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What's Next for CAS?

The F-35

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AIR FORCE MAGAZINE

December 2014, Vol. 97, No. 12





About the cover: A joint terminal attack controller keeps an eye out as an A-10 releases munitions overhead at the Nevada Test and Training Range. See "What's Next for CAS?" p. 34. USAF photo by TSgt. Michael R. Holzworth.



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Editorial

By Adam J. Hebert, Editor in Chief

Win or Go Home

It has been very difficult to judge the effectiveness of the air war against ISIS terrorists in Iraq and Syria. The information the US government releases is so generic it is nearly impossible to determine whether the US-led multinational effort to beat back the terrorists is succeeding, failing, or something in between.

To those watching from afar, the war against ISIS, also known as ISIL or IS, is oddly reminiscent of times in two previous air wars. The points of reference date back 15 years and half a century—to Kosovo and Vietnam, respectively.

One war was frustrating but ultimately successful, the other was frustrating and ultimately unsuccessful. It remains to be seen whether Operation Inherent Resolve (the war against ISIS) will more closely resemble Vietnam or Operation Allied Force, but decisions made today will help determine its effectiveness.

The Vietnam parallels begin with the fact that the US appears to be in a war without a clear strategy. The problem was famously elucidated by President Obama himself.

"We don't have a strategy yet," Obama admitted Aug. 28—nearly three weeks into the air campaign against ISIS. "I think what I've seen in some of the news reports suggests that folks are getting a little further ahead of where we're at than we currently are. And I think that's not just my assessment, but the assessment of our military, as well. We need to make sure that we've got clear plans, that we're developing them."

The US appears to be stumbling into a broader war without its heart fully in the fight. Obama ran for president with a promise to end the US war in Iraq, which he did. But now ISIS is forcing the US back into that country. Obama is reluctant to commit US ground troops to defeat ISIS, wishing to rely on local forces to handle ground combat.

The Administration has subsequently backed into what is gradually becoming a larger campaign. When Obama did come forward with a strategy to "degrade and ultimately destroy" ISIS, the Sept. 10 announcement included sending 475 additional US troops to Iraq to support the "forces fighting these terrorists on the ground."

The expansion continued. On Sept. 22, the US began air operations in Syria, where ISIS has also seized large chunks of territory. Then on Nov. 7, Obama authorized sending 1,500 additional troops to Iraq to advise, assist, and train Iraqi forces. This includes forces for "logistics and force protection," according to a DOD release.

All of this recalls the early days in Vietnam. As John Correll noted in "The Long Retreat," in our October issue, "The US experience in Vietnam was a classic case of unplanned mission creep. It started as training and advice but slipped into counterinsurgency and then into conventional war."

A halfhearted attempt to defeat ISIS is doomed for failure.

But unlike Vietnam, the war against ISIS has been focused on air operations from Day One. This creates parallels to another war, Allied Force, the 1999 air war to save Kosovo from Serbian aggression.

Ground forces were ruled out as an option in Allied Force, meaning the 78-day campaign was air-only from the get-go. And like today's war against ISIS, Allied Force was conducted with highly restrictive target lists and cautious rules of engagement. In both wars, avoiding civilian casualties was a major but necessary constraint.

The two wars elicited similar enemy responses. Forces in the open are targeted and destroyed by allied airpower, typically but not always forcing the enemy to disperse and hide. When enemies do emerge or set up fixed positions, they risk death. Enemies know this, which leads to slow progress.

Still, recent news releases from US Central Command have listed many examples of airpower taking out enemy facilities or small concentrations of ISIS forces, such as an ISIS "armed truck and a vehicle convoy" consisting of 10 armed trucks in mid-November.

The air campaigns against Serb forces in 1999 and ISIS today were both criticized for their tepid level of effort. For example, in Allied Force it took the allies 12 days to hit the same number of targets as were hit in the first 12 hours of Operation Desert Storm.

Both air campaigns were also difficult to judge. In 1999 and 2014, official statements typically lacked useful strategic details and did little to explain progress or inspire confidence.

The Allied Force air campaign slowly and steadily ramped up over the spring of 1999, however, and the war was being won even though few outside government knew it. The cumulative, around-the-clock effort wore down Serbia's will and ability to wage war.

By the end of Allied Force, there were more than 400 strike missions on some days and 28,000 bombs were dropped in the two-and-a-half month campaign.

By point of comparison, there were just 1,084 air strikes in the first 13 weeks against ISIS, with the Air Force conducting more than 600 of them.

A lesson of Vietnam, Allied Force, and Inherent Resolve is this: Airpower will work if it is applied in a meaningful way. Airpower should not be employed under the false presumption that it is an easy and painless way for the US to "do something" against an enemy. Airmen are performing courageously and are in danger on every mission they fly.

The Administration needs to decide what it wants to accomplish against ISIS. If these terrorists are not important to fight to defeat, they are not important enough to fight at all. The US can choose to ignore them—there are bad guys doing terrible things all over the world, and the US can never destroy them all.

ISIS is not just a terror organization—it calls for attacks worldwide and has ambitions of being an actual nation. The US and its allies (which include Bahrain, Jordan, Iraq, Saudi Arabia, and the United Arab Emirates) can destroy ISIS, but half-measures won't do the job.

If the Administration is serious about victory, it is time to step up the effort. The air campaign must be dramatically increased, with more flights, more targets, more surveillance, and more destruction. ✪

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Letters

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Red Flag

I enjoyed your article in the October issue, "Red Flag for the Future" *[p. 42].* While the 414th Combat Training Squadron has been increasing the fidelity of its training for aircrew and cyber operators, they have steadily raised the bar for support crews as well. In the summer of 2012, I served as the expeditionary maintenance group commander for RED FLAG 12-4, and the common reaction among maintainers then was [that] launching simulated combat sorties there was really no different from generating training sorties at home station. Fast forward two years, and I arrived to serve at USAF's Advanced Maintenance and Munitions Operations School, whose instructors serve as tactical mentors for the deployed maintenance units. In addition to providing an initial training session at the beginning of each exercise, the AMMOS instructors provide simulated injects and help the participants work through the challenges of operating in a contested, degraded, and operationally limited environment. During each flag exercise, more than a thousand maintenance and logistics professionals are exposed to threats that are difficult or impossible to replicate anywhere else. This is just one example of how different units from throughout the USAF Warfare Center team together to provide responsive, realistic, and relevant training for US and partner nation airmen.

Lt. Col. Greg Lowe
Nellis AFB, Nev.

"Red Flag for the Future" is one of the best features I have read in *Air Force Magazine* in quite a while. John Tirpak has done a great job of describing this phenomenal aviation event, both in its technical detail as well as in its huge scope and complex interactions. Red Flag's evolution and how important it has become to so many aspects of achieving the Air Force's missions is a story worth telling, and it has been told very well indeed in this feature.

I was also very impressed with Gen. Mike Hostage's comments in "Hostage's Warning" *[October, p. 50].* Usually, messages from the top sound like sterile PowerPoint presentations. It was a welcome change to read the General's candid assessments in plain language and common sense context. It's encouraging to know that there is someone like this in command.

Also worthy of praise are "Not Just Night Witches" *[October, p. 58]* and "The Long Retreat" *[October, p. 64].*

I learned a lot!

Hank Caruso
California, Md.

Enjoyed your detailed article on Red Flag. I was surprised, however, that you failed to note that the exercise was the brainchild of Col. Richard M. "Moody" Suter! He was at Nellis when he dreamed it up and was thankful that

Do you have a comment about a current article in the magazine? Write to "Letters," *Air Force Magazine,* 1501 Lee Highway, Arlington, VA 22209-1198. (Email: letters@afa.org.) Letters should be concise and timely. We cannot acknowledge receipt of letters. We reserve the right to condense letters. Letters without a name, city/base, and state are not acceptable. Photographs cannot be used or returned.—THE EDITORS

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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.

McKinley Ending Tour; Search for New AFA President Begins

The Air Force Association has begun its search for a new President to replace Craig R. McKinley, who is retiring at the end of 2014 after more than two years in the position. A search committee has been appointed to identify candidates.

The Presidential Search Committee consists of George K. Muellner as chairman, with Michael B. Donley and Duncan J. McNabb as members and John A. Shaud as advisor.

Muellner is a retired lieutenant general and AFA's immediate past Chairman of the Board. Donley was the longest-serving Air Force Secretary, and McNabb is a former commander of Air Mobility Command and US Transportation Command. Shaud is a retired general and held the position of AFA Executive Director in the 1990s and early 2000s. All four have strong, long-standing ties to AFA.

Persons wishing to be considered by the search committee must submit their requests in writing or via electronic correspondence, to be received by Jan. 1, 2015, to the following:

In writing:

Presidential Search Committee
Air Force Association
PO Box 736
Arlington, VA 22216

Electronic correspondence: afapressearch@gmail.com

"the powers that be" agreed to pursue it. As you note, it has done much for our fighter force. Unfortunately, Moody is no longer with us, but those of us who were privileged to know him and fly with him remember well his creative spirit.

Lt. Col. Bob Farland,
USAF (Ret.)
Hampton, Va.

