munition on an F-15E. Strike Eagles have flown air strikes for Operation Inherent Resolve in Iraq and Syria, on top of regular training deployments.* ***|5|*** *Then-1st Lt. Matt McQueeney looks through paperwork during a preflight check.* ***|6|*** *Maj. Chris Troyer prepares for an F-15E training mission.*

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|1| The flagship of the 48th Fighter Wing leads F-15Es from the 492nd Fighter Squadron and 494th Fighter Squadron and an F-15C (bottom of photo) from the 493rd Fighter Squadron on a flight over England's east coast. The Eagles and Strike Eagles of the three fighter squadrons routinely train together in air-to-air and air-to-ground exercises. |2| Lt. Col. Jason O'Brien and SrA. Bryan Garza review aircraft paperwork before a training sortie. |3| SrA. Earl Harris, an F-15E maintainer with the 494th Aircraft Maintenance Unit, carries out a postflight inspection on a Strike Eagle. |4| Delucy (left) secures a GBU-31 JDAM before the bomb is loaded onto an F-15E. SrA. Brittney Jones operates the bomb loader "Jammer." |5| An HH-60G Pave Hawk gunner with the 56th RQS checks the ammunition for the helicopter's .50-caliber gun before a training mission. |6| F-15E Strike Eagles assigned to the 492nd Fighter Squadron are lined up on Lakenheath's flight line.

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|1| *Pararescuemen from the 57th Rescue Squadron are hoisted into a Pave Hawk from the 56th Rescue Squadron during training. The 57th RQS activated at Lakenheath in February 2015, splitting the base's rescue airmen into two squadrons. In November 2015, the Air Force announced that the two units will leave the base in England and relocate to Aviano AB, Italy, in 2017.* *|2|* *Three F-15Es and one F-15C—at top left—fly past the White Cliffs of Dover on the southern shore of England.* *|3|* *An RAF Spitfire is on display at Lakenheath's Battle of Britain Memorial. The RAF built the base in the early years of World War II and stationed bomber units there. USAF bombers arrived in 1948 and administrative control was transferred from the RAF to USAFE in 1951.* *|4|* *SrA. Nathan Lee (left) and SSgt. Joseph Carranza check on a 492nd FS F-15E's avionics during maintenance.* *|5|* *SrA. Jordan Hughes (left) and Troyer attend to paperwork for an F-15E before a preflight walkaround.* *|6|* *The 48th Fighter Wing's Statue of Liberty patch.*

RAF Lakenheath is an invaluable resource for USAF and the US. USAF has had a continuing presence at the base since World War II. Although USAF in 2015 announced plans to close RAF Mildenhall, Lakenheath's future looks secure. ✪

In the summer of 1990, as the Cold War was ending, the Air Force was still focused on the Soviet Union. Then, Saddam Hussein invaded Kuwait.

Operation Desert Storm, which began Jan. 16, 1991, lasted just 43 days. Though the conflict was not expected, it was a turning point in the way wars are fought—and marked the beginning of 25 years of uninterrupted combat for the Air Force.

Desert Storm served as a defining event for an entire generation of airmen, shaping "who we are and how we've gone through our Air Force career," Maj. Gen. Paul T. "PJ" Johnson said in an interview.

Before Saddam invaded and seized Kuwait, few airmen had even conceived of the idea that they might one day be flying from an airfield in Saudi Arabia into Kuwait to attack Iraqi ground forces, said Johnson, who would earn an Air Force Cross for his role in Desert Storm.

"We imagined a lot of things: Soviets, Russians, Warsaw Pact, Korea. We imagined a lot of things, but few of us imagined that," said Johnson, now the Air Force's director of operational capability requirements. "We were always prepared to start getting airplanes out of town on 24 hours' notice. ... We just thought it was going to be somewhere else to do something else."

USAF AS CENTERPIECE

More than just a surprise, Desert Storm "was a seminal event that set the conditions for modern warfare," said retired Lt. Gen. David A. Deptula, who served as the principal attack planner for the coalition air campaign.

The conflict set the expectation for low casualties, "ensconced precision in the application of force as a routine measure," and was the first time the US did joint and coalition planning in a serious way, explained Deptula, now the dean of AFA's Mitchell Institute for Aerospace Studies. It also was the first time in a major conflict where "airpower was the key force, or the centerpiece, in the strategy and execution of the war," Deptula told *Air Force Magazine.*

Johnson was an A-10 pilot and a captain with the 353rd Fighter Squadron, Myrtle Beach AFB, S.C., in summer 1990.

His squadron was "on pins and needles" wondering if they were going to deploy, Johnson recalled, but he was scheduled to go to the USAF Fighter Weapons School at Nellis AFB, Nev.

The day the unit got word that it would deploy, Johnson's commander pulled him into his office and said,

USAF photo

PERSPECTIVES ON THE STORM

By Jennifer Hlad, Senior Editor

"We're going to Saudi Arabia and you're not."

"It killed me. It was awful," said Johnson, who completed weapons school and arrived in Saudi Arabia on Jan. 1, 1991. "My squadron mates then and ever since have given me infinite grief for missing all of the 'fun' of Desert Shield and showing up two weeks before the war."

Meanwhile, Deptula was working for a highly classified planning cell in Saudi Arabia, at first working 20-hour days on a plan that could be executed within five days. The constantly changing plan for the first 48 hours of the war was focused on "centers of gravity" that could be attacked all at once to cut Saddam off from the ability to command and control his forces.

After a few weeks, the planners realized that Saddam had stopped his movement in Kuwait and was not going to continue into Saudi Arabia, which gave the US more time to build up forces, Deptula said.

Shortly before the war began, Johnson said he had the opportunity to see the master air attack plan, complete with all the planned targets, assets assigned to those targets, and the time line.

"I flipped through two or three pages and realized what was going to happen within the first hour, or the first 15 minutes, or the first five minutes. And I was struck by, 'Saddam Hussein has no idea what's about to happen to him,'" Johnson recalled.

"When Desert Storm began, we unleashed the military force. It was sequenced, it was timed, and it was constructed so that this would not be a gentle ramp up or an escalation. It was an unleashing of the coalition."

In 1991, the Air Force unexpectedly changed direction and left the Cold War in the past.

In the first 24 hours of Desert Storm, the coalition attacked more than 150 separate and discrete targets, more than the total number hit by all of Eighth Air Force in 1942 and 1943 combined, Deptula said. "By the time of Desert Storm, airpower technology had finally caught up with airpower theory," he noted. "What took over a thousand sorties and 9,000 bombs in World War II, we did in Desert Storm with one aircraft and one bomb."

The operational tempo was intense, remembered Johnson.

There were six A-10 squadrons at King Fahd Airport in Saudi Arabia, he said—about 145 of the airplanes on one airfield, plus Air Force Special Operations Command assets.

Johnson's squadron flew during the day, and pilots would fly two or three times per day, usually three hours at a time, he said.

But instead of close air support, which may have been expected of A-10s, Johnson said they were focused on attriting the Iraqi ground forces.

Now-retired Lt. Col. Edward Ballanco, then a Wild Weasel pilot and the chief of the weapons and tactics division for the 52nd Tactical Fighter Wing, deployed to Bahrain. From there, they could get to Kuwait quickly, without a lot of fuel.

Normally, the F-4G was configured with two wing fuel tanks, a centerline fuel tank, and two HARMs, he said, but the unit decided to configure the airplanes with four HARMs and just the centerline fuel tank.

"We had a target-rich environment early on," he said. During one flight, he fired four missiles in about a minute-and-a-half.

Johnson called the F-4G "one of the most potent forces we had in Desert Storm."

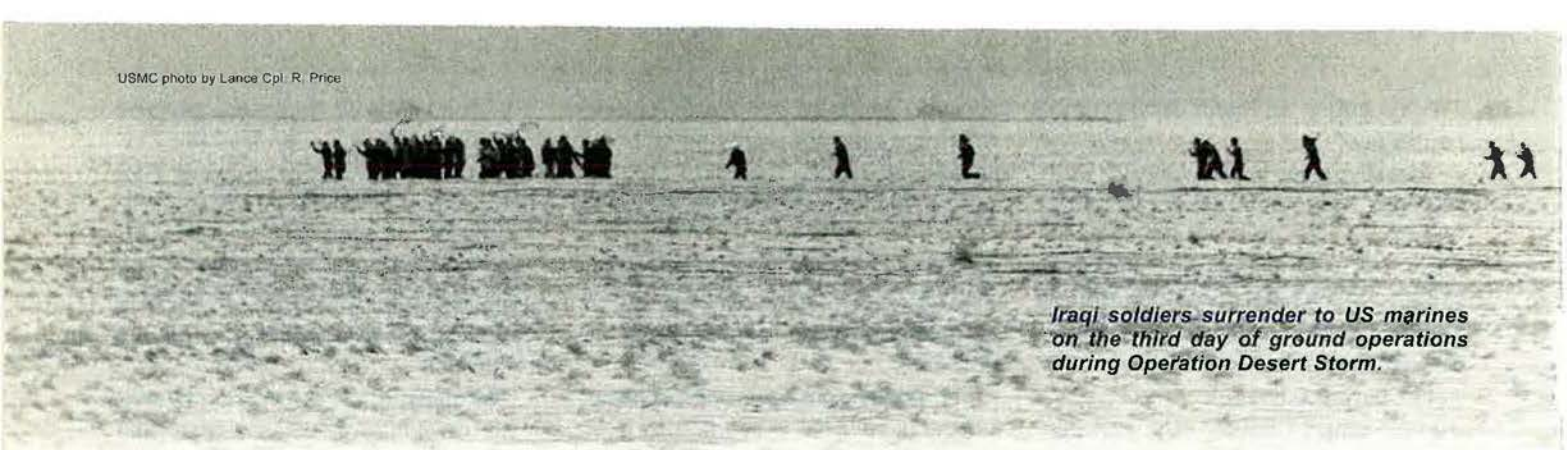
The aircraft could suppress enemy defenses by destroying SAM sites and antennae, and the Iraqis soon realized that turning on their radars was a recipe for disaster.

Often, just by monitoring communications, the Iraqis "could figure out when the Weasels were in the neighborhood. And when they were, they would not turn on their radars to find our aircraft. Self-preservation kicked in," Johnson said.

Ballanco said that after the war was over, an Army intelligence officer told the pilots that when soldiers moved into Iraq for the "100-hour ground war," Iraqi soldiers were surrendering left and right. The American soldiers noticed that one group of prisoners of war didn't have any radios with them, and the radios stored in the bunkers all had the batteries removed.

The POWs told the soldiers that they were afraid the HARMs could find them if they had the batteries in their radios, Ballanco said.

USMC photo by Lance Cpl. R. Price



Iraqi soldiers surrender to US marines on the third day of ground operations during Operation Desert Storm.

Still, the Wild Weasels couldn't be everywhere at once, Johnson said, and it was difficult to destroy the Iraqi SAM sites with anti-radiation missiles if they couldn't get them to come up on the radars. The coalition began sending F-4Gs to intimidate the SAMs to stay off the air. Meanwhile, jamming platforms went forward to jam any radar that did come up, and flights of A-10s got "up close and personal" to physically destroy the SAM sites.

Billy Harvey, then a major and an F-4G pilot stationed at Spangdahlem AB, Germany, had been in the Air Force since 1980 and never expected to deploy to combat. Before Saddam had invaded Kuwait, Harvey had been asked to put together a plan for a deployment to Turkey, where there was nothing but a runway.

It wasn't until the war began that Harvey's squadron, the 23rd Tactical Fighter Squadron, was given the deployment order and launched en masse to Incirlik AB, Turkey, from Germany.

Harvey ended up having to stay with some of the aircraft at NAS Sigonella, Italy, for a few days while they were repaired, but immediately began flying four or five hours a day once he arrived in Turkey.

An F-4G was frequently tasked to fly with an F-16, he said, because though the F-16 could launch a HARM, the Viper was not as capable as it is today and benefitted by receiving information from the F-4G first.

THE RODEO CLOWN

Generally, Harvey said, an F-4G and F-16 would go in first, playing the role of what he described as the suppressing "rodeo clown" between "the bull and the cowboy." Weasels and Vipers would be followed by striker forces to drop weapons on the target.

The aircraft, the training, the resources, and even the political attention given to the effort was unlike anything before or since, he said.

"We were at the top of our game," recalled Harvey, who is now retired. "We felt very confident, but I don't think we ever got into the cocky side of things."

In addition to being a turning point in how wars are fought, Desert Storm was the first time the US saw the critical importance of space contributions to airpower, Johnson said. "Precision navigation and timing, GPS. That was the dawn of criticality of GPS to military operations."

Desert Storm also was the debut of the JSTARS aircraft, which gave the coalition the capability to see, track, and target, regardless of the time of day or weather, the precise movement of formations on the ground.

"We saw the ability to dynamically, with all of the attack sorties airborne, to detect, to characterize, and to target targets in the middle of battle," Johnson said.

And precision weapons, just starting to be used, changed everything.

"Since the beginning of combat airpower, the calculus had always been: How many airplanes does it take to destroy a target? We saw the beginning of the change in Desert Storm, and by

USAF photo by TSgt. Joe Coleman

US military personnel examine a pulverized Soviet-made SA-2 surface-to-air missile launcher during Desert Storm. A section of a missile is in the foreground.

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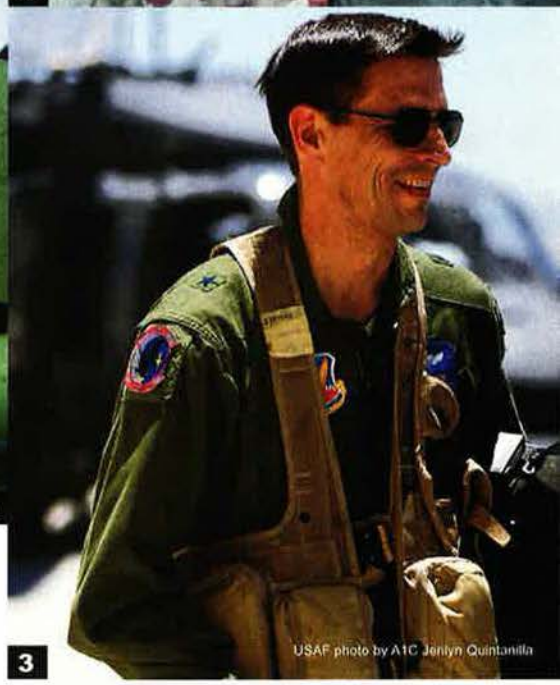

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the end of the '90s, it had completely flipped and was: How many targets can a single airplane destroy? That's not a minor tweak," Johnson noted.

Laser guided weapons have come a long way since Desert Storm, when precision weapons were only nine percent of munitions delivered, Deptula said, but stealth allowed the US to operate with near-impunity across the country.

"We spent the first 100 years of airpower ... trying to figure out how to deliver weapons and achieve target success, and we did. We arrived at the point in time at the end of the 20th century, where we could destroy any target, in any weather, day or night, rapidly and with precision, anywhere in the world," Deptula said.

The Air Force may not have anticipated Desert Storm, but it was ready, and the nonstandard mission sets—like A-10s taking out SAM sites—are a testament to flexibility being the key to airpower, Johnson said.

Though the Air Force has seen constant combat ever since, Johnson said it is critical to remember that while the force has "been really busy with a particular kind of fight since 9/11," airmen must maintain other capabilities.

"Everything from humanitarian assistance to thermonuclear warfare" is still in the job jar, Johnson said.

The US must not "fall into the trap of assuming the next war is going to look like this war," he said. "And that's not a new challenge." ✪

1. Two F-4s pass over Saudi Arabia during the buildup to Operation Desert Storm. 2. Then-Lt. Col. David Deptula (c) is briefed on operations during Desert Storm. Deptula was the principal attack planner for the coalition air campaign. 3. Paul Johnson, shown here as a brigadier general, was an A-10 pilot during Desert Storm. In the war, A-10s were focused on attriting the Iraqi forces, as opposed to providing close air support, their usual role. 4. A ground crew member signals the pilot of an A-10 at King Fahd Arpt., Saudi Arabia, during the buildup of forces and aircraft there in Desert Shield.

Iron Dome

By Gideon Grudo, Digital Platforms Editor

Israel's defensive system brings strategic and psychological protection from rocket attacks.

Israeli Air Force photo by Tomasz Zal

The US and Israel have jointly spent billions of dollars developing Iron Dome, a defense system against surface-to-surface weapons—mortars, rockets, and missiles—targeting Israel. Launched by various terror groups from the land surrounding Israel and its occupied areas, indiscriminate attacks have played havoc with daily life in Israel for decades. The country needed a reliable defense for military, economic, and psychological reasons. Iron Dome answered the call.

Boasting an 85 to 90 percent success rate in some episodes, the system—which Israel continues to refine—has been called a "game changer."

The United States has subsidized the cost of developing the system not simply to help an ally with a chronic need for such defenses, but in hopes that derivative systems may some day help defend US forces from missile attacks as well.

Iron Dome reassures Israeli citizens, who now have less to fear from rocket attacks. As it improves, it reduces the tactical and propaganda value of such attacks to Israel's enemies.

However, Iron Dome's success against cheap forms of attack may drive Israel's adversaries to seek ever more powerful weapons.

Iron Dome works by sensing an incoming weapon with radar, deciding where the weapon is headed, and targeting the genuinely threatening rounds with a high-speed missile. The system works in all weather, is mobile, and can also approximate the location of the enemy's firing position, according to its creator.

Its main limitation is that it can be overwhelmed by large salvos. The system is least effective against guided missiles and the smallest rounds, such as mortars and short-range rockets.

"The Iron Dome by itself doesn't give you full protection from all missile attack," said Ilan Goldenberg, director of the Middle East Security Program at the Center for a New American Security. However, it was never meant to be a leakproof defense.

Iron Dome is the umbrella name for two subsystems, the dual-mission counter rocket, artillery, and mortar (C-RAM) and very short-range air defense (V-SHORAD) system. It was developed by Rafael Advanced Defense Systems and went operational in 2011.

The system got its first taste of combat in 2012, during what was later named Operation Pillar of Defense. Hamas in Gaza attempted to fire more than 1,500 rockets at Israel, 400 of them deemed threats. Of those, the Israeli government says 85 percent were intercepted by Iron Dome. Four civilians were killed by the attacking rocket fire during the conflict.

Iron Dome works in the following sequence: First, it recognizes incoming short-range fire (up to roughly 45 miles away) using its multimission radar.

Next, using its mobile battle management and control unit, it determines whether the round is headed toward a populated area—say, an outdoor restaurant or a gathering of soldiers.

DISCRIMINATING

If the system determines that an intercept is necessary, it fires one of its Tamir missiles (there are 20 per battery) from a mobile unit.

Critically, it can discriminate between rounds that don't pose a real danger from those that do—and concentrate its fire accordingly.

The principal drawback of Iron Dome is its cost. The Katyusha rockets favored by Hamas and Hezbollah typically cost about $300 a round, while the Iron Dome's Tamir missiles cost anywhere from $20,000 to $100,000 each, depending on whose numbers are being quoted. (The Israeli government will not officially disclose this information.) Also, some sources suggest that two Tamirs are fired at each incoming projectile to ensure success, which, if true, would double the cost of each interception.

On the other hand, the cost of a successful rocket attack—in terms of lives, physical destruction, and propaganda value for the attacker—can be enormous, and in Israel's view, make the cost of Iron Dome well worth it.

Another shortcoming is the relatively small magazine of missiles each unit can fire. In a volley of hundreds of missiles at once—a rarity—the system could be overwhelmed by sheer numbers.

Guided missiles, which can alter their course en route to the target, are also a challenge for Iron Dome, but neither Hamas nor Hezbollah have yet utilized such weapons.

Boasting an 85 to 90 percent success rate in some episodes, the system, which is still being refined, has been called a "game changer."

Yiftah S. Shapir of the Institute for National Security Studies—a nonpartisan Israeli think tank—wrote in a 2014 INSS paper that Iron Dome is the right system to deal with very short-range rocket fire.

Israel has been plagued by "prolonged rocket fire since 1968," Shapir wrote in "The Lessons of Operation Protective Edge," a paper about the 2014 campaign against Hamas in Gaza. Hamas, he said, had been relying on rocket fire to attack Israel since 2001, and the 50-day Protective Edge was the second—and successful—trial for Iron Dome.

At the beginning of the conflict, Hamas's inventory comprised Chinese- and Iranian-made 107 mm rockets; 122 mm Grad rockets for short range; upgraded Grad rockets for long range; Iranian-made Fajr-5 rockets; Syrian-made 302 mm rockets; and Hamas-made Sejil-55, M-75, and J-80 rockets.

Hamas had been launching rockets against Israeli civilian and military

An Iron Dome defense unit fires a rocket at an incoming threat during Pillar of Defense, a 2012 operation that saw Hamas lob more than 1,500 rockets at Israel.

targets with increasing frequency into the summer of 2014, reaching a peak of about 150 a day against Tel Aviv, Jerusalem, and the Carmel coast. Throughout the operation—officially lasting from July 8 to Aug. 26, 2014—Hamas (and other organizations) launched more than 4,500 rockets.

Here is where Iron Dome's ability to discriminate between dangers and wayward attacks proved its mettle: Eighty percent of those incoming rounds—about 3,600—headed toward locations that didn't pose a threat to Israel. Another 200 failed en route. Iron Dome intercepted 735 of the dangerous launches and missed 70, according to the INSS report.

Although that's a 90 percent success rate, what constitutes success?

"Because the stuff that's being shot down with this is not very technologically sophisticated," noted Goldenberg of CNAS, "it's hard to overwhelm the system." Iron Dome's success is due in part to the reality of asymmetric warfare with low-end materiel in enemy hands, he suggested.

Left: A kindergarten class takes defensive postures during a rocket alarm in 2014. Below: A piece of a rocket smashed the hood and windshield of a car in central Israel. The rocket had been intercepted by Iron Dome.

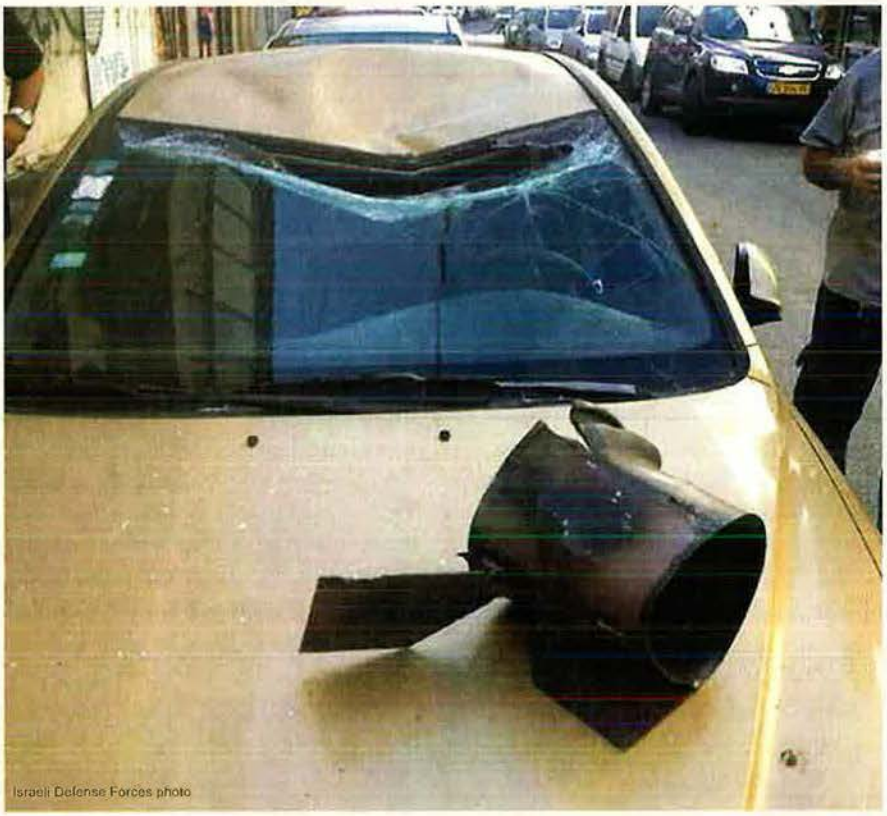
Aid for the Iron Dome

The US provides considerable military aid to Israel. The Obama Administration requested that Congress provide $3.1 billion for this purpose in the Fiscal 2017 budget proposal.

Between Fiscal 2011 and Fiscal 2016, the US provided some $1 billion for Israel's indigenous development and production of Iron Dome, as follows (dollars in millions):

FY11	$205
FY12	$70
FY13	$194
FY14	$235
FY15	$351
FY16	$41

Sources: Congressional Research Service, June 10, 2015: "US Foreign Aid to Israel," NDAA FY14, and NDAA FY16.



Israeli Defense Forces photo by Shay Wagner

Maj. Gen. Tal Russo (l) and Israeli Defense Forces Chief of Staff Lt. Gen. Benny Gantz in the situation room during Pillar of Defense, Nov. 15, 2012.

Realistically, though, Iron Dome's place is how Rafael describes it: the "lower layer" of Israel's multilayered air and missile defense network.

Seven civilians died during Protective Edge, two by rocket fire. In comparison, during the Second Lebanon War in 2006, 53 civilians died by rocket fire. Hezbollah fired about 4,000 rockets into Israel as opposed to Hamas' 2014 figure of 4,500.

Though saving lives is the top priority, Iron Dome does much more than keep Israelis alive: It helps them feel reassured about their security.

CONFIDENCE AND CALM

"You hear those air raid sirens go off, which means there's a rocket in the air," a former senior US government official told *Air Force Magazine,* having experienced the system firsthand in Tel Aviv during 2014's conflict.

"And if you can hear those sirens, then probably the rocket's coming your way. And to hear the Iron Dome battery go off, and then to hear the explosions in the air gives a civilian population a huge sense of comfort," he said. "That goes a very long way in keeping people calm. It goes a very long way in creating a sense of confidence in the defensive capabilities of Israel."

That calm allows Israeli leaders to "think through options or to nuance options," he said.

"Public mood can translate into concrete strategic benefits," wrote Emily B. Landau and Azriel Bermant in the INSS Protective Edge paper. The success of Iron Dome during the 2014 operation reduced the "pressure" to retaliate with a ground attack into Gaza, they observed.

It's anyone's guess, however, how much of Iron Dome's success is real. Michael O'Hanlon, co-director of the Center for 21st Century Security and Intelligence with the Brookings Institution, said he's "skeptical" about those 85 and 90 percent success rates touted by the Israeli government.

"I'm dubious anytime you start quoting double-digit success rates for a defense system," he told *Air Force Magazine.*

Even if accurate, those numbers need to be viewed in context, O'Hanlon said. Iron Dome defends against a very specific, low-end threat. He believes it's not "healthy" to sell the Iron Dome as some kind of "incredible savior."

Whether Iron Dome is all it's cracked up to be or not, the US clearly supports it, if American funding is any indicator.

"Israel is one of our most precious allies on the planet," the former senior official said. "Our intent is to do what we can to support Israel in its defense." Congress has been "very forthcoming in helping with the development and procurement of the system," he said.

Goldenberg said it's common for the Israeli Defense Forces to show off the missile batteries to US lawmakers who help fund them; he's visited one himself on just such a congressional fact-finding tour in Israel.

As of June 2015, the US has given Israel a little over $1 billion specifically for Iron Dome batteries, interceptors, co-production costs, and general maintenance, according to a Congressional Research Service white paper about foreign aid to Israel.

Israel is the "largest cumulative recipient of US foreign assistance since World War II," having received $124.3 billion over some 70 years.

Because Israel developed Iron Dome on its own, it kept technical details of the system proprietary for several years before beginning to share them with the US in March 2014. In September of that year, Rafael awarded US-based Raytheon a contract worth $149 million to provide parts for the Tamir interceptor.

The enacted Fiscal 2016 National Defense Authorization Act provides $41.4 million for Iron Dome.