Great to read your Red Flag report "Red Flag for the Future." It is coming up on its 40th year! The first Red Flag was a 9th AF product flown 1974 or 1975. I was chief of plans in the 9th AF fighter tactics division and was given the project to develop a plan to exercise our fighter forces and the first exercise under 9th AF [Lt. Gen. James D.] Hughes. As I can best recall we had A-10s (attack mission), F-4s (air cover), KC-135s (refueling) F-100s (aggressor fighters), C-121 (exercise monitor), a SAR mission out of Homestead, and Tactical Air Control System (monitor and control operations). The target was at Avon Park Gunnery Range. The exercise was designed to put inexperienced aircrews in a high-threat environment as much as possible. It worked. As best as I can recall the scenario was our response to aggression in Iraq. I had my simple tape recorder on board the C-121 and recorded the activity. We had an air refueling problem, and the guys had to think on their feet. They did a great job and the mission was a continued. One of the A-7s dropped its bomb rack rather than bombs and there were other problems and that was the purpose of the entire exercise, which was to place the troops into a high-pressure "combat" environment and monitor their reactions. It was a total success. When I played my tape back to General Hughes, he got a bit upset about the air refueling problem, and I stopped the tape and explained the whole purpose of the exercise and to listen to the tone of the flight leader—how he shuffled the flight through AR and continued on the mission! General Hughes really liked the tape. (I think I have the tape somewhere.) In the summer of 1975 I went to TAC HQ (9th AF HQ was then under the command of [Lt. Gen. James V.] Hartinger) and briefed the concept of our plan. It was adopted by TAC as "Red Flag." Today's plan has the same objectives as the original 9th AF plan but it has been expanded and improved to meet the changing combat environment.

Maj. Douglas J. Cook,
USAF (Ret.)
Madison, Ala.

Crush ISIS

I cannot believe our military leadership has become so politically correct as to believe what they are doing against the threat of ISIS is militarily effective *["Editorial: The Airpower Advantage in Iraq," September, p. 4].* It's an affront to the concept and application of airpower. I am reminded of the debriefing of an Iraqi Air Force general following Desert Storm regarding our air campaign. He stated that they all believed our precision campaign a failure. "Not enough casualties," I believe was the comment. Then, "If you started to carpet bomb Baghdad with B-52s, we would have understood"—a testimony to how different the mind of those brought up under Islam think about the value of human life. If we want to defeat ISIS and MINIMIZE boots on the ground, we should have, immediately following the President's declaration, begun air strikes, in addition to those precision strikes accomplished, to include massive carpet bombing of the ISIS headquarters in al-Raqqah turning it into rubble, along with other key leadership locations. The same approach could have prevented what is going on in Kobani. Had we run a few heavy bomber strikes along the outskirts of the town before it became infested, the attack could have been stopped cold. It's time to wake up and stop limiting our approach to crushing these vile pests.

Col. John E. Frisby,
USAF (Ret.)
Henderson, Nev.

Let me ignore the argument that the campaign against ISIS should be a combined air plus ground campaign vs. air only. Let me make some observations on what airpower alone can accomplish:

1. US airpower can attack with little or no casualties. There have been 3,800 sorties in the campaign and no American losses. There were no [American] losses in the Libyan air campaign either. [Nor] were there losses in the 10-year no-fly zone against Saddam Hussein. In other words, airpower gives us the important option of attacking with little or no losses. For one thing, this has to be extremely discouraging to the enemy. Another important aspect is the effect on the American home front. The continual casualties from Iraq and Vietnam in earlier years were constant front page news. However, the no-fly zone wasn't even noticed.

2. US airpower can respond quickly. We are talking hours not days, weeks, or months.

3. US airpower can be effective. Key leaders of the Khorosan Group and ISIS have been eliminated. The Mosul Dam was retaken with critical air support. In Libya, Khadafy was overthrown with critical air support. In the case of Kosovo, airpower alone was enough to end the battle. While airpower alone can accomplish much, US airpower (or coalition airpower) can be a powerful assist to indigenous ground troops. It allows the US the option to be "part of the solution" vs. "all of the solution"

and "all of the responsibility."

4. Airpower takes no prisoners. In Iraq our ground troops were taking prisoners just to see them released from captivity a week later. There are no prisoners with airpower. There are no new candidates to put in Guantanamo. Whether the air attacks are in ISIS territory, Libya or Yemen, there are no prisoners.

William Thayer
San Diego

Don't Retire, Promote

I salute General Hostage for his honest and candid comments made during his speech sponsored by AFA *["Hostage's Warning," October, p. 50].* Military members want to hear the truth. The problems he addressed not only affect his command but the whole Air Force. He addressed the problems truthfully and did not sugarcoat the issues. Facts are facts. As the budget is reduced we lose our operational edge.

General Hostage's approach—"I'm not going to ask them to do more with less"—is exactly what all our command leaders need to [demonstrate]. I'm sure his officers, NCOs, and airmen appreciate that type of leadership and work hard to accomplish what the general expects and give him 100 percent with what they have. More Air Force leaders should stand up and take the general's approach.

If I had my say I would recommend that General Hostage not retire but be moved into a higher position where his talents would continue to benefit the Air Force mission. Short of that all I can say is, "Thank you, sir, for your dedication and service."

CMSgt. William F. Eads,
USAF (Ret.)
Leesburg, Fla.

Sorry, I'm confused. As reported in the October issue of *Air Force Magazine,* did ACC commander General Hostage actually say, "I could not send an A-10 into Syria right now. They'd never come back. I would have to conduct three weeks of very significant [integrated air defense system] degradation before I could think about sending [in] a fourth gen platform, and I sure as heck wouldn't send in an A-10"? Did he really say that? Correct me if I'm wrong, but is not the battle against ISIS the exact mission the A-10 was designed for? After all, Apache helicopters seem to be doing OK over there and they are a damn sight slower and less robust than an A-10. Is it possible that current Air Force senior leaders actually believe that sleek, pointy, and complicated "Bones," F-22s, and the elusive and benighted F-35 are better at close air support than airplanes designed for that specific mission? Have our leaders drunk so much Kool-Aid that they are convinced that our airplanes and crews are ineffective unless they operate in a completely unchallenged environment? And if the A-10 is so pitiful that it can't survive over a modern battlefield, then why did he also say he'd keep 250 in the inventory if he could? I am old, retired, and often can't grasp the bigger picture, but sometimes I read this stuff and just shake my head.

Col. Robert D. Coffman,
USAF (Ret.)
Rome, Ga.

■ *General Hostage's comments were made before it was known that Syrian air defenses would not attack US aircraft.—THE EDITORS*

Transfer the ground killing capable A-10 to the infantry.

As proven in Korea from January 1951 to June 1951, armor, artillery, [and] air-supported, highly mobile, properly armed infantry are capable of defeating in detail any massed army, conventional or guerrilla. In 1970 and 1971 the principle was again proven against the Soviet-supported North Vietnamese Army and their Viet Cong satrapy.

In today's warfare, a combination of M1A tanks, Bradley Fighting Vehicles, advanced artillery, AH-64 helicopters, and A-10 aircraft supporting properly armed and highly mobile infantry riflemen would defeat any army in the world.

In trade, give all of the useless nuclear weapons to the Air Force for overwhelming use without hesitation in the event that any enemy dares to utilize nuclear weapons of any size at any time or at any place.

Larry E. Brasher
Belton, Texas

Rather Damning

As a 33-year flight line maintainer, with the last two at [Oklahoma City Air Logistics Complex], I must say I am surprised and dismayed that depot leadership would actually say the things said in this article *["Depot Reduction," October, p. 32].* The part that really stands out to those of us from combat flight lines is that the focus began shifting to a format that established a RIGHT way to do aircraft maintenance. This only confirms our thoughts about depots: that everything we always feared about depots, was true!

Aircraft maintenance is not, and never was, an "art" form. We have technical orders that tell us all we need to know when working on any aircraft, and if one uses the TO it shouldn't matter what "movements in personnel" happen. There never should have been personality-driven maintenance in the depots. After all, people's lives are in our hands whenever we touch an aircraft or any part of one. This article is rather damning, in my opinion.

Col. Frank Alfter,
USAF (Ret.)
Beavercreek, Ohio

I read the article "Depot Redirection" regarding depot maintenance at Robins Air Force Base, and I was very disappointed. I agree with the comments, for the most part, made by General George and other base leadership, but took exception to the fact that Autumn Arnett didn't bother to discuss the issue with the AFGE Local 987 President Robbie Tidwell.

It is no secret that Robins Air Force Base depot has had its share of issues, but since his election, Mr. Tidwell and the officers of Local 987 have worked diligently with the ALC and the ABW to create a pathway for success not just on the flight line but across the installation.

Tidwell would have been happy to reiterate the fact that AFGE as an organization has long said that organic maintenance will always be cheaper and a better investment than contractor-performed maintenance.

Many civilian employees at Robins (and Tinker and Hill) have family members that are Active Duty, so they have a vested interest in making sure that the maintenance is done right and done well. The Boeings, Lockheed Martins, and Raytheons of the world have a vested interest also—their stockholders. The more maintenance they do, the longer it takes, and the more airframes they have to replace, the more their stock price goes up.

Investing in a community by employing people who live there builds a sense of pride in workmanship and an esprit d'corps that cannot be achieved through contractor-led maintenance, because the bottom lines are different. They are in different places.

JaLynn Hudnall
Warner Robins, Ga.