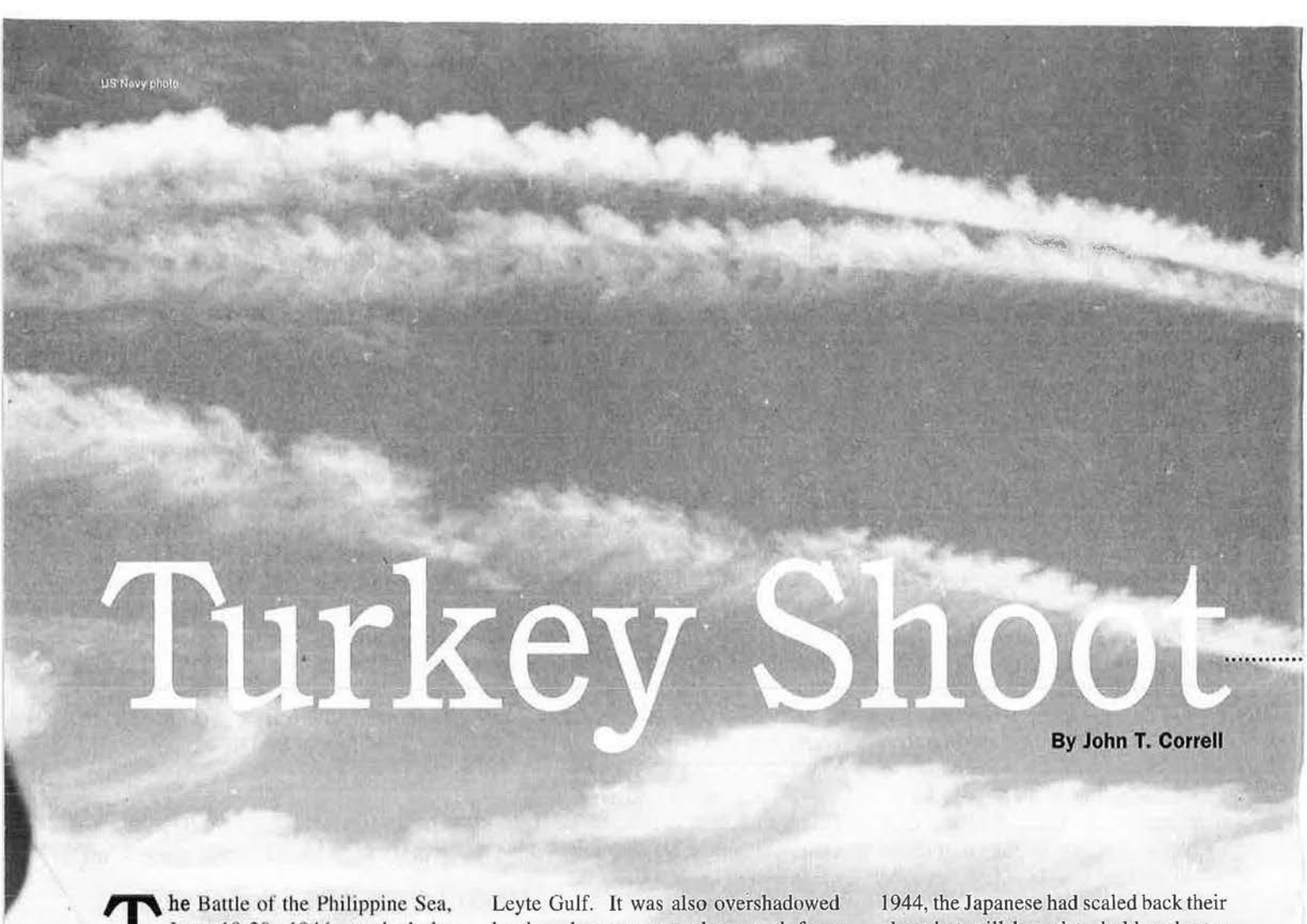
Though saving lives is the top priority, Iron Dome does much more than keep Israelis alive: It helps them feel reassured about their security.

Like the US military's Future Years Defense Program, a five-year roadmap of spending, Israel has its own five-year plan. The newest one, nicknamed the "Gideon" plan, will fund the Ministry of Defense with about $15 billion annually. It includes money for increased defenses against groups like Hamas and Hezbollah.

"The significant aid extended by the United States is extremely useful, but it cannot serve as a substitute for Israel's allocating the resources needed," wrote Assaf Orion and Udi Dekel in January's "Strategic Survey for Israel, 2015-2016," an annual publication from the INSS. They argue that the Iron Dome's "key challenge" is adding enough batteries to provide "concurrent protection to civilians, IDF facilities, and critical infrastructure."

The official who heard the system intercept incoming rounds in 2014 agrees.

"I remember thinking to myself—and I've been under fire a lot— ... 'Isn't this terrific?'" ✪



Turkey Shoot

By John T. Correll

The Battle of the Philippine Sea, June 19-20, 1944, marked the end of Japanese naval airpower as a significant factor in World War II. It was the single biggest aircraft carrier battle in history.

The first day is remembered as "the Great Marianas Turkey Shoot," in which US Navy pilots and anti-aircraft gunners shot down more than 300 Japanese airplanes. Before the two-day battle was over, the Japanese had lost five ships, including three fleet carriers, and a total of 476 airplanes and 450 aviators.

The Japanese fled with the ships and aircraft they had left. The carriers would not again be an effective force in the war except as decoys to distract the oncoming Americans.

The battle was part of Operation Forager, the amphibious invasion of the Marianas. Under the cover of air superiority from US carriers, ground forces took Saipan, Guam, and Tinian, 1,500 miles from Tokyo and the Kanto Plain and within range for B-29 bombers.

For whatever reason, the Marianas Turkey Shoot never achieved the popular fame of the carrier battles at Midway and Leyte Gulf. It was also overshadowed by the other war news that month from halfway around the world: The Allied landings in Normandy on D-Day, June 6, to begin the invasion of occupied Europe.

However, naval history buffs still argue about the Turkey Shoot and how Adm. Raymond A. Spruance—the non-aviator in command of the US Fifth Fleet—might have conducted the battle, but didn't.

REVERSAL OF FORTUNES

The heyday of the Japanese navy in the Pacific did not last long. At Midway in June 1942, five months after the attack on Pearl Harbor, the Imperial Fleet lost four carriers, one cruiser, and 322 airplanes on the same day.

Expecting fast conquest, Japan did not provide for replacing losses in aircraft and trained aircrews. Japanese technology did not keep pace and the once-superior A6M Zero fighter was soon outclassed by the US Navy F6F Hellcat and the Army Air Forces P-38 Lightning.

The outer defensive perimeter—running through the Gilbert Islands in the central Pacific around to New Guinea and Sumatra—was no longer secure. By 1944, the Japanese had scaled back their plans but still hoped to hold a shorter inner perimeter, anchored on the east by the Mariana Islands.

Japan's greatest hero, Adm. Isoroku Yamamoto, who had planned the Pearl Harbor attack, was dead, his airplane shot down over the jungles of New Guinea in 1943 by AAF P-38s. There was no one of comparable stature to take his place.

Meanwhile, the US armed forces were engaged in an intramural argument about strategy. Gen. Douglas MacArthur called for a push northward from New Guinea through the Philippines led, of course, by MacArthur. Adm. Ernest J. King, Chief of Naval Operations, advocated an island-hopping approach across the central Pacific where Adm. Chester W. Nimitz was in command.

King had an unusual ally in Gen. Henry H. "Hap" Arnold, commander of the Army Air Forces. Arnold, who rarely agreed with King on strategy, wanted bases in the Marianas from which his new B-29 bombers could strike the Japanese home islands.

The Joint Chiefs of Staff came down squarely on both sides of the issue, direct-

It was the biggest carrier battle of all time. It also gained bases from which B-29s could strike Japan.

ing an invasion of the Marianas in June 1944 with invasion of the Philippines to follow a few months later.

Operation Forager, drawn up by King, would strike at three islands in the Marianas chain: Saipan, Tinian, and Guam.

Vice Adm. Chuichi Nagumo, who commanded the strike on Pearl Harbor, had been relegated to relatively minor positions since the defeat of his carriers at Midway. In 1944, he was commander of the Central Pacific Area Fleet on Saipan, which was not as impressive as the name suggested. It consisted of patrol craft, coastal vessels, and some ground forces.

Ironically, the first target of the Operation Forager attack would be Saipan.

JAPAN'S DESPERATE PLAN

The main Japanese naval strategy in World War II was the "Decisive Battle," inspired by Adm. Heihachiro Togo's victory over the Russian fleet at Tsushima Strait in 1905 in the Russo-Japanese War.

In 1944, the Imperial Navy was desperately seeking such an engagement, upon which the outcome of the war might turn.

The force created to stop the Americans was the Mobile Fleet, to which virtually all of Japan's remaining carriers, battleships, and cruisers were assigned. The commander was Vice Adm. Jisaburo Ozawa.

Ozawa pulled the Mobile Fleet together at Tawi Tawi in the southern Philippines. All told, he had nine carriers with 450 combat aircraft, five battleships, 13 cruisers, and 28 destroyers. It was a large force, but as Ozawa knew, badly outnumbered by the US Fifth Fleet.

In addition to the airplanes on his carriers, Ozawa could call upon hundreds of land-based aircraft dispersed to islands around the perimeter from Guam to New Guinea to assist.

The plan was to lure the Fifth Fleet into open water west of the Marianas where the land-based airplanes would destroy a third of the US ships before the opposing carrier forces engaged. Mobile Fleet aircraft would finish off the rest

Offsetting to some extent his shortage in numbers, Ozawa had several tactical advantages. His airplanes—lacking armor and self-sealing fuel tanks—were lighter and had greater range. He could attack from 100 miles farther away than the Americans could. The Americans would be far from support bases; Ozawa would have bases nearby.

The American carriers, steaming west from their anchorage at Majuro Atoll in the Marshall Islands, would have the easterly tradewinds at their backs. To launch or recover aircraft, they had to swing around into the wind, turning away from the enemy. Ozawa, facing into the wind, could launch and recover while moving forward.

On the other hand, Ozawa's Zero fighters were no match for the US Hellcats. His pilots were minimally trained and had little flying experience. His meager fuel supply did not allow expansive operations.

On June 15, Adm. Soemu Toyoda, commander in chief of the Imperial Fleet, sent a message to the Mobile Fleet: "The rise and fall of Imperial Japan depends on this one battle," he

Fighter contrails paint the sky during the Marianas Turkey Shoot in 1944.

Staff map by Eric Lee

US Navy photos

said—the same words used by Togo at Tsushima.

BLACK SHOE ADMIRAL

In command of Operation Forager would be Spruance, regarded by CNO King as "the most intelligent officer in the Navy." Spruance had the complete trust of Nimitz as well.

Although the main strength of his command was a carrier task force, Spruance was not an aviator. He had been a cruiser officer for most of his career before coming to special prominence as leader of the carrier victory at Midway and—despite the grumbling of some airmen—was now commander of the US Fifth Fleet.

Between the world wars, battleships had been displaced by carriers as the foremost ships of the navy. Some senior officers, notably King and Adm. William F. Halsey Jr., had qualified as naval aviators in midcareer. Others, notably Nimitz and Spruance, did not.

With a big carrier battle looming, many of the "brown shoes"—so called because naval aviators wore brown shoes with their working uniforms—would have preferred one of their own in command instead of the "black shoe" Spruance.

The Fifth Fleet had been built up to extraordinary strength and consisted of more than 800 ships grouped into two task forces.

The striking arm was Task Force 58, commanded by Rear Adm. Marc A. Mitscher, a longtime aviator deeply experienced in carrier operations. TF 58 was so large it took almost five hours to clear the lagoon as it departed from Majuro. It included battleships, cruisers, and destroyers, but the heart of the task force was seven fleet carriers and eight light carriers with 904 combat aircraft.

Mitscher's pilots were mostly experienced veterans. His principal aircraft were fast F6F Hellcat fighters, SB2C Helldiver dive bombers, and TBF/TBM Avenger torpedo airplanes. Among the complement of the carriers were two future US Presidents. Lt. Gerald R. Ford was assistant navigator on *Monterey*. Ensign George H. W. Bush was an Avenger pilot on *San Jacinto*.

Task Force 51 under Vice Adm. Richmond K. Turner brought the 127,000 amphibious assault troops who would

US Navy photo

4

conduct the invasion. In addition to the transports and landing craft, Turner had combat vessels, including battleships, but they were of the older and slower kind.

THE INVASION BEGINS

While Ozawa was exploring ways to induce the decisive battle, Spruance was focused on his central mission of capturing the Marianas. In early June, he moved the Fifth Fleet into position west of Saipan—although not as far west as Ozawa had hoped—and systematically attacked the land bases on Guam, Iwo Jima, Chichi Jima, Saipan, and other islands where the Japanese had pre-positioned aircraft.

The invasion force, one Army and two Marine Corps divisions under Marine Corps Lt. Gen. Holland M. "Howlin' Mad" Smith, landed on Saipan June 15. Seventy thousand Americans were ashore by June 19, meeting fierce resistance and taking heavy casualties.

By then, unknown to Ozawa, the US attacks had already wiped out nearly all of the land-based Japanese aircraft in the area except for about 50 still operational on Guam.

Mitscher's scouts discovered the location of the Mobile Fleet in the Philippine Sea, some 400 miles from the Marianas. Mitscher proposed to Spruance that TF 58 pull away and go after the enemy carriers but Spruance would not approve it.

"The carrier 'people'—the crews of the 15 fast carriers, the pilots, and the admirals—wanted to strike the Japanese fleet," said naval analyst Norman Polmar. "They had had enough of the strikes against island airfields and fortifications." They "had not yet been pitted against the Japanese fleet. The aviators wanted a fight."

Spruance held firm to his primary responsibility, the security of the Saipan beachhead. He would not weaken the carrier defensive screen and leave the landing force vulnerable to a Japanese end run.

Instead, Task Force 58 would await the Japanese attack. Mitscher deployed his force in five circular groups, the battleships and destroyers posted forward to chew up incoming airplanes with anti-aircraft fire. The US carriers were fanned out in a wide semicircle about 100 miles from Guam and Saipan.

TURKEY SHOOT

Rather than concentrating his smaller force, Ozawa chose to divide it up into four waves, launching the first one at dawn on June 19. His intent was that his airplanes would hit the US carriers, land ashore to rearm and refuel, and strike the Americans again on the way back.