The Right Way to QDR

In "Aperture," October *[p. 12],* John A. Tirpak, editorial director, summarized the 2014 Quadrennial Defense Review. The QDR panelists, he said, believe "national defense needs should drive national defense budgets, not the opposite," and recommended that Congress ask the Pentagon for a plan to build needed forces without undue

emphasis on budgetary constraints. Although I concur with this general statement, I would also add that national defense needs should be based on actual and projected threats posed by leaders and weapon capabilities of state and nonstate sponsored military and terrorist organizations. Rather than the QDR recommending that Congress *ask* the Pentagon, I believe this should be required by law. This is so basic to national defense strategic planning that it should not be overlooked inadvertently or purposefully by military planners or leaders and legislators of either political party.

Lt. Col. Russel A. Noguchi,
USAF (Ret.)
Pearl City, Hawaii

What About the C-74?

I was a little disappointed that Robert Owen, in his excellent article on the growth of MATS, didn't mention the C-74 *["The Hearings That Revolutionized Airlift," November, p. 64].* Only 14 were procured, but they provided essential airlift in the late '40s and early '50s. I know because I was a passenger on a C-74 in September 1951 from Westover to Tripoli, en route to my assignment to the Air Section, MAAG Indochina.

Col. Robert F. Myers,
USAF (Ret.)
Panama City, Fla.

Quite a Woman

The article "Not Just Night Witches" *[October, p. 58]* poses the question of who was the first female combat pilot. While there are other claims, the undisputed record of French aviatrix, nurse, competitive bicyclist (placing 10th as a "nonparticipant" in the 1910 Tour de France), athlete, and expert marksman Marie Marvingt demonstrates that she owns that honor. In 1909 she qualified as a balloon pilot and the following year became the third Frenchwoman to hold a fixed wing pilot's license. By 1912, she was developing the first air ambulance. Interrupted by World War I, she used her marksmanship skills on the front lines as a French sniper (Chasseur 2ième Classe [Soldier, 2nd Class] in the 42ième Bataillon de Chasseurs à Pied). In 1915, she piloted a French bomber during an attack on Metz for which she received the Croix de Guerre (Military Cross).

She finally became a helicopter pilot in 1961 at the age of 86. Marvingt devoted much of the rest of her life to aeromedical evacuation and air ambulance work. She was an organizer of the First International Congress on Medical Aviation in 1929. Today this remarkable woman is honored by the Aerospace Medical Association with its annual award in her name.

A. J. Parmet
Kansas City, Mo.

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Spartan Saga

John Tirpak's "The Saga of the Spartans" *[September, p. 40]* was a thoroughly researched and well-written account of the many twists and turns of the Joint Cargo Aircraft (JCA) program. JCA was a sound concept that, unfortunately, fell victim to poor budget timing. The C-27J Spartan was selected for JCA because of the size of its payload, low operating costs, and ability to land in austere environments; its 11-month performance in Afghanistan proved it was always the right aircraft for the mission—which is why so many in the National Guard were sad to see the program end. The flexibility and capabilities of the C-27J that made it such a great fit for JCA were the same reasons it was so highly sought by US government agencies when the US Air Force made the airplanes available. In fact, the demand between US agencies significantly exceeded the 21 available airframes.

Thank you for your tremendous piece of journalism and for writing the JCA chapter of the Spartan story. Now we move forward, enthusiastic about new chapters with SOCOM and the USCG. Alenia Aermacchi is proud to support our new customers and look forward to helping make the next part of the Spartan book a record of their success.

Benjamin Stone
President & CEO
Alenia Aermacchi North America
Arlington, Va.

Action in Congress

By Megan Scully

If Texas Republican Mac Thornberry takes the gavel of the powerful House Armed Services Committee in the next Congress, as is widely expected, cyber security could quickly become a top priority item for the panel and a major focus of its annual policy bill.

A thoughtful lawmaker and an old-school hawk, Thornberry is considered an expert on the complex cyber world, having been tapped by GOP leaders in 2011 to lead a cyber task force aimed at focusing Congress' efforts on combating the growing national security and economic threat.

From his perch on the Armed Services' intelligence, emerging threats, and capabilities subcommittee, he has had direct oversight of cyber issues affecting the military and routinely inserted provisions in recent defense authorization bills demanding reports and creating at least one new cyber leadership post.

"This subcommittee has viewed as one of its primary responsibilities helping ensure that the military is as prepared as it can be to defend the nation in cyberspace," Thornberry said at a March hearing on the Administration's Fiscal 2015 budget request. "It is one of the few areas of the budget where there is widespread agreement that we need to spend more."

Thornberry has cautioned, however, that it doesn't necessarily mean the Defense Department should get a blank check for its cyber efforts, particularly in this era of constrained defense spending. He wants money directed at priority programs and wants to ensure Congress remains in the loop on the issue.

"We also want to see that all taxpayer funds are spent carefully and effectively," he said at the same hearing. "And we want to develop policies and, frankly, the public education required to protect the nation in this new domain of warfare."

The House-passed version of the defense authorization bill, which still must be reconciled with the Senate Armed Services Committee's bill in the waning days of the 113th Congress, includes a provision authored by Thornberry that would require the Defense Department to create an executive agent for cyber testing and training ranges. The goal, according to the panel, is to prevent redundancies while also addressing gaps in cyber training.

"Though there has been significant growth of cyber personnel to fulfill critical defensive and offensive missions for the department, the capacity for training in a realistic environment has not kept pace," according to Thornberry's language. "The committee is concerned that those challenges have not been addressed and that the department is unable to come to resolution on how best to provide adequate management and support for such capabilities."



Thornberry going slow and steady this time.

In an effort to boost oversight, the House bill tasks the Government Accountability Office, Congress's investigative arm, with reviewing the existing organizational structure of US Cyber Command to determine how clearly the Defense Department has defined the command's missions, responsibilities, and authorities.

The bill also asks GAO to review how Cyber Command, established in 2010, supports and coordinates worldwide missions while also minimizing duplication of efforts with combatant commands and the individual military services.

Virginia Republican Rep. J. Randy Forbes is expected to challenge the 10-term lawmaker for the coveted post of HASC chairman.

Forbes, who hails from southern Virginia and chairs the Armed Services seapower and projection forces subcommittee, has made shipbuilding and Navy issues his top priority.

But Thornberry, who has previously lost bids for the Armed Services and Intelligence Committee chairman spots, is considered the odds-on favorite for the job.

Retiring House Armed Services Chairman Howard "Buck" McKeon endorsed the Texas Republican for the job months ago and has appeared to be grooming his top lieutenant to take the gavel.

Thornberry also meets two other requisites for the chairman job. He has closes ties to House GOP leaders and has a well-established leadership political action committee that has raised nearly $180,000 this cycle, according to numbers provided by the Center for Responsive Politics.

By comparison, Forbes' leadership PAC has raised just $29,000.

Aside from cyber, Thornberry has also been an advocate for improving and streamlining the Pentagon's archaic acquisition processes. Previous attempts at acquisition reform in recent years have largely fallen flat, doing little to make positive and lasting changes to how the department does business.

The House-passed authorization bill includes what Thornberry's office describes as "modest steps toward acquisition reform."

Those include a provision directing the Pentagon's director of operational test and evaluation take the potential for increases in program costs or schedule delays into consideration when implementing the office's policies and procedures.

The bill also encourages the Defense Secretary to improve the department's efforts to collect data on service contracts and conduct better analysis to identify any waste.

Thornberry has said he plans to make changes over time, rather than study the issue at length and unveil a major legislative package—traditionally the approach in the past. ✪

Megan Scully is a reporter for CQ Roll Call.


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Aperture

By John A. Tirpak, Editorial Director

A game-changing strategy; Vulnerable forward bases; Up the drone ante; Sequestration a year later; Research takes a hit .....

AMERICAN ASYMMETRY

Defense Secretary Chuck Hagel has a dilemma: America's adversaries are arming up with the latest combat technologies, but the US can't or won't spend the money to comprehensively upgrade its military, which is heavily populated with worn-out or obsolete military equipment. Allowing the nation's enemies to catch up to—or surpass—the US in military prowess is unacceptable, though. What to do?

Hagel telegraphed the possible answer in a speech to an industry group in September. He said he'd directed his deputy, Robert O. Work, to find a "game-changing offset strategy" like those adopted by the US in the 1950s and 1970s to find some way around the conundrum.

An offset strategy can also be called "asymmetry." Rather than match an adversary tit-for-tat, it capitalizes on the nation's strengths while forcing adversaries to compete in technology areas where they are not strong or cannot win. It's also a page from the same playbook China has been using for the past 20 years to blunt US military advantages.

Work, in an August speech at the National Defense University, tipped to this effort, explaining that in the 1950s, President Dwight D. Eisenhower's "New Look" strategy sought to offset large Warsaw Pact conventional forces with nuclear weapons and delivery systems. In the 1970s, Defense Secretary Harold Brown's "Offset Strategy" sought to overcome quantity with quality in conventional arms through digital microelectronics, new sensors, precision, networks, and stealth.

A "third offset strategy," Work said, will require innovative thinking, new operational concepts, and organization.

Now, a Center for Strategic and Budgetary Assessments study, released in late October, details how such a "third offset" strategy might work. Titled "Toward a New Offset Strategy: Exploiting US Long-Term Advantages to Restore US Global Power Projection Capability," it was authored by Robert C. Martinage, who was acting undersecretary of the Navy until January, 2014. Martinage served under Work at the Navy, and Pentagon officials suggest Work strongly influenced the analysis.

Illustration by Erik Simonsen



The still-notional LRS-B is a winner in Martinage's study.

The review names names, choosing platforms to accelerate or beef up while cutting back on areas deemed less relevant—or affordable—to the threats of the coming decades. If indeed Third Offset is the new American strategic blueprint, it will spell radical changes for all the services in the very near future.

Among the winners in the analysis are the new Long-Range Strike Bomber—which Martinage suggests be accelerated and increased beyond the planned 80 to 100 aircraft—a new family of stealthy, long-range and long-endurance remotely piloted aircraft for not only intelligence, surveillance, reconnaissance, and strike, but for aerial refueling. Submarines and new unmanned undersea vehicles also play a central role.

New operational constructs with different notions of how and when to use them would go with the new gear and all would be aimed chiefly at deterring an enemy with the threat of unbearable consequences instead of attempting to defeat an enemy with overwhelming force. Martinage suggests the Pentagon "shape the competition, shifting it to areas advantageous to the United States (e.g., the undersea domain) while imposing costs on rivals."

DOING LESS WITH LESS

To pay for the adds, Martinage encourages cutting back on land forces, surface combatants, and fighters, which he deems are either too expensive, take too long to get to the fight, or are too vulnerable to modern precision weapons.

Burgeoning compensation costs mean large ground forces for the US are "untenable," Martinage said, while surface combatants—especially aircraft carriers—and forward-based airfields are too vulnerable to modern, long-range precision missiles. Current fighters also lack the range to get to their targets, Martinage asserted.

China "has a growing force of air interceptors with unrefueled combat radii between 600 and 900 nautical miles," he wrote. "This would require US tankers to stand off as much as 750 to 1,000 nautical miles. It is critical to note that this standoff distance exceeds the unrefueled radii of the F/A-18E/F, F-22, and F-35A/B/C and thus would effectively preclude an offensive strike role for the entire US fighter force."

Besides the vulnerability of forward bases and surface ships, Martinage said nonstealthy aircraft can't survive against modern integrated air defense systems, and "space is no longer a sanctuary from attack," dictating higher-stealth systems and a profusion of alternative network platforms.

Long-range strike capabilities with high stealth and survivability become a key asset, Martinage argued, because they don't require forward bases, have some liberty from a "tanker tether," and can operate, if necessary, from domestic bases. They can also hold at risk a potential enemy's most valued assets, heightening deterrence.

To make space assets a less-inviting target, Martinage follows other recent studies that add a lot of high-altitude, long-endurance RPAs to serve as communications nodes



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Lockheed Martin photo by Darin Russel

F-35s or drones: it's a tough call.

and ISR platforms. With a proliferation of such targets, an enemy would find less value in attacking any one piece, since the network could rapidly heal itself.

It's getting much more expensive to defend against an offensive capability—such as ballistic missiles and precision weapons—than the cost of those weapons. Israel's Iron Dome system, for example, costs tens of thousands of dollars to defend against mortars and rockets that cost mere hundreds of dollars. Martinage recommends a technology effort to reverse the equation and make defenses far cheaper than the attacking weapons. To this end, he suggests a big push toward lasers and other directed energy weapons, which have far less expensive magazines. The idea is to impose unacceptable costs on an aggressor, which would have to use expensive assets that achieve limited or no effect. Here is where Martinage posits an appropriate role for ground forces: establishing forward-area air defense, area denial for allies.

RISE OF THE DRONE FLEETS

The US enjoys clear superiority in RPAs and should play to that strength. "No other country in the world can conduct sustained, high-tempo ISR and strike operations over *global* distances," Martinage wrote. It's also "a world leader in artificial intelligence" and should capitalize on the two to create autonomous unmanned systems that can loiter in the air or underwater, perhaps for extended periods, which would increase battlespace awareness and decrease reaction time. They would also be "indispensable" for hunting and destroying mobile or relocatable targets.

The CSBA study recommends more emphasis on stealthy, fighter-size unmanned aircraft instead of manned aircraft, citing long-term cost savings and longer sortie duration. It says the Navy's F-35C might be terminated to make room for a bigger fleet of the unmanned carrier-launched airborne surveillance and strike RPAs. The Navy is now in the middle of an internal debate over whether UCLASS should be more or less capable, given the other elements in carrier aviation such as the F-35C.

Overall, Martinage argued that the US must also convince enemies it is willing to take military action against a near-peer. US strategy should shift from threatening to "restore the *status quo ante"* by direct force in a conflict to *"decreasing* an adversary's perception of the probability of achieving its war aims in the first place (i.e., deterrence by denial) and increasing the anticipated costs" to an adversary "by threatening asymmetric retaliatory attacks against highly valued targets (i.e., deterrence by punishment)."

The goal would be to make the enemy doubt that he could achieve a fait accompli before the US had a chance to react—and might lose some valued assets in the bargain. Because modern foes have precision, long-range systems, the typical American pattern of war—building up a war force nearby and then unleashing it to reverse an aggression—won't work anymore, Martinage argued.

A YEAR IN THE HOLE

The numbers are in, and it's official: Sequestration hammered the armed services budgets and the defense industry, particularly in research and development and products spending, according to a Center for Strategic and International Studies report released in October.

Defense outlays saw a drop of $56 billion from 2012 to 2013, according to "US Department of Defense Contract Spending and the Industrial Base, 2000 to 2013," which was prepared under the direction of David J. Berteau. CSIS said gross defense outlays fell by eight percent, from $702 billion in Fiscal 2012 to $646 billion in Fiscal 2013, not including the effects of inflation. In contract obligations, the damage was worse, with a 16 percent decline, "four times as steep as was seen during the 2009 to 2012 budget drawdown."

During that period, the Air Force saw a 22 percent decline in defense contract obligations, taking the biggest cuts to research and development and products, while spending for services was "relatively preserved." Because the Air Force had actually seen a small uptick of four percent in 2012, "the sharp decline under sequestration [was] even more notable."

Research and development had a bad ride. Defensewide, "R&D contract obligations, which declined by 11 percent in 2012, fell by an additional 21 percent under sequestration."

In fact, "though defense R&D contract obligations had been declining steadily for years (-8.1 percent … between 2009 and 2012), the decline observed under sequestration was both qualitatively and quantitatively different," according to the report. During sequestration, Air Force R&D fell 27 percent.

Moreover, the fall in spending wasn't driven by the cancellation of programs or R&D efforts progressing to production, CSIS said. "Rather, cuts to more fundamental R&D, particularly in the missile and space realm, accounted for the largest share" of [Pentagon] R&D contract declines."

A QUARTER DOWN ON ADVANCED TECH

Basic DOD-wide research dropped 19 percent and applied research 18 percent. Disproportionately, the hit fell on advanced technology development (down 27 percent), advanced component development and prototypes (down 24 percent), and systems development and demonstration (down 21 percent).

"Under sequestration, the major DOD components (particularly the Army and Air Force) were forced to make significant cuts in the stages of R&D that are critical to identifying and developing future critical technologies," CSIS asserted.

In products, the story was a little different. "Air Force products contract obligations, which had been increasing at a three percent [compound annual growth rate] from 2009 to 2012, fell by 28 percent. The main drivers … are cuts related to the C-17A (-$3.5 billion), the Evolved Expendable Launch Vehicle (EELV) (-2.3 billion), and a $3 billion decline for uncategorized fixed wing aircraft that the study team believes to be related to the F-35" strike fighter. ✪

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Air Force World

By Aaron M. U. Church, Associate Editor

Tyndall F-16 Pilot Dies in Crash

Matthew J. LaCourse, 58, an Air Force civilian pilot assigned to the 82nd Aerial Targets Squadron at Tyndall AFB, Fla., died in the crash of an F-16 he was flying over the Gulf of Mexico Nov. 6.

The base lost contact with the F-16 around 9 a.m. on Nov. 6 and search and rescue crews immediately were dispatched to the aircraft's last known location. Rescue crews recovered his body in the Gulf.

LaCourse, a 1978 Air Force Academy graduate, retired as a lieutenant colonel after more than 22 years of service.

"Our thoughts and prayers go out to the family members of our fallen teammate as they struggle through this extremely difficult time," stated a base news release. The cause of the crash is not yet known, but an investigation is underway.

Russia Ups Air Activity in Europe

Russia intensified air exercises over Europe in October, and in response NATO scrambled British, Danish, German, Norwegian, Portuguese, and Turkish fighters, Alliance officials said.

"NATO detected and monitored four groups of Russian military aircraft conducting significant military maneuvers in European airspace over the Baltic Sea, North Sea/Atlantic Ocean, and Black Sea. … These sizable Russian flights represent an unusual level of air activity over European airspace," according to a NATO news release.

Allied fighters intercepted a total of 26 Russian combat aircraft, including two flights of Tu-95 strategic bombers supported by tanker aircraft and fighter escorts off Norway, Britain, and Portugal on Oct. 29.

F-16s scrambled over the Baltic to investigate a group of strike aircraft the same day, mimicking a similar strike group that had flown the preceding day.

"NATO has conducted over 100 intercepts of Russian aircraft in 2014 to date, which is about three times more than were conducted in 2013," officials stated.