Task Force 58 radar picked up the approaching bogeys just before 10 a.m. and the first Hellcats took off to meet them. At the same time, dive bombers struck the airfields on Guam so the Japanese could not land there.

The Hellcats and the gunners on the ships made short work of the first Japanese wave. The radar screens were clear within the hour. Oblivious to what was happening, Ozawa assumed that many of his airplanes had landed on Guam and that they and

1. The locations of US and Japanese forces and the places they met in battle during the Turkey Shoot. 2. Adm. Raymond Spruance as commander of Central Pacific Force in 1944. 3. Vice Adm. Marc Mitscher, commander of Task Force 58, aboard USS* Lexington, *his flagship, during the Marianas campaign. 4. An F6F Hellcat launches during the battle. Hellcats proved to be the Navy's premier fighter in the last part of World War II.

US Navy photos

the shore-based units had inflicted great damage on the American fleet.

He launched his subsequent waves at 11 a.m., 1 p.m., and 2 p.m. Of the 374 aircraft Ozawa sent out, only 130 returned, most of the others shot down by the Hellcats. Fifty more aircraft based on Guam and the neighboring island of Rota were shot down as well, and that wasn't the end of it.

The US pilots did not reach the Japanese fleet but US submarines did, sinking two carriers and sending 22 more airplanes with them to the bottom, raising Ozawa's aircraft losses for the day above 300. Hellcat pilot Lt. Cmdr. David McCampbell shot down seven enemy aircraft, on his way toward becoming the leading Navy ace of the war. By contrast, 25 Hellcats were lost.

One of the aviators on the carrier *Lexington* said the day had been akin to an "old-time turkey shoot," and the name stuck.

Around 9 p.m., Toyoda sent a message instructing Ozawa to withdraw. By midnight, the Mobile Fleet was 460 miles from Guam with Task Force 58 about 320 miles astern.

PURSUIT

That evening, with the enemy on the run, Spruance directed Mitscher to pursue and attack the next day if the Japanese position was known with sufficient accuracy. Mitscher left some of his carriers for air defense of Saipan and went in pursuit of Ozawa.

It was almost 4 p.m. on June 20 before a garbled report from scout airplane placed the Japanese fleet about 270 miles to the northwest, at the edge of the operational range for the US aircraft.

Mitscher launched his first wave of 216 fighters, dive bombers, and torpedo attack aircraft and was preparing to send the second wave when he learned that the Japanese were 60 miles farther away than he had thought. He canceled the second wave but did not recall the first one, even though the extra distance meant they would be landing in the dark on their return.

The American aircraft plowed into the Japanese fleet and in short order sank another carrier and two oilers and shot down 80 airplanes. Seventeen US aircraft were lost in the effort.

1. A Japanese aircraft carrier (center) is pummeled by US aircraft during the battle in the Philippine Sea. 2. B-29s of the 462nd Bomb Group taxi on the West Field runway on Tinian in the Mariana Islands in 1945. Tinian was captured shortly after the Turkey Shoot, putting the Japanese homeland within range of US B-29s. 3. Lt. j.g. Alexander Vraciu, on the deck of USS* Lexington, *holds up six fingers to signify his kills during the Turkey Shoot.

US Navy photograph

For some of the TF 58 airplanes, it was 300 miles back to their carriers and it was pitch dark when they got there around 10:30 p.m. Many of them could not make it all the way back, their fuel tanks hitting empty before they got there. Eighty-two of the airplanes ran out of fuel and went down at sea, although nearly all of the airmen were rescued.

To help them land, Mitscher had the ships turn on their lights, even though that made them easy targets if an enemy was lurking about.

Estimates vary for the two days of Japanese losses, including airplanes that crashed or were aboard the carriers when they sank. Naval historian William T. Y'Blood's count of 476 airplanes and 450 aviators lost is widely accepted as authoritative.

The US invasion force took Saipan July 18, Tinian on Aug. 1, and Guam Aug. 10. In Tokyo, the government of Premier Hideki Tojo fell the day the loss of Saipan was announced. In a cave on Saipan, Nagumo shot himself to death.

SPRUANCE UNDER FIRE

Even though Ozawa was down to 34 aircraft, he still had most of his ships, including six carriers. Almost immediately an outcry arose among the aviators that Spruance had let the Japanese fleet escape.

The view at naval air headquarters at Pearl Harbor was, "this is what comes of placing a non-aviator in command over carriers." Rear Adm. Joseph J. "Jocko" Clark, who commanded four carriers in the battle, said that a more decisive victory might have ended the war in a few days.

Adm. John H. Towers, deputy commander of the Pacific Fleet and the most senior naval aviator on Active Duty, demanded that Nimitz fire Spruance for incompetence. Nimitz ignored him.

Then and later, King heaped praise on Spruance for sticking to his basic obligation. When he landed on Saipan following the battle, he told Spruance, "You did a damn fine job there. No matter what other people tell you, your decision was correct."

"We cannot assume that fortune would have favored the strong—it did not do so at Midway," said Samuel Eliot Morison, the most respected naval historian of World War II. "Our dive- and torpedo-bombers would probably have sunk some of the Japanese carriers, but the Japanese might have sunk some of ours. And the 'Turkey Shoot' could never have made such a spectacular score if Mitscher had to divide his air forces between offense and defense."

HALSEY GOES FOR THE BAIT

"Without its air arm, the [Japanese] fleet was crippled, and the six carriers that survived were useful only as decoys to lure another American admiral to do what Spruance declined to do," Morison said.

Morison's reference was to the Battle of Leyte Gulf in October, supporting MacArthur's return to the Philippines. The main naval force there was the US Third Fleet, commanded by Halsey, who had most of the ships that had been with the Fifth Fleet at Saipan, including Mitscher and his 15 carriers and 800 airplanes.

The strongest Japanese naval force was the First Striking Force under Vice Adm. Takeo Kurita, consisting of two battleships and other surface combatants approaching from the west.

Ozawa's fleet, with only four carriers and 13 airplanes left, was north of Leyte Gulf, unable to do anything except perhaps draw Halsey away from protecting the invasion convoys. Ozawa sent a few of his ships to make a demonstration to catch Halsey's attention, which they did.

Leaving the defense of the invasion transports to a subsidiary force from the US Seventh Fleet, Halsey took the entire Third Fleet—carriers, battleships, cruisers, and destroyers—in chase of Ozawa.

Ozawa lost all four of his carriers and his handful of airplanes, of course, but he had succeeded in his purpose. The US force avoided disaster only because Kurita, fearful of being caught between two American fleets, withdrew prematurely.

Contrary to Jocko Clark's surmise, destruction of the Mobile Fleet did not end the war in a few days, but after that, the Japanese naval air threat was mostly from kamikaze suicide attack units, first organized during the battle for the Philippines.

Ozawa went on to become commander in chief of the Imperial Fleet, or what was left of it. In 1945, Spruance succeeded Nimitz as commander in chief of the Pacific Fleet.

The greatest strategic value from the Turkey Shoot was US possession of the Marianas, where fleet, submarine, and logistics bases as well as airfields were established. Nimitz moved his headquarters to Guam in January 1945.

The ultimate legacy of Operation Forager was the success of the B-29s. The first of them arrived Oct. 12 and flew their first mission against Tokyo Nov. 24. Over the months that followed, the B-29s reduced the infrastructure of the Japanese home islands to rubble.

It was from Tinian that the two B-29 atomic bomb missions launched Aug. 6 and Aug. 9, 1945, finally breaking the Japanese will to continue the war and inducing the Imperial surrender. ✪

John T. Correll was editor in chief of Air Force Magazine *for 18 years and is now a contributor. His most recent article, "All Eyes on Khe Sanh," appeared in the March issue.*

By Sam McGowan

HERCULEAN ORDNANCE

Since its debut shortly after the Korean War, the C-130 has earned a well-deserved reputation for versatility. Developed as a tactical transport, the Hercules has been adapted to other roles ranging from intelligence gathering to weather reconnaissance to gunship.

One of the lesser-known roles it has played is as a bomber, dropping the heaviest munitions used since World War II.

Massive "Daisy Cutter" bombs dropped from C-130s were highly effective at clearing landing zones in Vietnam.

The use of the C-130 as a bomber in the Vietnam War wasn't the first time transports were used in that role, but it was the most successful. And while some may think of the application as an ad hoc development, the C-130 turned out to be an excellent and accurate bombing platform. What is remarkable is that the bombs were dropped by unmodified transports.

Project Commando Vault was the Air Force's answer to US Army requirements for a means of clearing patches of triple-canopy Vietnamese jungle to allow helicopters to land. Attempts to use air strikes to clear jungle began in 1966, but proved ineffective, so an effort was begun to develop a specialized answer to the requirement. In November 1967, the scientific advisor to Military Assistance Command, Vietnam, came up with an idea to use a 3,000-pound M118 bomb to create clearings. One was flown to Dak To, where it was lifted into the jungle by a CH-47 helicopter and detonated by an explosives ordnance disposal team. The resulting blast cleared an area 150 feet in diameter and destroyed booby traps that had been set at intervals out to 150 feet from the bomb.

Impressed by the test results, MACV directed 7th Air Force to develop a method of delivering specialized ordnance designed to clear jungle. Tests of various explosives were conducted at the Armament Development and Test Center at Eglin AFB, Fla. Simultaneously, the Army began static tests at Fort Benning, Ga., of the 10,000-pound M121 bomb, a weapon originally developed for the B-36 bomber, then being stored in New Mexico. Further M121 testing was conducted in the western US using a CH-54 Skycrane helicopter and a C-130.

According to the flight engineer, TSgt. Charles Anderson, ideas were kicked around on a routine C-130 flight in Vietnam. Two colonels onboard, one Army and one Air Force, revealed they were with Air Force Systems Command and had come to Vietnam to evaluate the use of bombs to clear helicopter landing zones. While the plan was to use CH-54s, they

An MC-130E drops a 15,000-pound bomb at the Utah Test and Training Range. BLU-182 bombs were used to create instant landing zones for helicopters in Vietnam.

USAF photo by Capt. Patrick Nichols

thought C-130s might be more efficient. The pilot, Maj. Robert Archer, offered his opinions and was recruited on the spot as a project officer. The mission was assigned to Archer's 463rd Tactical Airlift Wing.

Archer went to Kirtland AFB, N.M., to observe tests and returned to Clark Air Base in the Philippines, where the 463rd was based. He took his 29th Tactical Airlift Squadron crew to Vietnam in October 1968 to make a series of test drops using guidance provided by MSQ-77 ground radar. Originally developed to score Strategic Air Command bomber crews on practice missions, the MSQ-77 radar had been adapted to control Skyspot "blind bombing" by fighters as well as B-52s. Marine pilots used a similar system called the TPQ-10. Ten bombs were dropped in December 1967 in another series of tests using the TPQ-10.

The test drops, which were conducted to evaluate the bombs' effectiveness and train additional crews, were code named Combat Trap, but the operational mission was dubbed Project Commando Vault. Due to logistical issues, it wasn't until the spring of 1969 that operational drops commenced.

The 463rd was one of the C-130 wings providing airplanes and crews for airlift duty with 834th Air Division, a 7th Air Force component in South Vietnam. The division scheduled bombing missions for the 463rd. The wing's C-130Bs had been operating out of Tan Son Nhut since 1966 but when the 463rd assumed the new mission, its operating location changed to Cam Ranh, where Det. 2, 834th Air Division, provided operational control of the temporary duty C-130 crews and supervision of their maintenance personnel.

QUALIFYING CREWS

The bombs were shipped to Cam Ranh and missions originated from there to reduce flying time. The 463rd operated the C-130B, which was mechanically compatible with C-130Es from the 314th TAW that also operated from the seacoast base. The C-130As of the 374th TAW and 815th TAS, which had different systems, were not parts-compatible. They replaced the 463rd B models at Tan Son Nhut.

Select crews in the wing's four squadrons were qualified to drop the huge bombs. Only the aircraft commander, navigator, and loadmaster needed to be qualified. Engineers and copilots required no special training and any loadmaster could serve as the second loadmaster. Loadmasters assigned to 834th AD Det. 2 routinely flew as second loadmaster on bomb missions.

For pilots and navigators, the few unique aspects of the mission meant working with the radar controllers, providing wind drift information and flying precise headings. Loadmasters learned new procedures involving rigging and the actual drop method itself and became familiar with the controller's terminology. On cargo drops, the loadmaster's job was to monitor the drop, but the load was released by the copilot using a switch in the cockpit.

Commando Vault loadmasters released the powerful weapons themselves by pulling a handle that was intended for emergency release. The extraction parachute was deployed prior to the actual release. Because they sent the huge bombs on their way, loadmaster were sometimes referred to unofficially as bombardiers. Once they were qualified, bomb crews rotated to Cam Ranh as they had been doing. If bomb missions were scheduled, bomb crews were scheduled separately from the normal schedule. The 463rd kept at least two Commando Vault crews at Cam Ranh at all times.

Contrary to common belief that the bombs were "rolled out the back" of the C-130s, delivery was actually very precise. After they arrived at Cam Ranh Bay by ship, the bombs went to the 14th Aerial Port Squadron rigging section where they were placed on wooden cradles secured to modular air-drop pallets with cotton and nylon webbing. The bombs were secured to their cradles with the same materials. The webbing was rigged so it all came together at two points on top of the bomb with a harness over the nose. Each point was connected by straps with a metal "knife" rigged into the connection, and the knives were attached to static lines.

Normally, a 15,000-pound pallet required a larger parachute, but 15-foot extraction parachutes could be used because the extraction parachute was already deployed in the slipstream when the pallet was released. The bomb was held in the airplane by the right hand locks on the 463L cargo handling system, which had been set to provide maximum tension and prevent the pallet from moving when the parachute deployed. The loadmaster released the locks on a signal from the controller, who counted down to the drop from 10 to one, followed by, "Hack."

HOW IT WORKED

When the loadmaster heard "hack," he pulled the release handle and sent the bomb on its way. As the load left the ramp, the static lines pulled knives through the webbing and the bomb separated from the pallet. A triangular parachute, which deployed during the separation, stabilized the bomb as it fell. It took 26 seconds for the bomb to fall 6,000 feet. By the time it went off, the C-130 was some distance away; however, the shock wave caused a brief jolt.

Each bomb had two fuses: a conventional impact fuse at the front—armed by a propeller on a three-foot "tree penetrator" extension—and a fuse set off by a timer at the rear. The timer activated when the triangular parachute deployed. Munitions personnel installed them before the platform went to the airplane.

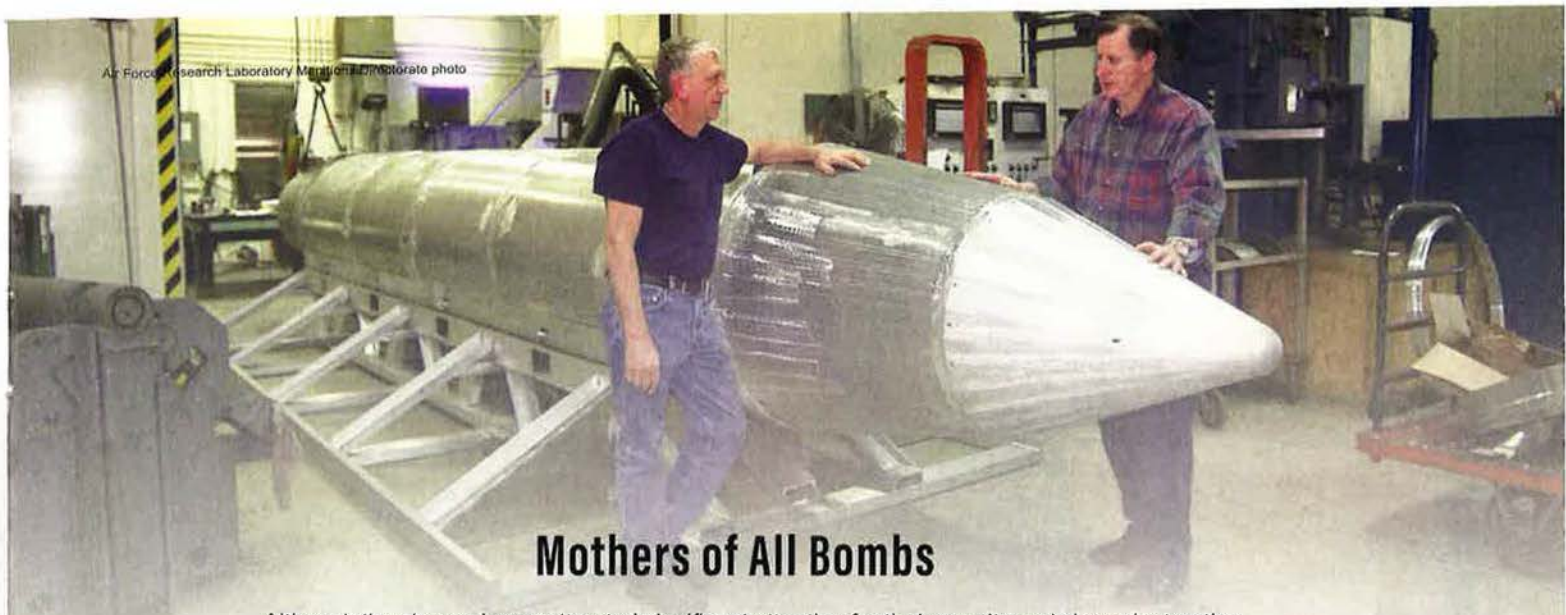
The conventional fuse was the primary. If it worked properly, the bomb would detonate before it buried itself in the ground and not leave a crater. The timed fuse was a backup in case the primary failed. Occasionally, neither worked and the bomb was a dud. When this happened, an EOD team flew in by helicopter to detonate it to prevent the enemy from using the TNT.

Each mission carried two bombs, one for the primary target and one for a backup. Sometimes the second bomb was dropped adjacent to the clearing left by the first in order to enlarge it. If it wasn't needed at the primary target, the second bomb was dropped on a secondary target.

Only minor modifications were required to turn the transports into bombers. The scanner's intercom control boxes on all of the 463rd C-130s were rewired so the loadmaster could monitor the radios. Small antennas were installed on both sides of the fuselage. A technician taped a small battery-powered transponder to a seat rail on the side that would be facing the radar during the drop and hooked it

The last operational BLU-82 detonates at the test range in Utah. In addition to clearing landing zones, some of the bombs were used on tactical targets during the Vietnam War.

USAF photo by Capt. Patrick Nichols



Mothers of All Bombs

Although they have always attracted significant attention for their novelty and sheer destructive power, the Air Force's M121, BLU-82, or GBU-43B are not the largest aerial bombs ever developed. During World War II, the British Royal Air Force dropped 22,000-pound Grand Slam bombs from Avro Lancaster bombers. The M121 was developed from the 12,000-pound T10 bomb, the US version of the British Tallboy.

Though it was for a time, the GBU-43B is also no longer the most powerful non-nuclear weapon. In 2007, Russia announced it had developed and tested a weapon that, although smaller than the GBU-43B, has four times the destructive power.

And while not precisely acting as a bomber, a C-5A Galaxy released an 86,000-pound Minuteman missile from its cavernous cargo bay in a 1974 test. The missile was extracted with a parachute.

to the appropriate antenna with a coaxial cable.

Prior to the drop, the navigator provided wind information to the radar site. The controller vectored the pilot to put the airplane on a predetermined track to the target using a plot recorded by a stylus on paper. He provided precise heading information, sometimes only a degree at a time, to keep the C-130 on the proper track. Bombing accuracy was phenomenal, with an average circular error of 190 feet, although experienced crews were more precise. As crews gained experience, they became the most accurate of all crews controlled by Skyspot operators. Bombs were even dropped on top of ridges.

Although the Commando Vault mission was designed to create instant helicopter landing zones, some bombs were dropped on tactical targets. One crew was given a bomb damage assessment of over 100 enemy killed in action. The bombs were sometimes referred to as "daisy cutters" but this was a generic nickname given to a variety of big weapons used in Southeast Asia.

The process for requesting and scheduling a bomb mission was laborious. Field commanders made a request through channels and it was forwarded to 7th Air Force and from there to 834th Air Division, which passed it on to Det. 2 at Cam Ranh Bay where one of the bomb-qualified crews was scheduled for the mission. An 834th officer flew with the forward air controller responsible for controlling the drop. Both the FAC and the 834th observer had authorization to abort the drop, as did the field commander. Aborts were rare, however.

SHUTTLING

Typically, a mission took about four hours of the crew's duty day. Once the Commando Vault portion was complete, the 834th command post assigned the crew to cargo missions for the remainder of their duty day. Since the crew wasn't assigned to a scheduled airlift mission, they filled requests that had come in during the day, missions often designated as "combat essential" or "combat emergency."

In 1969-70, this usually meant shuttling ammunition or fuel out of Bien Hoa to forward airfields along the Cambodian border. On days when no bomb missions were scheduled, bomb crews flew airlift missions.

Even before operational M121 drops began, the Air Force was working on a replacement for the aging weapons. The supply of M121s was limited but instead of manufacturing new ones, the Air Force Weapons Laboratory recommended other options using explosives other than TNT. The final result was eventually designated as the BLU-82B. Some 225 of these were ordered.

Albert Weimorts (l), creator of the MOAB (GBU-43B), and Joseph Fellenz (r), lead model maker, look over the bomb prototype before it was tested. MOAB, the replacement for BLU-82, is satellite guided.

The new bombs looked like a propane tank with a cone on the front, which gave rise to a rumor that the explosive contained propane. It didn't. The bomb was filled with a gelled slurry explosive (GSX) made primarily of ammonium nitrate and powdered aluminum. It had been developed in the 1950s for commercial use.

Seventh Air Force saw a safety advantage with the GSX because the components weren't explosive until mixed and they could be shipped separately. Each BLU-82 weighed 15,000 pounds, of which 12,600 pounds was explosive. The rigged weight of the two types, including the cradle and webbing, was 15,000 and 20,000 pounds, respectively.

The average BLU-82 clearing was 1.5 times the size of that created by an M121. MACV wanted to be able to fly five heli-

The author, then-SSgt. Sam McGowan, leans on an M121 bomb before a mission from Cam Ranh Bay, South Vietnam, in 1969. A C-130 is in the background.

Photo courtesy of Sam McGowan

copters into the instant LZ simultaneously but neither bomb had that much explosive power. Nevertheless, the soldiers and marines jumping into the new LZs found a clearing that would have taken days to complete using conventional engineering methods, and they were nearly always secure. Any enemy in the vicinity who wasn't killed outright by the blast was physically stunned for up to 18 hours. After the assault force secured the LZ, engineers flew in with chain saws to expand it. Sometimes the clearing was enlarged enough to accommodate artillery and was turned into a firebase.

USAF records show that as of Oct. 1, 1970, some 324 bombs—217 M121s and 107 BLU-82s—had been dropped. Commando Vault missions continued into 1972, but with less frequency due to fewer combat operations. Both the Cambodia incursion in May 1970 and the Lam Son 719 operation in Laos in early 1971 began with the detonation of BLU-82s.

Commando Vault commenced a few months before President Richard Nixon directed MACV to reduce American casualties. The US ground combat role began decreasing as troops were withdrawn, and the Air Force began inactivating or reassigning its units in the Pacific. USAF plans called for the reduction of the Pacific Air Forces C-130 fleet from 12 squadrons to four.

The 463rd lost its first squadron in the fall of 1970 and the wing inactivated on Dec. 31, 1971. When the 463rd ceased in-country operations, Commando Vault operations were taken over by the wing at Ching Chuan Kang AB, Taiwan.

In the spring of 1975, as communist troops overran the country, the US supplied South Vietnam's air force with rigged BLU-82s to drop from C-130As the US had handed over two years before. USAF C-130s flew the bombs into Tan Son Nhut, where they were transferred to VNAF airplanes. The last USAF C-130 lost in Vietnam had just brought in a BLU-82 when it was destroyed by artillery.

MOTHER OF ALL BOMBS

Vietnamese air force crews achieved considerable success dropping the bombs on the advancing North Vietnamese. One bomb dropped near Xuan Loc reportedly killed more than 250 enemy troops. Unfortunately, the use of the bombs came too late to halt the communist advance.

A few weeks after Saigon fell, a USAF C-130 dropped a BLU-82 on Koh Tang during the Mayaguez Incident.

A few BLU-82s remained after the war. They were placed in storage until 1991, when they were resurrected—initially to clear mines in Kuwait and then to demoralize the Iraqi forces. Eleven BLU-82s were dropped on Kuwait, mostly for psychological purposes.

The bombs dropped in Southeast Asia were dropped by tactical airlift crews; those used in Kuwait were dropped from highly modified MC-130Es by special operations crews. Later still, a few BLU-82s were dropped in Afghanistan in an attempt to destroy underground command posts and caves that were being used as sanctuaries by enemy fighters. The last BLU-82 was detonated in Utah in 2008.

As the supply of BLU-82s was exhausted, the Air Force sought a replacement using Global Positioning System guidance. The 21,600-pound GBU-43B Massive Ordnance Air Blast bomb (or MOAB, also jokingly referred to as the "mother of all bombs") is much longer than the BLU-82B but smaller in circumference. The MOAB features fins that deploy when the bomb separates from the air-drop platform, thus eliminating the need for a stabilization parachute. GPS guidance manipulates the fins to keep the bomb on the desired path. ✪

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Photo courtesy of Fullerton Public Library

1946: The Year After the War

By John T. Correll

SEVENTY YEARS AGO, THE NATION, THE ARMED FORCES, AND VETERANS MADE A TURBULENT TRANSITION TO PEACETIME.

As 1946 began, the United States was winding down from World War II. It had been only four months since the war ended with the surrender of Japan, but demobilization was in full progress. By January 1946, the armed forces had released more than five million men with another 300,000 arriving home from overseas each month.

US industry was reconverting as fast as it could from wartime production to output of consumer goods, including automobiles. Defense plants were closing and armament contracts were canceled. Disposal of the huge surpluses—everything from airplanes and tanks to medical supplies, clothing, and toothpaste—was an enormous task.

Rationing of gasoline and most other things ended in the United States in 1945, but shortages continued for meat, sugar, butter, and other commodities. The government struggled to deal with the shortages while holding prices down.

These problems, however, were essentially about the adjustment to peacetime. Overseas, the situation was radically worse, with devastation and famine rampant in the bombed-out cities and millions of refugees and "displaced persons" to be resettled. Relief efforts helped somewhat, with the United States providing most of the funding and food.

The United Nations was in its first year. The UN General Assembly held its first meeting in London in January 1946 before moving to New York later in the year.

It was a shock for the United States to learn that its wartime ally, the Soviet Union, had turned into an adversary. When former British Prime Minister Winston Churchill warned that an "iron curtain" had descended on Europe, many Americans refused to believe it.

In the atomic age, the United States relied increasingly on the Army Air Forces, already moving toward new status as a separate military service. In January 1946, the AAF was down to 30 percent of its wartime strength. By summer, the inventory of aircraft had been reduced by half, most of them cut up for scrap.

Changes were afoot that would reshape the world. This was the year that the Baby Boom began, when television started to emerge, and when the first general-purpose electronic computer, ENIAC, was introduced.

DEMOBILIZATION

When the war ended, the armed forces had 12.2 million members in uniform, 7.6 million of them stationed abroad. The new defense budget called for an 85 percent reduction, with an Active Duty strength target of 1.7 million for 1947.

Most of the troops, especially those who had been drafted, expected that they would come home and be discharged right away. So did their families and their representatives in Congress.

Demobilization could not be done that rapidly. Forces were still needed for occupation duty in Europe and Japan and for manning of the peacetime military. The number of volunteers staying in service was not enough. The draft continued to provide replacements, but by January 1946, the draft boards were not keeping pace with the massive rate of discharges. The Army announced a slowdown of demobilization.

The political uproar and angry demonstrations by soldiers overseas generated more heat than the Army could bear. Rapid separations resumed and discharges reached seven million in late April. Every available ship was packed with returning veterans, but throngs of others still awaited transport.

The order in which soldiers were released was determined by complex rules. Each enlisted member was given an

Left: In Fullerton, Calif., Oct. 2, 1946, World War II veterans march with veterans from the Spanish-American War and World War I to celebrate the end of World War II. Below left: ENIAC, the first general-purpose electronic computer, had 18,000 vacuum tubes and took up most of a large room. Below right: B-29s scrapped on Tinian. By June 1946, the inventory of AAF aircraft had been reduced by half. Some went into storage but most were cut up for scrap.