Second F-15 Crash in Less Than Two Months

An F-15D Eagle from the 48th Fighter Wing crashed north of its base at RAF Lakenheath, UK, during a combat training mission Oct. 8, officials announced.

The 493rd Fighter Squadron pilot—who was alone in the two-seater—safely ejected and was taken to a hospital for treatment and subsequently released, according to official statements.

The crash comes on the heels of a fatal Massachusetts Air National Guard F-15C crash in the mountains of Virginia this August. Lt. Col. Morris Fontenot Jr. reported a mechanical problem before communications were lost. Both accidents are under investigation.

New Bosses at ACC and PACAF

Gen. Lori J. Robinson assumed command of Pacific Air Forces from Gen. Herbert J. "Hawk" Carlisle, becoming the first woman to lead an Air Force component major command. The ceremony took place at JB Pearl Harbor-Hickam, Hawaii, on Oct. 16.

"General Lori Robinson is a phenomenal leader and a proven operator," said Chief of Staff Gen. Mark A. Welsh III, who presided over the change of command. "She fully understands what it takes to be successful in this business and has all the tools to take this command to even higher levels of performance."

Carlisle assumed command of Air Combat Command from Gen. Gilmary Michael Hostage III during a ceremony at JB Langley-Eustis, Va., shortly thereafter, on Nov. 4.



Air Force Secretary Deborah Lee James said Hostage, who will retire after nearly four decades in uniform, "has been a tireless leader" who is "dedicated and committed to excellence." She also praised Carlisle, saying he "really knows what it takes to be successful in the combat business."

Bouncing Predator

Wind shear combined with pilot inexperience caused the MQ-1B Predator remotely piloted aircraft landing accident at Creech AFB, Nev., in April, investigators announced.

The student pilot was flaring the RPA for a practice landing when a sudden wind shift caused the aircraft to lose lift on April 4. The student pushed full-throttle to compensate but did not follow standard procedures and failed to pull the nose up after the aircraft bounced off the runway surface, according to the accident investigation board report released in late October.

"It is highly likely that the aircraft would have recovered to normal flight" if the student had responded correctly, the report's executive statement noted. Instead, the student attempted to level the aircraft, overcorrected, and bounced the RPA several times before shearing the undercarriage off.

Total repair costs are tagged at $4.5 million, according to the AIB. The aircraft was assigned to the 11th Reconnaissance Squadron at Creech.

Last Time Flying the Hercules

The New York Air National Guard's 107th Airlift Wing at Niagara Falls Airport/Air Reserve Station flew its final C-130 mission Sept. 25 before conversion to the MQ-9 remotely piloted aircraft.

"We are transitioning from the C-130, which we've been flying since 2008 and have become comfortable with, having deployed with it to Iraq and Afghanistan," said wing commander Col. John J. Higgins in an Oct. 1 news release.

The flight ended the Air Guard unit's seven-year association operating the C-130s at Niagara Falls together with Air Force Reserve Command's 914th Airlift Wing. Members of the



11.13.2014

Four F-15s with the Massachusetts Air National Guard's 131st Fighter Squadron fly over Cape Cod during a training mission in November.

Photo by Jim Haseltine

107th AW are now training as RPA pilots, sensor operators, intelligence coordinators, and communications specialists.

The unit is expected to be fully operational in the RPA mission by 2017. Reservists of the 914th AW will continue to fly the C-130s.

Prolonged Friction Caused F-35 Fire

DOD and Pratt & Whitney investigators have determined that prolonged engine friction caused an F-35 fan blades fire in June that led to grounding the entire fleet.

The team concluded the fire was caused by "prolonged rubbing into the material in the stator," which then "decomposed and superheated the titanium rotor leading to excessive heating."

The excessive heating "started very small cracks in a titanium seal and then led to failure of the third stage fan rotor," according to a joint statement. The statement was issued with an Oct. 14 contract notification disclosing that DOD and the engine maker had agreed on a $592 million contract for 36 additional F135 engines.

Under terms of the latest contract, the F-35 Joint Program Office and P&W are now "executing a plan to modify the current fielded operational and test engines and [will] implement a long-term solution for production engines."

GPS IIF Launch Successful

The Air Force successfully launched its eighth GPS IIF satellite from Cape Canaveral AFS, Fla., aboard an Atlas V launch vehicle Oct. 29.

The mission was the fourth GPS IIF launch this year, pushing the Air Force to its "highest GPS launch tempo in over 20 years," said Col. William T. "Bill" Cooley, AFSPC's director of the Global Positioning Systems Directorate.

The launch was also the 50th mission utilizing United Launch Alliance's Atlas V vehicle.

***An Eerie Site:** Air Force commandos from the 321st Special Tactics Squadron and British military members "infiltrate" an area of RAF Sculthorpe, UK, during a bilateral training mission Nov. 6. The commandos searched for simulated threats and rescued simulated hostages.*

Jack Broughton, 1925-2014

Retired Col. Jacksel M. Broughton, a fighter pilot who flew a total of 216 combat missions in Korea and Vietnam and later became a prominent aviation author, died Oct. 24 at age 89 after a short illness.

Broughton earned an Air Force Cross for action in Vietnam, along with two Silver Stars, the Legion of Merit, and four Distinguished Flying Crosses. In addition to his storied Air Force flying career—Broughton commanded the Thunderbirds in the 1950s, leading their transition to the supersonic F-100—he wrote two critically acclaimed books about the Vietnam air war: *Thud Ridge* and *Going Downtown*.

Broughton was also a valued contributor to *Air Force Magazine*. His most recent article, "The Heart of the North," appeared in April.

He graduated from West Point and flew P-51s and P-47s in Europe before transitioning to the first jet-powered aircraft in Korea. During Vietnam, he was vice commander of the 355th Tactical Fighter Wing and led ground-attack missions in the F-105.

He attempted to protect two pilots who inadvertently broke rules of engagement during the Vietnam War, leading to his court-martial. The events were widely considered a miscarriage of military justice, but they ended his uniformed career.

Postretirement, Broughton flew as a charter pilot and was a space shuttle program flight test and technical planning advisor, entrepreneur, and author.

Safest Year for USAF Aviation

The Air Force logged its best year in terms of aviation safety in Fiscal 2014, achieving a 32 percent reduction in overall Class A aviation mishaps and a 64 percent drop in Class A flight mishaps from the preceding year, officials said.

USAF photo by A1C Dillon Johnston




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Breathe. Just Breathe: ***Capt. Jessica Looft, a flight nurse with the 18th Aeromedical Evacuation Squadron, secures an oxygen hose to a litter on a Marine Corps C-130 during Keen Sword, a joint exercise with Japan held at bases in the Pacific region including both Kadena and Yokota air bases in Japan. More than 11,000 US military personnel participated in the exercise, aimed at honing interoperability and the combat readiness of the two nations.***

The Air Force Safety Center defines a Class A mishap as one involving loss of life, an injury resulting in permanent or total disability, the destruction of an aircraft, or more than $2 million in property damage or loss.

"This is truly a good news story," said Air Force safety chief Maj. Gen. Kurt F. Neubauer. "Commander involvement at all levels resulted in [Fiscal] 2014 being the safest aviation year in the history of the Air Force."

The Air Force suffered seven Class A accidents and lost two aircraft in Fiscal 2014, compared to 19 Class A incidents resulting in the loss of 14 aircraft in Fiscal 2013, according to an Oct. 10 press release.

"Aviator attention to detail and proper risk management enabled these historic lows," said Neubauer.

Total Force OTS Graduation

The Air Force Officer Training School graduated its first class incorporating Active Duty, Air National Guard, and Reserve trainees in a ceremony at Maxwell AFB, Ala., on Oct. 10.

In a major step toward Total Force integration, OTS commissioned 193 new second lieutenants, including 73 Active Duty and 12 Reserve candidates who completed the Basic Officer Training course and 108 ANG trainees who finished the Academy of Military Science, according to officials.

For the first time, all the officer candidates went through parallel eight-week training courses, rather than the 9.5-week program for Active Duty and Reserve and six weeks for ANG. "The simultaneous training provided the same great training to two great officer candidate groups," said OTS Commandant Col. Scott M. Lockwood.

The Total Force integration also shows in the staffing and command at OTS, where the commandant's office rotates between an Active Duty and an ANG officer. OTS plans to merge the BOT and AMS programs into a single system.

Special Ops Squadron Leaves Hurlburt

The 9th Special Operations Squadron has transferred from Hurlburt Field, Fla., to Cannon AFB, N.M., in preparation to retire its legacy MC-130P Combat Shadow aircraft for new-build MC-130J Commando IIs.

"It's sad to see an aircraft retire, but we will retain the best of what the Shadow community has done for [Air Force Special Operations Command] and our nation and move that

F-35 LRIP 8 Handshake Deal

The Defense Department and Lockheed Martin have struck a deal on the Lot 8 buy of F-35 low-rate initial production jet aircraft in October. The unit cost "for all three variants of the airframe in LRIP 8 is approximately 3.6 percent lower than the previous contract," the company stated in a press release.

"We are making steady progress in reducing F-35 costs," said Lockheed Martin F-35 general manager Lorraine M. Martin. The company reiterated the goal of reducing F-35 unit costs "to the equivalent of today's fourth generation fighters by the end of the decade." LRIP 8 involves 43 aircraft, broken down into 19 Air Force F-35As, six Marine Corps F-35Bs, four Navy F-35Cs, and 14 international airframes. This includes two F-35As each for Israel, Italy, and Norway, four for Japan, and an additional four F-35B models for Britain.