Adjusted Service Rating score with points for months of service, months overseas, battle stars and decorations, and number of dependent children. Those with the highest ASRs were discharged first. Eventually, officers got ASRs as well, but the rules were more stringent.

Until peacetime requirements could be figured out, the AAF stopped procurement of aircraft. Modification work was also suspended to be sure, as commanding Gen. Henry H. "Hap" Arnold put it, the AAF was not "shoeing any more dead horses."

The government scrambled to dispose of surpluses that included buildings, real estate, lumber, tractors and trucks, soap, and socks and shoes. Surplus machine tools were sold for 56 cents on the dollar. Airplanes that had cost $215,000 went for $37,000. France bought 75 surplus Liberty ships for a third of what it cost the United States to build them. Hosiery manufacturers, long unable to meet the demand for stockings, were pleased to obtain 3,300 bales of surplus raw silk.

BACK ON THE ROAD

Large parts of US industry that had converted to defense work between 1942 and 1945 were in the process of reconverting. Automobile production resumed in July 1945 but did not reach full speed until 1946.

Ford's output of 468,000 cars in 1946 led the industry, 21 percent of the total manufactured. The most popular model was Ford's Super DeLuxe Tudor sedan, almost identical to a 1942 Ford except for a new stainless steel grille. It sold for $1,262 initially, but the price rose to $1,348 in September. A big backlog of orders continued.

By December 1946, US industry was declared to be "virtually out of the reconversion mode" and retail sales had gained 25 percent over 1945. The unemployment rate for the year was 3.9 percent, not as low as the wartime years when workers were scarce, but far below the jobless rates of the Great Depression before the war.

Rosie the Riveter was out of the job market. Between VE Day and May 1946, about a million women left jobs in aircraft plants, shipyards, and defense industries. The main reason was closure or cutback of such plants at the end of the war, although increased competition with men for jobs was a factor as well.

An unexpected spinoff from reconversion was a series of labor strikes by autoworkers, steelworkers, railroad unions, and coal miners in 1946. The unions were trying to make up for the drop in take-home pay as defense work ended and overtime was reduced. President Truman wanted to draft the railroad strikers into the Army and court-martial those who refused to work but Congress would not agree to it.

Photo by Mal Barker

The 1946 Ford Super DeLuxe Sedan was almost identical to the 1942 model, with an added heavy front grill and a widened hood.

GI TRANSITION

The Servicemen's Readjustment Act of 1944, the "GI Bill," bestowed three big benefits on veterans: unemployment pay, guaranty of loans for homes, farms, or businesses, and education and training.

Veterans were sometimes depicted as idle and enjoying their membership in the "52-20 Club." Indeed, the GI Bill did provide for unemployment pay of $20 a week for up to 52 weeks, but relatively few veterans remained long on the unemployment rolls and less than 20 percent of the funding set aside for this benefit was ever used.

Millions took advantage of the home loans backed by the Veterans Administration and over the years to come, GI loans contributed substantially to a transition from renting to home ownership in the United States.

What former servicemen did—in enormous numbers—was go to college. VA paid up to $500 a year for tuition and other fees. There was also a subsistence allowance, $65 a month for single veterans, more for those with dependents.

The Census Bureau reported that in October 1946, veterans accounted for 75 percent of all men attending school. Some were in training courses, but most had gone to college under the GI Bill. In December, 1.1 million war veterans were in school.

Colleges and universities expanded their facilities to accommodate those who wanted to enroll. A big limitation was housing for married students. Some lived in surplus Quonset huts and

trailers, others in refurbished government buildings close to the campus.

One benefit—not part of the GI Bill—that was *not* popular was GI life insurance. Four out of five veterans let it lapse, partly because of "tedious delays" in dealing with VA on coverage, the *New York Times* said.

Many servicemen married overseas. During 1946, nearly 43,000 "war brides" and 14,000 children arrived in the United States. The numbers increased after December when the nonfraternization rules were relaxed, ending the ban on marriages between American soldiers and German women.

It was a boom year for marriages in general, although there was one divorce for every three marriages. The leading causes for divorce were hasty wartime marriages and the breakup of others after long separations.

The big increase in marriages was attributed mainly to GIs returning home. Births in 1946 set an all-time record. The Baby Boom was underway.

THE POSTWAR AIR FORCE

At the time of the Japanese surrender, the AAF had 218 operational groups. The War Department's postwar planning called for a "bedrock minimum" air force of 70 groups and a personnel strength of 400,000. In January 1946, the AAF was down to 734,000 people and dropping steadily.

USAF photo


USAF photo

Above: Workers at the Separations Control Room at Bolling Field, D.C., expedited the return to civilian life. Above right: Gen. Carl Spaatz attended a welcome home ceremony in Pottstown, Pa., in 1946. Right: The Northrop XB-35 flying wing made its first flight June 25, 1946.

In February, Arnold retired and Gen. Carl A. "Tooey" Spaatz took over as Chief of Staff. He held to the objective of 70 air groups and was supported in that position by the Army Chief of Staff, Gen. Dwight D. Eisenhower.

One of Spaatz's first actions was to reorganize the force, creating Strategic Air Command, Tactical Air Command, and Air Defense Command. That structure would endure until the end of the Cold War almost 60 years later. Eisenhower declared his "unequivocal" support for an autonomous Air Force.

The 70-group plan evaporated in August when Truman ordered "economy commitments" to reduce the budget by $2.2 billion, with 75 percent of that to come from the armed forces. At the end of 1946, the Air Force had 55 groups, only two of which could be counted as combat ready.

"We are not ready to fight a war if one came today—and we won't be for quite a long time," Spaatz said. The Air Force had not yet reached bottom. It would sink to 48 groups and a strength of 304,000 before the buildup for the Korean War began.

Several important aircraft made their first flights in 1946: the F-84, the Air Force's first postwar fighter, in February; the XB-35 flying wing in June; and the B-36 intercontinental bomber in August.

In February 1946, the Air Force Association was incorporated and took over publication of the AAF's monthly journal, *Air Force Magazine.*

FOOD AND POLITICS

The federal price controls set up for

THE AMERICAN SCENE

■ Television arrives. In 1946, two TV networks were operating, NBC and Dumont, although CBS and ABC were preparing to begin. Only 44,000 American homes had TV sets. The meager viewing choices included boxing on "Gillette Cavalcade of Sports," a soap opera, "Faraway Hill," and the first TV game show, "Cash and Carry." Radio was still predominant. The most popular show in 1946 was "Fibber Magee and Molly."

■ Baseball returns. Major League Baseball players—who had not been exempted from military service—were back for the 1946 season, including Chief Petty Officer Bob Feller of the Cleveland Indians and AAF Sgt. Joe DiMaggio of the New York Yankees. Lt. Ted Williams, discharged from the Marine Corps, rejoined the Boston Red Sox, hit .348 with 123 RBI, and was the American League MVP. Former Army Lt. Jackie Robinson became the first black player in the minor leagues, hit .349 with the Montreal Royals to lead the International League, stole 40 bases, and moved up to the Brooklyn Dodgers in 1947.

■ ENIAC (Electronic Numerical Integrator and Calculator), the first general-purpose computer, was introduced at the University of Pennsylvania. It had 18,000 vacuum tubes and, fed a problem on a punched card, could do 5,000 additions a second.

■ The Movie of the Year was "The Best Years of Their Lives," about the return home and readjustment difficulties of three veterans: an AAF captain, an infantry platoon sergeant, and a sailor who lost his hands in battle. It went on to win nine Academy Awards and was a massive box-office success.

■ New products in 1946 included radial tires, car phones, filament tape, bikini swimsuits, Reddi-wip, bank-issued credit cards, and artificial snow.

■ Two future Presidents were born in 1946: Bill Clinton and George W. Bush. Two more were elected to Congress for the first time: Rep. John F. Kennedy (D-Mass) and Rep. Richard Nixon (R-Calif.).

■ Born in 1946: Reggie Jackson, Dolly Parton, Steven Spielberg, F. Whitten Peters, Sylvester Stallone, Cher, Donald Trump.

AT&T Archives and History Center

Samuel Goldwyn Co. photo

wartime were still in effect in January 1946, but some producers and retailers were no longer willing to sell at the artificial ceilings.

The *New York Times* said that most choice cuts of beef and lamb were selling above the legal price. Milk producers told the Senate agricultural committee that 60 to 80 percent of the butter was going to black markets.

With demand for consumer goods exceeding the supply, shortages continued. Truman held that price controls were still necessary. The Office of Price Administration went out of business briefly in June, but new controls, including a cap on meat prices, were instituted in July.

Stockmen refused to send their cattle to market, and the meat shortage intensified. The public blamed Truman, and his opponents called him "Horsemeat Harry." Truman lashed out at those who deserted principle for "a mess of pottage," but after his party lost its majority in Congress in the mid-term elections, he abandoned price controls and said the marketplace would be better served by the law of supply and demand.

Shortages were a problem but in the United States, there was enough to eat. That was not the case everywhere. In addition to food production lost by the ravages of war, the wheat and rice crops abroad were the worst in years. Consumption in the US was about 3,300 calories per person a day. In some parts of Europe and Asia, people subsisted on 1,500 calories or less.

Most relief was channeled through the United Nations Relief and Rehabilitation Administration, which got about 75 percent of its funding from the United States. Between July 1945 and 1946, the US shipped 16.5 million tons of food, primarily wheat—about a sixth of the US supply—to Europe and Japan.

Hundreds of thousands of CARE packages were sent from American donors to Europe and Asia. Packages weighed 30 pounds and contained mostly food but also such commodities as soap and cigarettes. A new package introduced in December included two wool blankets and sewing utensils.

HARD TIMES ABROAD

Shortages of food and fuel were widespread abroad but Germany and Japan had the additional problem of infrastructure and industry destroyed by the bombing. Even so, some of the industrial facilities survived and those not deemed essential to peacetime needs were subject to confiscation for wartime reparations.

The Russians stripped sections of Germany almost bare, dismantling hundreds of factories and shipping them to the Soviet Union. Trains laden with machinery and equipment moved east.

The black market and barter often supplanted the regular economy. Farmers and others with goods to offer did not want currency, which they distrusted, and insisted on trade instead. In Germany, where the reichsmark had become virtually worthless, the preferred medium of exchange was American cigarettes.

In February 1946, there were about five million refugees and displaced persons in Europe and adjacent territories, and that figure did not totally reflect the enormity of the problem. At one time or another, some 12 million individuals had been refugees or displaced persons but many of them had been resettled, although not necessarily under favorable conditions.

Many of these people were Jews who survived the concentration camps. Others were former slave laborers the Nazis had brought to Germany from Russia and Eastern Europe. Still others were Germans or ethnic Germans expelled from lands in the east when the Nazi conquest was rolled back.

It took years to resettle all of the displaced persons. The nation accepting the greatest number was Israel (652,000), followed by the United States (more than 400,000). Australia took 182,000 and Canada 157,000.

German Federal Archives photo

Civilians clean debris in Berlin. Food was scarce in many parts of Europe and Japan, and in 1946 the US shipped 16.5 million tons of food to the war-ravaged areas.

There was still some unfinished business. The International Military Tribunal to try Japanese accused of war crimes convened in Tokyo in May 1946. The Nuremberg trials in Germany, which had begun in 1945, sentenced 12 Nazis to death in October.

Eventually, Europe was rebuilt between 1948 and 1952 with massive aid from the European Recovery Program, called the "Marshall Plan" after George C. Marshall, the former Army Chief of Staff who became Secretary of State and was the program's foremost advocate.

ADVENT OF THE COLD WAR

As soon as the war was over, the Soviet Union consolidated its control in the east and pressed for new advantages in Central Europe. Soviet leader Joseph Stalin redefined his adversary to be the United States and Western Europe.

In February, diplomat George F. Kennan at the US Embassy in Moscow sent his famous "Long Telegram" (19 pages) to the State Department warning that the USSR did not want peaceful coexistence and was committed to a "patient but deadly struggle for total destruction of rival power."

In a speech at Fulton, Mo., in March 1946, Churchill declared that, "From Stettin in the Baltic to Trieste in the Adriatic, an iron curtain has descended across the continent." It was political dynamite. Truman, who was present for the speech, refused to comment on Churchill's proposal for a British-American alliance. He denied that he had seen a copy of the speech in advance.

"The speech has its critics and defenders, the former apparently in the majority," the *New York Times* said. Among the critics was Secretary of Commerce Henry A. Wallace who denounced it as "an attack on a former ally."

As time went by, the true face of the Soviet Union became easier to see.

Elsewhere, especially in Asia, the old European colonial empires, weakened during the war, were breaking up. In Hanoi in March 1946, Ho Chi Minh became President of the Vietnam Republic of Annam, reluctantly recognized by France as "a free state within the Indochinese federation and French Union." In December Ho's military forces attacked the French in Hanoi and surrounding areas. The long Vietnam War had begun. ✪

John T. Correll was editor in chief of Air Force Magazine *for 18 years and is now a contributor. His most recent article, "All Eyes on Khe Sanh," appeared in the March issue.*

By Robert S. Dudney

An Airman Looks at Russia

"I look east and I see a pretty powerful Russia. I see a Russia that has changed borders. I see a Russia that continues to operate outside of the international world order, all of the rules. ... When you look at the totality of Russia and what they have done, I have very little faith in what they say. I'm more interested in how they act and up to this point it hasn't been good. ... They are No. 1 for me and growing. I take them seriously."—***Gen. Frank Gorenc, head of US Air Forces in Europe- Air Forces Africa, interview with*** **Defense News,** ***March 1.***

Complete Rewrite

"Russia does not want to challenge the agreed rules of the international order. It wants to rewrite them."—***USAF Gen. Philip M. Breedlove, NATO's Supreme Allied Commander, Europe, House Armed Services Committee, Feb. 25.***

Weaponizing the Migrants

"Together, Russia and [the Syrian] regime are deliberately weaponizing migration in an attempt to overwhelm European structures and break European resolve. ... I can't find any other reason ... other than to cause refugees to be on the move and make them someone else's problem. ... This is bringing great pressure on the nations of Europe."—***Gen. Philip M. Breedlove, NATO's Supreme Allied Commander in Europe, Senate Armed Services Committee, March 1.***

American Way of War, Continued

"The United States can't fight— much less win—today's wars without airpower. That's just the way modern warfare has moved and the demand signal for that airpower continues to rise. ... The platforms and systems that made us great over the last 50 years will not make us great over the next 50. ... The world is changing, and the threat is changing, and our Air Force must change with it if we're to remain relevant. ... Today, American airpower is a given and I believe it's our job, collectively, to ensure that this nation's ability to deliver that airpower, when and where it matters most, does not diminish over time."—***USAF Chief of Staff Gen. Mark A. Welsh III, Senate Appropriations defense subcommittee, Feb. 10.***

Aircraft Carriers: Fading, Fading ...

"Operating the carrier in the face of increasingly lethal and precise munitions will ... require the United States to expose a multibillion dollar asset to high levels of risk in the event of a conflict. ... An adversary with A2/AD capabilities would likely launch a saturation attack against the carrier from a variety of platforms and directions. Such an attack would be difficult—if not impossible—to defend against. ... [The US] must re-examine the relevance of the carrier and its air wing."—***From the report, "Red Alert: The Growing Threat to US Aircraft Carriers," Center for a New American Security, Feb. 22.***

How Loh Sees It

"You are going to have to fight for [the B-21] every day, every week, every month, every year, because there are people out there that are going to try to kill it. They are all over this town [Washington]. The sooner the Air Force can release [facts about] the team, the industry team, ... the more support you are going to get. If you don't do that, it isn't going to survive."—***Retired USAF Gen. John M. Loh, former head of Air Combat Command, quoted in*** **Defense News,** ***Feb. 25.***

Ancient Hardware

"As we have explained in the past, less than half of our combat air forces are ready today for a high-end fight. Our aircraft inventory is the oldest it's ever been, and our adversaries are closing the technological gap on us quickly so we simply must modernize."—***Secretary of the Air Force Deborah Lee James, Senate Appropriations Committee, Feb. 10.***

Motherless Orbs

"An increasingly [large number] of nations can attack US satellites through nonkinetic, limitable, and even reversible techniques. ... This means that an opponent is likely to have ways of going after US satellites that don't necessarily seem massively escalatory. Given that satellites 'have no mothers,' how angry are the American people going to be if one gets disabled by jamming or cyberattack, even if the satellite is a crucial asset?"—***Elbridge Colby, senior fellow at the Center for a New American Security, op-ed in*** **Defense News,** ***Feb. 23.***

Reading Material

"Once you've set it [Hillary Clinton's private email system] up this way, ... it's gone bad. You're going to end up with information on this private server that just shouldn't be there. ... How much energy would I expend if I were still director of the National Security Agency and someone told me I could get access to the unclassified email server of [Russian Foreign Minister] Sergei Lavrov? I'd move heaven and Earth to do that. ... I would lose all respect for a whole bunch of foreign intelligence agencies if they weren't sitting back, paging through the emails."—***Retired USAF Gen. Michael V. Hayden, former director of the NSA and CIA, quoted in*** **MilitaryTimes.com,** ***Feb. 22.***

Still on the March

"Unfortunately, we have lost ground over time [in the fight against Islamic terror]. The scope of the ideological movement, the geographic dispersion of Islamic extremism, the number of terror attacks, the number of people swearing allegiance, and the ground they hold have all increased. Groups like the Islamic State have now taken on state-like forms and features that are unlike anything we've seen in the past. So on balance we are in a worse position strategically with regard to the growth of international terrorism, Islamic terrorism in particular, than we were after September 2001."—***Retired Army Gen. John P. Abizaid, former head of US Central Command, in an interview published in the Combating Terrorism Center's*** **Sentinel,** ***Feb. 19.***

Flat Earthers

"In my opinion, China is clearly militarizing the South China Sea. You'd have to believe in a flat earth to believe otherwise."—***US Navy Adm. Harry B. Harris Jr., head of US Pacific Command, Senate Armed Services Committee, Feb. 23.***

What I Learned in Kindergarten

"China must not pursue militarization in the South China Sea. Specific actions will have specific consequences. These activities have the potential to increase the risk of miscalculation or conflict among claimant states."—***Secretary of Defense Ashton B. Carter, speech to the Commonwealth Club of San Francisco, March 1.***

Published by the Air Force Association

WINGMAN

Mark Westlake's students build eco-friendly vehicles.

Their "Green Machine" motorcycle plugs into a household outlet.

They're racing a battery-operated car in an eco-marathon this month.

In 2009, they won a solar bike race.

AFA's National Teacher of the Year

AFA's Teacher of the Year, Mark Westlake, has been teaching in Mendota Heights, Minn., for 27 years.

Turn the page for more!

The Shoulders of Giants

By Susan Mallett

AFA's National Teacher of the Year drives STEM learning.

Westlake's students build their experimental vehicles at Saint Thomas Academy in Mendota Heights, Minn.

Westlake's students drove this solar-powered car from Dallas to Pasadena in 2005.

Mark Westlake was 10 years old when his father pulled a rust-colored sheet off an amazing object the older Westlake had been building for months in the family garage: a two-person electric car.

The sparks of curiosity and tenacity lit within the boy that day have endured through Mark Westlake's 27 years of teaching physical science and physics at Saint Thomas Academy in Mendota Heights, Minn.

Last July, the Air Force Association announced Westlake as its 2015 National Teacher of the Year. He received a $3,000 award in a formal presentation during the AFA Air & Space Conference at National Harbor, Md., in September.

The Gen. E. W. Rawlings Chapter of Minnesota nominated him for the honor.

In the essay he wrote as part of his national-level nomination package, Westlake said he began his own vehicle engineering program in 1997, when a group of industrious seniors at Saint Thomas approached him for help building a go-kart. He challenged them: "We can build a vehicle if you can find a contest to enter it in."

FUEL ECONOMY: 866 MPG

Less than five weeks later they received a grant from Toyota, and a few months afterward, Westlake knew how his father had felt, uncovering that electric car so many years before: He watched with pride as his students pushed their gas-powered 100-pound blue and white carbon fiber car to the starting line of the 1998 Minnesota Super Mileage Challenge. They went on to break the state record; their fuel-sipping car achieved a prorated 866 miles per gallon, according to Westlake.

Westlake wrote that the teardrop-shaped car sat in his garage for weeks after the competition, almost begging him to keep his vehicle engineering program going. He realized that science, technology, engineering, and math—STEM—education had jumped out of the textbook and into the hands of students. It was how science was intended to be taught.

So he continued, following a mantra, "Challenge students to be creative by giving them a chance to fail."

"Mark pushes students to realize that science is not always easy, does not always work, and that the answers are not always in the back of the book," said Mike Sjoberg, assistant headmaster at Saint Thomas Academy.

Westlake's engineering program evolved to more complex vehicle designs. He said his students—to use an aphorism—have been "standing on the shoulders of giants" to solve some difficult problems.

His students have driven a solar-powered car from Dallas to Pasadena, Calif., and driven an electric motorcycle onto the stage of a lecture hall at the Massachusetts Institute

Photo by Andy King

Boston Society of Architects displayed the students' electric urban-commuter motorcycle in 2013.

Mendota Heights, MN

Boston, MA

New York, NY

Dallas, TX

In NYC last fall, their electric/solar energy car promoted a NatGeo TV series.

of Technology in Cambridge, Mass. They have explored engineering initiatives in battery- and solar-powered experimental vehicles.

BREAKTHROUGH IN NYC

In 2015, his school and students earned national recognition. In October they traveled with their two-person electric urban concept car to New York City to be a part of National Geographic's premiere of a six-part TV series on innovation. Produced by General Electric, the series was entitled, "Breakthrough."

Westlake feels his role has gone beyond guiding students to teaching educators: In addition to his work at Saint Thomas, he is a master educator at MIT, mentoring projects through the Lemelson-MIT invention program for young people.

He explained in his AFA State Teacher of the Year essay, "At the end of the invention cycle, the students and their teachers arrive at MIT to showcase their yearlong project. ... Watching them carefully unpack their inventions while beaming with pride reminds me that I am making a difference." ✪

Susan Mallett is the Youth Development and AFA Programs coordinator for the Civil Air Patrol's national headquarters and a member of AFA's Aerospace Education Council.

Photo via David Black

FIRST RUNNER-UP

David V. Black, the National Teacher of the Year first runner-up, has 24 years of teaching experience. He teaches high school physical science and computer technology at the Walden School of Liberal Arts in Provo, Utah.

Black has conducted presentations and workshops to share his knowledge, and his blog, "The Spaced-Out Classroom," shares aerospace lesson plans, activities, and events. More than 15,000 people have viewed it. More than 240,000 people have checked out his second blog, on chemistry, and he and his students also created YouTube videos on science topics.

The Salt Lake City Chapter in Utah nominated Black as Teacher of the Year.

Photo via Sean McSheeny

SECOND RUNNER-UP

Sean D. McSheehy, nominated by the Hurlburt Chapter, Fla., is the second runner-up.

With more than 24 years of experience, McSheehy teaches aviation, Web design, and Photoshop photo-editing to students at Choctawhatchee High School in Fort Walton Beach, Fla.

Inspired by trips to software and technology giant Google with his advanced-Web students, McSheehy has conducted "Google School" in-service workshops for teachers and staff.

He has purchased more than 10 drones for his aviation classes and created the website USDroneTeam.com to encourage an interest in remotely piloted aircraft and robotics. He also created DroneTeamPink.com, describing it as "the first all-girls team" in the US.

AFA Launches Day of Service

By Bridget Dongu

AFA's 70th

2016 is a yearlong celebration of AFA's birthday, and AFA National encourages chapters to participate in a day of service to give back to the airmen in their communities.

AFA's mission is to educate about, advocate for, and support the Air Force. That includes the Air Force family and promoting aerospace education.

On Feb. 4, 2016, AFA celebrated its 70th birthday. To mark the occasion, AFA organized day of service events, to give back and thank the airmen who are serving or who are veterans.

As part of this endeavor, AFA President Larry Spencer visited Falcons Landing Military Retirement Community in Potomac Falls, Va., to meet with the residents. His message? A heartfelt thank you for their service, updates on AFA's focus, and—of course—a few war stories.

Spencer next visited Walter Reed National Military Medical Center in Bethesda, Md., to meet outpatient airmen and caregivers. He discussed their paths to recovery and the companionship needed to make it through their next steps.

Each airman received from Spencer an American flag that had been flown over the Air Force Memorial, and he presented AFA coins to their caregivers. Spencer reminded them about AFA's Wounded Airman Program and urged them to contact AFA if they need assistance.

Bridget Dongu is AFA's senior manager, communications.

CHAPTER NEWS

By June L. Kim, Associate Editor

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

LT. COL. B. D. "BUZZ" WAGNER CHAPTER

Members of the Lt. Col. B. D. "Buzz" Wagner Chapter had some excitement earlier this year when parts of a replica P-40 Curtiss Warhawk, the aircraft their chapter namesake flew in World War II—and flew to become the first ace in the Army Air Forces—arrived at the John Murtha Johnstown-Cambria County Airport in Johnstown, Pa. It had taken the chapter more than two years to plan and fundraise to receive the aircraft, according to the local *Tribune-Democrat.*

The chapter began in 2013 to search for a replica of Wagner's P-40 to honor the local hero. "The ultimate tribute to a World War II ace would be to have a replica of the plane he flew to become an ace," said Chapter President William B. Burns, according to the paper.

After securing a full-scale replica of a P-40 in Memphis, Tenn., the chapter began efforts to raise $48,000, states the paper. The chapter received support when they announced their fundraising efforts to the airport authority. "There were donations, fundraisers, pin sales and we got a grant from the Community Foundation [of the Alleghenies]," said Burns, according to the paper.

Lt. Col. Boyd D. "Buzz" Wagner was born in Emeigh, Pa., less than an hour north of Johnstown. He became an ace with eight Japanese kills. He was killed in a 1942 airplane crash.

The chapter plans for the unveiling to be in late May, states the *Tribune-Democrat.* The aircraft is to be located near the main driveway.

Photo by Randy Griffith, *The Tribune-Democrat*

Patrick Replogle (left) and William Burns look over the fuselage of the replica P-40. Burns is the Buzz Wagner Chapter president. Replogle works for the architecture firm that will mount the Warhawk on a pedestal for display at the Johnstown, Pa., airport, to pay tribute to the chapter's namesake.

ALBUQUERQUE CHAPTER

The Albuquerque Chapter (N.M.) sponsored a Military Coalition luncheon in January and picked up a prominent new AFA member. Chapter President Fred Harsany signed up guest speaker New Mexico Lt. Gov. John A. Sanchez, a Republican.

"His chief of staff commented that we should never assume that they are aware of what ... is happening, and he welcomes the information and news the AFA membership will bring him," said Harsany.

Photo by John A. Toohey

Albuquerque Chapter President Fred Harsany (right) stands with new AFA member New Mexico Lt. Gov. John Sanchez.

GEN. BRUCE K. HOLLOWAY CHAPTER

The Gen. Bruce K. Holloway Chapter in Tennessee kicked off its 17th annual golf tournament in October by honoring the victims of last summer's shooting at a Chattanooga military recruiting station. The chapter invited recruiters from each service to attend as guests, said Joseph E. Sutter, former AFA chairman of the board and Holloway chapter member. "Eighteen representatives from all branches teamed up with AFA members and Community Partners," he said.

The idea stemmed from tournament chair Paula Penson's son-in-law, John Shawhan, a retired Marine. He suggested the idea, and "it was easily a unanimous decision," said Sutter.

More than 70 participated and the chapter raised more than $7,000. The funds will go toward scholarships and grants that promote education and STEM.

The tournament was renamed after the late Brig. Gen. Walter J. "Bud" Bacon in 2008. Bacon, a chapter member, was deputy commander of Caribbean Contingency Joint Task Force in Key West, Fla., before retiring in 1980.

Photo by Paula Penson

Tommy Gontarski (left) watches tournament partner SSgt. Jordan Siwula tee off during the Holloway Chapter's 17th annual golf outing at a Knoxville, Tenn., country club.

AFA Emerging Leader

Robbie L. J. Walsh

Home State: Oklahoma

Chapter: Central Oklahoma (Gerrity) Chapter.