Coupled with the 166 aircraft contracted for under LRIP Lots 1 through 7, the F-35 program will total 209 aircraft in use by eight nations when LRIP 8 is complete.

—John A. Tirpak

to the next aircraft," said CMSgt. Matt M. Caruso, AFSOC's command chief, at Hurlburt on Oct. 3.

Officials activated a stay-behind detachment—1st Special Operations Group, Det. 1—at Hurlburt to see the unit's MC-130Ps to retirement in May 2015. Until then, the detachment "will continue to provide aerial refueling to SOF vertical-lift assets as well as support infiltration and exfiltration operations," said 1st SOG Commander Col. Shawn Cameron.

F-16s in Midair Collision

A pair of F-16Cs assigned to the Oklahoma Air National Guard's 138th Fighter Wing collided during a training sortie, forcing one of the pilots to eject near Moline, Kan., Oct. 20.

The pilot who ejected was taken to the hospital at McConnell AFB, Kan., for medical evaluation and was released. The second pilot safely recovered the other F-16 involved in the mishap and flew the fighter back to the unit's base in Tulsa. Neither aviator was seriously injured in the accident.

Maintainers at Tulsa were assessing the extent of damage to the surviving aircraft and Air Force investigators will publish details of the Oct 20 incident after the conclusion of a formal accident investigation.

We Got This: *TSgt. Patrick Vitamvas gives the go-ahead signal to lift the wing of an Oklahoma Air National Guard F-16 that had crashed near Moline, Kan., on Oct. 20. (See "F-16s in Midair Collision," on this page.) Crews from McConnell AFB, Kan., aided in recovering the aircraft and securing the area. The McConnell airmen teamed with members of the 138th Fighter Wing to complete the recovery process and transfer responsibility to the safety inspection board.*

USAF photo by A1C David Bernal Del Agua



Back Home, More To Come

An Air Force X-37B orbital test vehicle returned to Earth after a 674-day classified mission in space. The reusable unmanned spaceplane touched down at Vandenberg AFB, Calif., on Oct. 17, Air Force space officials announced.

The mission, OTV-3, was the third and longest space trip to date for the two-vehicle, Boeing-built X-37B fleet. OTV-3 began on Dec. 11, 2012, with the vehicle's launch into orbit from Cape Canaveral AFS, Fla.

Air Force officials were tight-lipped about the X-37's activities on orbit—as they have been about the previous two X-37 missions—other than to say the vehicle served as a test platform to validate new space technology and concepts of operation.

Several more X-37 flights are planned, with the next mission slated to lift off from the Cape in 2015, Air Force spokesman Capt. Chris Hoyler told *Air Force Magazine*.

Space officials revealed no additional details "on the current or future operating status of the OTVs" due to the classified nature of the spaceplanes' activities, Hoyler said.

Earlier in October, NASA announced that the Air Force would begin using bays at the nearby Kennedy Space Center for processing X-37 vehicles for launch from Canaveral. The bays formerly supported space shuttles.

—Autumn A. Arnett

The War on Terrorism

Operation Enduring Freedom

Casualties

By Nov. 18, a total of 2,351 Americans had died in Operation Enduring Freedom. The total includes 2,347 troops and four Department of Defense civilians. Of these deaths, 1,841 were killed in action with the enemy while 510 died in noncombat incidents.

There have been 20,040 troops wounded in action during OEF.

Oil Leak Caused Predator Crash

A rapid oil leak that resulted in an engine seizure caused the April 26 crash of an MQ-1B Predator near Jalalabad Airfield, Afghanistan, according to an Air Combat Command accident report summary.

The Predator, assigned to the 214th Reconnaissance Squadron from Davis-Monthan AFB, Ariz., was lost during an intelligence, surveillance, and reconnaissance mission from Jalalabad.

The Predator was destroyed on ground impact for a loss of some $4.61 million. There were no injuries or damage to private property.

C-5Ms In Tactical Retrograde Role

C-5M Super Galaxys were drafted into the tactical role for the first time to expedite the drawdown of forces and equipment in Afghanistan.

This helped ease demands on the highly tasked C-17 fleet, according to Air Mobility Command officials.

"We've never seen a C-5 used like this," said SMSgt. William March, an AMC logistics management specialist. This usage has increased the stress on C-5M components, such as landing gear, creating a need to change logistics support practices a bit.

Instead of flying eight-to-10-hour missions as usual, the C-5Ms conducted three short daily flights, flying more than 70 sorties to and from expeditionary airfields, carrying 381 vehicles and more than 460 pieces of equipment since August, according to AMC.

Operation Inherent Resolve

Casualties

By Nov. 18, a total of two American troops had died in Operation Inherent Resolve. Of these deaths, none were were killed in action with the enemy. Both both died in noncombat incidents.

There have been no troops wounded in action during OIR.

Incoherent but Finally Resolved

US Central Command dubbed the aerial offensive against ISIS as Operation Inherent Resolve, applying the name retroactively to all operations in Iraq and Syria since Aug. 8.

The name signifies that "we are going to stay resolved and determined to get after this threat," Pentagon spokesman Rear Adm. John Kirby explained in an Oct. 15 press briefing.

"We're going to do it in partnership, and I think that's where the 'inherent' comes in, in the name," Kirby stated, noting that some 60 countries are now "involved in this effort in various forms."

CENTCOM stressed that Inherent Resolve will continue to be a broad coalition effort, but "diplomatic, informational, military, [and] economic" means also will be required to "degrade and ultimately destroy" ISIS, according to a press release.

Kobani Stabilized in Wake of US Airdrop

Kurdish forces seized control of most of the Syrian city of Kobani after USAF C-130s air-dropped bundles of weapons, ammunition, and medical supplies to the besieged fighters on Oct. 19.

Kurdish forces controlled the "majority of the city," though conditions were tenuous after US and coalition aircraft flew air strike and resupply missions in and around the city, Pentagon spokesman Rear Adm. John Kirby said in a brief.

Kirby said the US did not get involved in the inventory of the supplies dropped, but Kurdish officials in Iraq arranged the supplies and requested the airlift.

"Air relief ... was deemed to be the best, most efficient, effective way to get the supplies in," he said, adding that it is likely the US may determine future air resupply sorties could be used in the campaign against ISIS. The strikes and air resupply helped degrade ISIS capabilities, such as key equipment and vehicles, in addition to killing several hundred fighters.

Reaper Damages Runway

An Air Force MQ-9 Reaper remotely piloted aircraft suffered a "hard landing" in Niamey, Niger, following an unarmed reconnaissance and surveillance sortie in support of operations in West Africa Oct. 20.

The impact "damaged the runway at Diori Hamani International Airport in Niamey" but caused no injury to military or civilian personnel, a US Air Forces in Europe-Air Forces Africa spokesman said.

The incident is under investigation.

B-52s Support NATO Drills

B-52 bombers flew long-range sorties in support of NATO naval forces during Exercise Noble Justification in the Atlantic and Mediterranean in October, US Strategic Command announced.

"The B-52s will perform two long-range sorties from the continental United States to the US European Command area of operations and back," a STRATCOM spokesman told *Air Force Magazine* Oct. 22.

"The participation of US bombers ... was specifically requested by NATO leadership," STRATCOM Commander Adm. Cecil D. Haney said in a news release.

"It is important that we continue to train our strategic bomber force in a variety of joint environments, to ensure we remain proficient in key skill sets," Haney added.

Europe-based KC-135s and F-16s also took part in the



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Senior Staff Changes

CONFIRMATION: To Be Brigadier General: Peter J. **Lambert.**

NOMINATIONS: To be Lieutenant General: Mark C. **Nowland. To be ANG Brigadier General:** Shelley R. **Campbell. To be AFRC Major General:** Derek P. **Rydholm.**

CHANGES: Brig. Gen. John A. **Cherrey,** from Dep. Dir., Intel., Ops., & Nuclear Integration, AETC, JBSA-Randolph, Texas, to Dir., Intel., Ops., & Nuclear Integration, AETC, JBSA-Randolph, Texas ... Brig. Gen. Thomas H. **Deale** from Commandant, ACSC, AETC, Maxwell AFB, Ala., to Dir., Ops., ACC, JB Langley-Eustis, Va. ... Maj. Gen. Michael A. **Keltz** from Dir., Intel, Ops., and Nuclear Integration, AETC, JBSA-Randolph, Texas., to Cmdr., 19th AF, AETC, JBSA-Randolph, Texas ... Brig. Gen. Peter J. **Lambert,** from Vice Cmdr., AF ISR Agency, JBSA-Lackland, Texas, to Vice Cmdr., 25th AF, ACC, JBSA-Lackland, Texas ... Maj. Gen. John T. **Shanahan,** from Cmdr., AF ISR Agency, JBSA-Lackland, Texas, to Cmdr., 25th AF, ACC, JBSA-Lackland, Texas. ▪

13,000-strong international exercise that ran Oct. 13-26.

Air Force B-2s and B-52s had deployed for exercises in Europe, staging from RAF Fairford, UK, this summer.

Upgrade for Tinker, NATO AWACS

Air Force and NATO Sentry AWACS E-3s have begun receiving an extensive cockpit modernization.