Joined AFA: 2000.

AFA Offices: Currently Chapter VP.

Military Service: Since 2000.

Occupation: Logistics readiness officer, Oklahoma City Air Logistics Complex.

Education: B.S., M.S., Embry-Riddle Aeronautical University.

How did you first hear of AFA?

My first exposure to the Air Force Association was as a young enlisted airman. I remember the organization had such a heritage behind it. Members would meet regularly at the base club, bring in guest speakers to share stories of their accomplishments, and share leadership experiences from every level of the Air Force.

What compelled you to join?

I saw the Air Force Association as an organization committed to Air Force airmen, both officers and enlisted personnel. I was compelled to join because the organization does nothing but help our service members by advocating for our rights and benefits. AFA meetings are a place you can go to receive that critical mentorship by someone who has served before you. I wanted to be a part of something that helps to preserve our Air Force heritage.

What do you enjoy most about AFA membership?

The chance to receive mentorship and network with people from every part of the Air Force, not from my career field. Being a part of AFA at the base level also allowed me to lead as a young airman. The many lessons on strategic leadership I have received along the way and the professional development opportunities made available through AFA are invaluable.

What do you think AFA needs to improve most to increase exposure and draw in more members?

In my opinion, AFA is losing touch with some of the younger airmen and NCOs. As an organization we are working to re-energize our focus through a robust social media effort at the base level that outlines the many benefits that go along with an AFA membership. Although it's true that all private organizations are facing dwindling numbers with respect to membership, we still have plenty of tools in our toolbox to reach out to folks who may not even know we are there. This includes military spouses and families. This is why EAM (Every Airman a Member), an AFA national membership effort, is so important.

How will you keep building awareness about AFA?

I've had the fantastic opportunity to be a part of the Every Airman a Member initiative through the AFA Membership Committee. To me, raising awareness means amplifying the goodness that comes from being a part of this great organization. AFA is over 200 chapters strong and directly sponsors the Wounded Airman Program, provides transition and support services, and extends grants and scholarships to worthy individuals. My plan is to help step up outreach efforts at the base level by increasing AFA awareness with airmen and their families.

Photo by Mark Gough

The Minuteman Chapter in Massachusetts donated funds to a center for veterans. L-r: Chapter Treasurer Joe Bisognano, facility president Andrew McCawley, and Chapter President Yvonne Thurston.

LONG ISLAND CHAPTER

The Long Island Chapter held a medal ceremony in February at the Long Island State Veterans Home in Stony Brook, N.Y., to honor World War II and Vietnam War veterans.

Three WWII veterans received the Jubilee of Liberty Commemorative medal and 21 Vietnam veterans received the 50th Anniversary of the Vietnam War Commemorative Medal, said Chapter Treasurer and VP of Leadership Development William G. Stratemeier Jr. The ceremony drew in nearly 500 people.

"We are drawing the attention of politicians, military associations, ... and others," said Stratemeier. "These ceremonies are proving to be a great community outreach program."

Photo by Virginia Montalvo

Membership VP Bob Morris (right) poses with Florida's Gold Coast Chapter's first 2016 member, Robert Livingston. Chapter President Virginia Montalvo said it didn't take much to persuade him to join. He was a waist gunner with the 351st Bomb Group in England in 1943.

RAMSTEIN CHAPTER

When members of the Ramstein Chapter in Germany heard that former CMSAF Sam E. Parish would be in town in January, they snagged the opportunity to have him speak at a dinner event. "Parish was invited to Ramstein as the guest speaker for the Wings Chief Recognition Ceremony honoring all of the new chief master sergeant-selects," said Chapter President SMSgt. Bradley A. Williams.

The chapter co-hosted the evening with a local Air Force Sergeants Association chapter. Some 40 people attended the dinner. Parish "spoke directly on the importance of professional organizations, highlighting specifically what AFA and AFSA do for our force," said Williams. They ended the night with questions to Parish about force development, change within the Air Force, and Parish's successes and struggles at the top enlisted rank.

LANCE P. SIJAN CHAPTER

The Lance P. Sijan Chapter sponsored for the sixth time the JROTC drill competition in Colorado Springs, Colo., in January. The competition took place at General William Mitchell High School and teams from all services represented nine area high schools, said Linda S. Aldrich, chapter VP.

In the competition, students were judged in color guard, unarmed regulation, armed exhibition, unarmed exhibition, and inspection, said Aldrich.

Two Mitchell High School teachers, retired Lt. Col. Isaac K. Woodfork, the senior aerospace science instructor, and retired CMSgt. David Figueroa, the ASI, led the teams. The final event was a drill down. The host high school won the Overall Championship Commander's Trophy. ✪

Reunions

7th Air Commando Sq/7th Special Ops Sq. May 19-21, Ramada Plaza Beach Resort, Fort Walton Beach, FL. **Contact:** Tom Bradley, 4009 Sugarcane Creek Run, Niceville, FL 32578 (850-499-0726) (tpb4009@aol.com).

36th/585th Air Police K-9. April 28-May 1, Holiday Inn Riverwalk, San Antonio. **Contact:** Dennis Nichols (805-377-8910) (dnick777@gmail.com).

363rd Tactical Fighter Wg Provisional (Desert Storm). June 24-26, Suncoast Hotel & Casino, Las Vegas. **Contact:** Ronald Perkins (r.perkins48@aol.com).

Brady AB/Camp Hakata, Japan, including all personnel. Sept. 8-12, San Antonio. **Contact:** Gus Cone (253-531-1783) (253-820-7116) (guscone@msn.com).

Navigator Cadet Class 52-24, Ellington AFB, TX. May 23-27, Albuquerque, NM. **Contact:** Charles Sterns, 1128 Castellano Rd., SE, Albuquerque, NM 87123 (505-296-6686) (charles.stearns01@comcast.net).

Pilot Tng Class 66-5, Vance AFB, OK. Sept. 28-Oct. 2, Washington, DC. **Contact:** Skip Foster (flyerskip@cs.com).

SAC Airborne Command Control Assn. Sept. 28-Oct. 1, Radisson Suites Hotel, Tucson, AZ. **Contact:** Wilton Curtis (804-740-2290) (wcurtis135@aol.com).

Seeking all **52nd FS or in civil engineering,** Spangdahlem AB, Germany (1979-81). **Contact:** Richard Helm (414-323-3533).

Air Force Memorial Spotlight on: PETE LINDQUIST

By Barbara S. Taylor

Pete Lindquist was the memorial's action officer, project manager, operations VP, and managing director.

Retired Col. Pete Lindquist was the first director of the Air Force Memorial and remains my best source of information. Recently, I asked him a few questions about his time at the AFM.

When did you begin working here? Retired Lt. Gen. Robert Springer [president of the AFM Foundation] hired me to work in July 1996. I was fortunate enough to work for the foundation for over 16 years, with the last six years as the managing director. Responsibilities changed with each succeeding phase of the memorial development: fund-raising, designing, constructing, and operating.

What were your greatest challenges? We had several transition points where oversight support of the memorial (maintenance/repair and custodial) changed from DOD's Washington Headquarters Services to SAF/AA [the Secretary of the Air Force's Administrative Assistant], from SAF/AA to the Air Force District of Washington, and site security responsibility changed from the Pentagon Force Protection Agency to the Air Force's 11th Wing. Each of these changes required new or revised agreements and different operating procedures.

Greatest joys? My No. 1 joy was when the first section of the first spire was installed and along with it came the first feelings of "soaring" into the heavens; and No. 2 was on AFM Dedication Day [in October 2006] when the Thunderbirds performed their famous bomb burst maneuver directly over the top of the spires. I still get goose bumps just thinking about the roar of the engines, the sun reflecting from those gleaming jets, the trailing smoke defining the contrails of their vertical climb toward the heavens as they mimicked the arching of the memorial's spires. How *awesome* it was!

What is your favorite component of the memorial? The grandeur of the spires is obviously the most dominant visual and easily seen component of the memorial. But right beside the spires is the very painstakingly detailed honor guard sculpture that provides the human element. It is this combination of two contrasting components—one large, one small and one conceptual, one human—that gives me the satisfaction that the proper balance was achieved.

What's a fun fact about the memorial? There is a poem, "High Flight," by John Gillespie Magee Jr. A portion of [it] is bead-blasted on top of the tallest 270-foot spire and reads: "Put out my hand and touched the face of God." Our board of trustees felt having a portion of it on top of the highest spire was a most appropriate location. ✪

Barbara S. Taylor is the managing director of the Air Force Memorial.

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Illustration by Ugo Crisponi, aviationgraphic.com

V-22 Osprey

The V-22 Osprey "tilt-rotor" is a unique multimission aircraft capable of vertical and short takeoff and landing. Typically, it takes off and lands like a helicopter. However, when airborne, its engine nacelles and 38-foot, three-bladed proprotors can rotate forward 90 degrees for horizontal flight, converting the Bell Boeing aircraft into a more fuel-efficient, higher-speed turboprop aircraft.

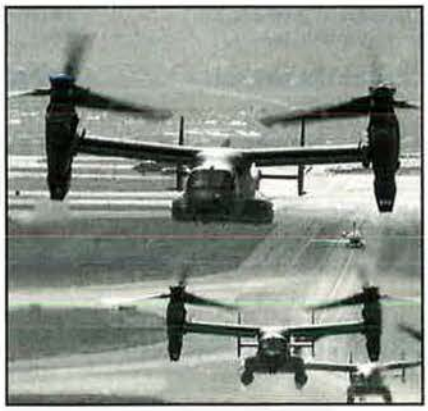
The US Marine Corps was the lead service in development of the Osprey and has acquired the largest number. The USMC variant, the MV-22, serves as an assault transport for troops, equipment, and supplies and can operate equally well from ships at sea or expeditionary airfields ashore. The Air Force variant, the CV-22, is used by Special Operations Command for long-range insert and extraction. CV-22 is equipped with extra fuel tanks and integrated threat countermeasures, as well as terrain-following radar and advanced avionic systems that allow it to operate at low altitude, at night, in poor weather, and in high-threat areas. It has been used operationally for long-range infiltration, exfiltration, and resupply missions for SOF of all services.

The V-22's extreme technical complexities produced a long, costly, and difficult development period—consuming 25 years, $22 billion, and 30 lives in crashes. In the early 1990s, Defense Secretary Richard Cheney tried, without success, to kill it. In the 2000s, crashes caused by "vortex ring state" lift problems forced a grounding and significant redesign. Since its operational debut in 2007, Marine and USAF Ospreys have performed well in Afghanistan, Iraq, Libya, Kuwait, and in various African locales. USMC has about 240 in inventory, the Air Force about 50.

—Robert S. Dudney with Walter J. Boyne

USAF Ospreys take off from Kirtland AFB, N.M., on a training mission.

This aircraft: USAF CV-22 Osprey—#11-0057, *Knife 75*—as it appeared in 2015 when assigned to the Air Force's 7th Special Operations Squadron, RAF Mildenhall, UK.



USAF photo by SSgt. Markus Maier

In Brief

Designed, built by Bell Helicopter and Boeing ★ first flight March 19, 1989 (helo mode) and Sept. 14, 1989 (fixed wing mode) ★ function, assault and SOF transport ★ number built approx 400 ★ crew four (pilot, copilot, two flight engineers) ★ two Rolls-Royce Allison T406/AE1107C turboshaft engines ★ max speed 351 mph ★ cruise speed 277 mph ★ rotor diameter 38 ft ★ length 57 ft 4 in ★ wing span 45 ft 10 in ★ height 22 ft 1 in ★ width (rotor edge to rotor edge) 84 ft 7 in. **Specific to CV-22B:** armament, one .50 cal-M2 Browning machine gun ★ max payload 10,000 lb ★ troop capacity 24 seated or 32 floor-loaded ★ max range 1,011 mi ★ combat radius (with aux tank) 575 mi ★ weight (max T/O) 60,500 lb ★ service ceiling 25,000 ft.

Famous Fliers

Mackay Trophy 2012: USAF Rooster 73 Flight—Ryan Mittelstet, Brett Cassidy, David Shea, Christopher Nin, William Mendel, Arjun Rau, James McKay, Kenneth Zupkow, Taylor Fingarson, Daniel Denney, Alberto Delgado, Jeremy Hoye. **Distinguished Flying Cross:** David Haake (USMC), Michael Hutchings (USMC). **Other USMC Notable:** Michael Murphy (former presidential helicopter pilot, killed in 2000 test crash). **Test Pilots:** Thomas Macdonald (Kincheloe Award 2003); John Rudzis, William Wainwright, Thomas Currie, William Witzig, Kevin Gross, Chris Seymour, Michael Healy, William Leonard, James Lindsey, William Norton, Steven Grohsmeyer, Martin Shubert (Feinberg Award 1999).

Interesting Facts

Deemed the world's first production "tilt-rotor" aircraft ★ carried body of Osama bin Laden from Pakistan to USS *Carl Vinson* for burial at sea ★ spurred into development by 1980 Iran hostage rescue fiasco ★ suffered seven hull-loss accidents ★ won Robert J. Collier Trophy in 1990 ★ opposed, at first, by DOD leaders, but backed by Congress ★ has performed rolling landings and takeoffs on carrier ★ used by presidential candidate Barack Obama in 2008 tour of Iraq ★ featured in 2007 and 2011 "Transformers" movies ★ able to fold rotors for storage in 90 seconds ★ can transition from forward flight to 50-foot hover with no pilot interaction ★ requires use of oxygen masks above 10,000 feet.

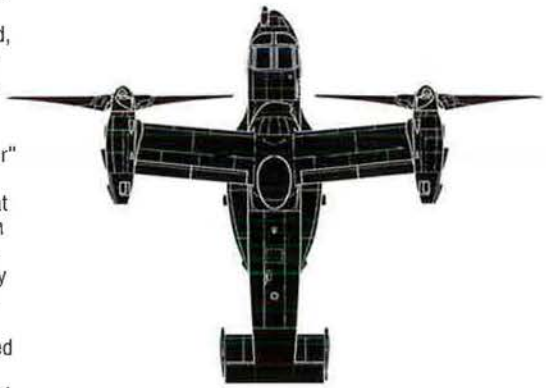


Illustration by Zaur Eylanbekov

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