The Diminishing Manufacturing Sources Replacement of Avionics for Global Operations and Navigation (DRAGON) program will remove obsolete parts and ensure compliance with International Civil Aviation Organization standards.

DRAGON will replace the jet aircraft's analog flight deck with digital displays, add Mode-5 identification friend or foe, new weather-radar and enhanced proximity warning capabilities, and delete the navigator from the crew.

E-3s of the 552nd Air Control Wing at Tinker AFB, Okla., and NATO's E-3s stationed at Geilenkirchen, Germany, are undergoing joint engineering and development, but each will have separate production and deployment contracts.

Ground testing for NATO AWACS was scheduled for October, with flight testing starting in November. The Air Force expects to deliver a full fleet of DRAGON-enabled E-3s by 2025.

Keltz Takes Command of 19th AF

Maj. Gen. Michael A. Keltz assumed command of the re-formed 19th Air Force in a ceremony at JBSA-Randolph, Texas, Oct. 22. The 19th oversees Air Education and Training Command's flight training programs.

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By the Numbers

333,610

The annual number of sorties flown in and out of Bagram Airfield, Afghanistan, making it DOD's busiest runway.

The numbered air force was activated Oct. 1, with Keltz as its first commander.

The newly reconstituted NAF "reinforces proper oversight and relieves some of the dual-role responsibilities of the AETC commander," Keltz said in a release.

The NAF was inactivated in an effort to reduce staffing and headquarters cost under a 2012 initiative. "We tried the directed efficiencies two years ago. But when you have wing commanders and nothing in between them and a four-star commander, we found there was something missing," Keltz explained. Now, "we can fully focus on the mission of flying training."

Keltz previously served as AETC's director of intelligence, operations, and nuclear integration.

Northrop Grumman Protests Contract

Northrop Grumman officially protested awarding of the Three Dimensional Expeditionary Long-Range Radar system to Raytheon, halting all work on the $19.5 million contract awarded earlier in October.

The company filed its complaint with the Government Accountability Office, to review the guidelines of the initial development contract. The Air Force plans to buy 30 of the ground-based radar systems to replace the legacy AN/TPS-75 radars currently in operation, and more are anticipated in sales to US allies and partners.

Raytheon spokesman Mike Doble told *Air Force Magazine* the company believes the Air Force ran "a very tough, but very fair, competition." He said Raytheon remains confident in its bid and is "eager to move forward and deliver this much-needed 3DELRR capability to the US and its friends and allies."

The company will work with the Air Force to mitigate any delays in the contract once it is resolved, said Doble. The first three radars are slated to reach initial operational capability by 2020.

First ANG Hercs Rotate to Poland

Air National Guard C-130s rotated to the Aviation Detachment at Powidz AB, Poland, to exercise with the Polish air force for the first time in October.

Three C-130Hs from the Illinois ANG's 182nd Airlift Wing based in Peoria, along with some 50 pilots, maintainers, and support personnel, arrived in Poland Oct. 10, wing spokesman TSgt. Todd Pendleton told *Air Force Magazine.*

Until then, C-130Js from Ramstein AB, Germany, supported the bulk of AvDet airlift rotations.

"As Poland's state partner, the Illinois Air National Guard airmen continue to deepen established relationships and build partner capacity between US and Polish forces," said Lt. Col. Jack Harman, commander of the 52nd Operations Group Det. 1. It oversees the detachment.

"NATO's interoperability is key to the strength of the Alliance," he said.

Illinois C-130s wrapped up their three-week rotation to Powidz Nov. 1, said Pendleton. ✪



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By Robert S. Dudney

Skywriting

"What you saw this past week was a larger, more complex formation of aircraft carrying out a little deeper, and I would say, a little bit more provocative flight path. ... My opinion is that they're messaging us ... that they are a great power and that they have the ability to exert these kinds of influences in our thinking."***—Gen. Philip M. Breedlove, NATO Supreme Allied Commander, Europe, on intrusive Russian military aircraft flights around Europe, DOD press briefing, Nov. 3.***

Hair Today, Here Tomorrow

"When they have no hair left and they're sitting there talking to their grandchildren, they will say, 'Hey, grandpa, what did you do when you were in the Air Force?' Every single guy here will answer, 'I was the first to work on the KC-46.' This -46 will be around here for decades and decades and decades. Our great grandchildren will probably be able to fly this aircraft. It's going be an Air Force legacy for a long time."***—Lt. Col. James Quashnock, commander of the 418th Flight Test Squadron, Det. 1,* Air Force Times, *Nov. 1.***

Tiered Unreadiness

"The modern day version of 'tiered readiness' has arrived for the US military. While the news has yet to sink in the minds of Washington leaders, the state of affairs across the force speaks for itself. ... For many Navy F/A-18 fighter pilots currently not flying, given aircraft equipment shortages, it is a situation described as one of 'haves' and 'have nots.' Pilots in a conflict zone or high-tension area are getting the staff and parts needed to keep jets in the sky, but those not deploying anytime soon are forced to sit idle alongside their parked aircraft and wait. ... In the Air Force, maintenance of older fighters like F-15s and F-16s being used more heavily than planned in Europe after Russia's invasion of Ukraine and against the Islamic State is now causing work to be deferred on the next generation [F-35] strike fighter given the lack of skilled maintainers. These critical personnel have had their transfer delayed because there are not enough people to both keep the older jets flying at such an accelerated pace overseas and prepare the newest fighter to enter the fleet."***—Mackenzie Eaglen, American Enterprise Institute defense scholar, writing in Real Clear Defense, Nov. 6.***

Mirror Image

"They [makers of China's J-31 stealth fighter] are still in the glossy brochure phase of development, so they still look 10 feet tall and bulletproof. I think they'll eventually be on par with our fifth gen jets—as they should be, because industrial espionage is alive and well."***—Unnamed "senior US fighter pilot," assessing Chinese fighter progress, US Naval Institute blog, Nov. 6.***

Our Negotiating Approach ...

"I want to get this [a US-Iran nuclear agreement] done. And we are driving toward the finish with a view of trying to get it done."***—Secretary of State John F. Kerry, remarks to reporters in Paris, Nov. 5.***

... And Theirs

"We will never come to terms with savage Americans, even if we have chosen to negotiate. Those cannibals, the Americans, shouldn't jump to any conclusion with these talks."***—Iranian mullah Alireza Panahian, speaking in Tehran to a crowd chanting, "Death to America," Reuters, Nov. 5.***

Mobilization, Anyone?

"Through its military exertions in the Islamic world, the United States is clearly trying to achieve something very big. ... Yet from the outset, Americans have refused to acknowledge what employing military means to do big things entails. ... Doing big things militarily necessitates reconfiguring national priorities, with peacetime pursuits taking a back seat to wartime imperatives. The old-fashioned word for this is mobilization, which implies changing just about everything: tax rates, patterns of consumption, social relationships, educational priorities, the prerogatives exercised by the state, and of course, the size of the armed forces. In simplest terms, mobilization implies collective effort that involves collective sacrifice, without which wars fought to achieve big things are doomed to fail. ... Americans willfully ignore this essential truth: If you will the end, you must will the means. Meanwhile, in Washington, where dereliction of duty is a way of life, no one in a position of influence has mustered the gumption to state the obvious: For the United States to achieve 'victory' in the greater Middle East, [it] will require exertions that exceed those made thus far by orders of magnitude."***—Retired US Army Col. Andrew J. Bacevich, now of Columbia University, op-ed in Los Angeles Times, Nov. 1.***

Slow as Lightning II

"I am very worried now that [despite] my promise to the Air Force to give them all the things they need to declare IOC on August 1 of 2016, I might not be able to give [it to] them. ... It takes a much longer time to get a new guy up to speed maintaining an F-35 than it does to get an experienced guy. ... Even if they can give me enough people, if they don't give me enough experienced people it's still going to take me longer to get them to the right number of maintainers for IOC."***—USAF Lt. Gen. Christopher C. Bogdan, F-35 program manager, claiming that continuation in service of the A-10 will drain experienced maintainers from the F-35, Defense News, Nov. 3.***

Dept. of Small Favors

"If [Russian President Vladimir] Putin says he wants to buy something [to nationalize it], you cannot say that you do not want to sell. If he says 'I want to buy something' then you say, 'Thanks for saying you want to buy it, and not just taking it.'"***—Sergei Pugachev, a Russian businessman and former Putin aide who now lives in London,* Time *Magazine, Nov. 5.***

Circling the Drain

"Cyberwar just plain makes sense. Attacking the power grid or other industrial control systems is asymmetrical and deniable and devilishly effective. Plus, it gets easier every year. We used to worry about Russia and China taking down our infrastructure. Now we have to worry about Iran and Syria and North Korea. Next up: Hezbollah and Anonymous."***—Stewart Baker, former NSA general counsel, quoted in Defense One dispatch, Oct. 30.***

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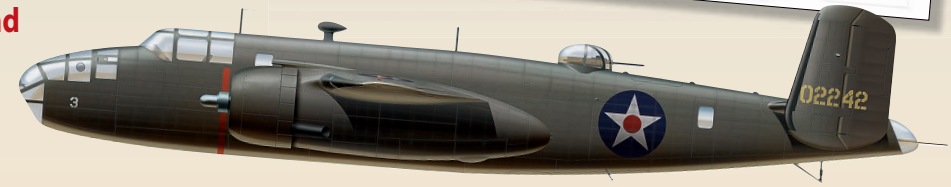
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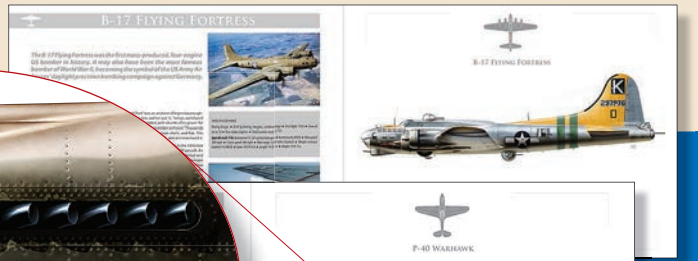
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The F-35 on Final Approach

By John A. Tirpak, Editorial Director



An F-35 lands at Luke AFB, Ariz., March 10, 2014, after its delivery flight from the Lockheed Martin facility in Fort Worth, Texas. The international F-35 training center at Luke has thus far received nine of an expected 144 F-35s.

Photo by Jim Haseltine

The massive strike fighter program is less than a year from initial combat readiness.

The huge, hyper-complex F-35 strike fighter program, rightfully described as the Pentagon's most expensive—and most capable—fighter aircraft project ever, is only seven months away from its most critical milestone and acid test: operational service.

The program is tightly focused on giving the Marine Corps everything needed to declare initial operational capability with the F-35B variant by July 1, 2015. The list of essentials includes 10 identical aircraft with the 2B version of software, trained pilots and maintainers, an adequate stock of spare parts, and mission computers fully loaded with combat-relevant data. There's a countdown calendar in the program office's conference room, marking days to Marine Corps IOC, and for the Air Force's, 13 months later.

"As you can see, we measure it by the day," F-35 Program Executive Officer Lt. Gen. Christopher C. Bogdan said at a late October press conference. The July 1 goal is still in force, he said, even as he acknowledged "we've got to work … really, really hard" to make it.

Lockheed Martin is the prime contractor on the F-35, with BAE Systems and Northrop Grumman as principal subcontractors.

A problem with the Pratt & Whitney engine, causing an F-35 to burn in June at Eglin AFB, Fla., and causing a series of groundings and flight restrictions, "put us behind … about 45 to 50 days," he observed. Flight tests can be made up, but that puts pressure on certifying the full combat envelope before July. Another challenge is the mission data files. As Bogdan explained, "We populate the brains of the airplane with all kinds of information about the threat data and about the [geographical] area" in which the F-35 is expected to operate. That data loading is done by Air Combat Command, and it's trying to do it for the Marine Corps and the Air Force at the same time. The work is done at Eglin, the only "factory" loading those files right now. More such programming centers are being set up, but the mission data represents a "risk" to IOC, Bogdan admitted.

"We have a throughput problem," he said.

Still, even with these pressures, "there's no way in the world" that Marine Corps IOC will be late by months.

"We're talking weeks, here" on "a program that's been years late" in the past, Bogdan pointed out. And "I see nothing in front of me" that indicates the IOC will slip past the "threshold" date—the no-fail, must-happen deadline—of late 2015.

At the Air Force Association's Air & Space Conference in September, Bogdan said Air Force IOC is "in even better shape" than that of the Marine Corps because there's a further year to hit the necessary marks. He assessed Air Force IOC in August 2016 as "low risk, quite frankly."

By late October, however, he'd become "very worried."

THE MAINTAINER CHALLENGE

In developing beddown plans, the program office told the Air Force "you have to have about 1,100 maintainers" to declare IOC, Bogdan explained. However, USAF had planned to bring about 800 of those from the A-10 program. It takes far less time to convert an "experienced" maintainer from one aircraft type to another than it does to train a new maintainer.

"So here's where the problem comes in," Bogdan explained. If Congress doesn't allow the A-10 to be retired, a far greater proportion of F-35 maintainers will be inexperienced airmen, and "it's going to take me longer" to train them. The difference could be nine to 12 months. The program office was working with the Air Force on a solution, but didn't have any answers yet.

Maintainers and flight test schedules have little to do with the F-35's technical capabilities, however, and in his AFA speech, Bogdan said technical issues are being systematically retired, even as new ones emerge.

Software, he said, remains a chronic challenge, but code-writers still have some schedule cushion. Fixes have been determined for the engine problem. Parts supply is a major headache and the logistics system is still being figured out, but a whole raft of previous headline-grabbing problems—including a jittery helmet display, a tailhook redesign, a fuel dump issue, and certification for flight in thunderstorms—are all effectively resolved.

Costs continue to fall. Bogdan has predicted the fifth generation F-35's unit cost, by 2019, will be comparable to that of fourth generation fighters.

The F-35 project is enormous by any standard. It will produce at least 3,243 aircraft to meet the needs of three US military services and at least 11 foreign countries, with three variants replacing nearly a dozen other types. Besides the airplane itself, it involves a simulation and training system; depots and field maintenance; creation of a "global sustainment" enterprise with foreign companies and support facilities; tactics development; and more.

Since he took over as program manager two years ago, Bogdan said he's worked to ensure the myriad elements are "moving in the same direction" with a holistic approach—something not done early in the project. Consequently, progress has not been "as fast as we would really like," but "any time we try and fix one thing on the program, we've got to make sure all the other pieces and parts are moving together in a synchronized kind of way, so that when we do deliver a weapon system, it's all ready to go."

Bogdan has also pushed to balance the risk borne by contractors and the government. Contractors have stepped up to accept responsibility for deficiencies and bear the cost of correcting them, he said.

More than 100 F-35s are flying at eight locations—Edwards AFB, Calif.; Eglin; Lockheed Martin's Fort Worth, Texas, location; Luke AFB, Ariz.; MCAS Beaufort, S.C.; MCAS Yuma, Ariz.; NAS Patuxent River, Md.; and Nellis AFB, Nev.—with two depots established and a final assembly and checkout facility in Italy now active. There will be 22 or more operating locations within five years. Basic F-35 training has been underway at Eglin for more than two years. Marine and British pilot training for the F-35B is in progress at MCAS Beaufort. The international F-35A training center at Luke has received the first nine of an expected 144 aircraft.

The F-35A version to be used by USAF is a conventional takeoff and landing airplane. It's the simplest of



All three F-35 variants at Edwards AFB, Calif. L-r: The F-35C Navy version, the F-35B Marine Corps STOVL version, and the F-35A Air Force CTOL version.

Lockheed Martin photo

the three, with the lowest cost, though it alone carries an internal gun. USAF has never wavered from its requirement for 1,763 of these fighters.

The F-35B is the short takeoff and vertical landing model. The most complex, it employs a "lift fan" behind the cockpit as well as a series of air inlet doors, wing vents, and a downward-rotating main exhaust, all to enable vertical flight and hover. It will be first to achieve IOC because of the urgency of replacing the AV-8B—and because the B model got extra attention early in the program when it was overweight and suffered from other problems, since resolved.

The Navy version is the F-35C, with larger wings and control surfaces to give it extra range and controllability for aircraft carrier landings. The Marine Corps will buy 340 F-35Bs and the Navy 340 F-35Cs. The first F-35C landed on a carrier in November.

The development partners—Australia, Britain, Canada, Denmark, Italy, Netherlands, Norway, and Turkey—together have a requirement for 612 airplanes. Israel, Japan, and South Korea have ordered 101 airplanes collectively under foreign military sales, a number likely to increase. Singapore is also a participant, but has not yet ordered any aircraft. Including the partners, Lockheed Martin forecasts an international market of 1,500 aircraft or more.

Air Force acquisition executive William A. LaPlante, in his own AFA speech, said the F-35 has been "remarkably stable in the last year and a half." He offered a succinct program summary: "IOC for the Air Force is two years away. Challenges are ALIS [Autonomic Logistics Information System], availability/reliability, keeping the parts moving. 3I software still needs to be finished, but it looks like it's still on track. 3F software somewhere between zero and five months behind. There, I just gave you the F-35 status."

Although there will certainly be more things found in flight test, Bogdan said there are two main things that F-35 stakeholders should watch closely: software and rework.

Some 10 million lines of code support the F-35 and its logistics system. The software is delivered to the fleet in blocks, each of which builds on the last and adds more capability. When one is being delivered, the next is being developed or flight-tested; there are various subreleases within each block.

THE SOFTWARE PROBLEM

The 2B block, which will equip the first operational Marine Corps jets, uses all the flight test-vetted flight control software, along with capability for basic weapons—such as the AIM-120 AMRAAM, laser guided bombs, and Joint Direct Attack Munitions, or JDAMs—plus more sensor modes and data links.

The 3I block will include some new capabilities, but will be hosted on new, faster processing hardware. The 3F block—the end-state software for all the services' first operational F-35s—will add even more sensor fusion, more sensor modes, and a greater variety of weapons. Air Force IOC will be declared with 3I software. 3F is to be ready in 2017, months before Navy IOC in 2018, but all versions will eventually get it. Some 99 percent of all F-35 software has already been written, and 90 percent is in some level of testing. Requirements for a Block 4 version are being discussed.

"You always hear that our software's been delayed. True statement," Bogdan said in his AFA speech. However, "we built some margin into our plans," so there would be cushion between the due date and the must-have date.

"We built six months of margin into that plan from the very start." He said, "We're not at the point where we've moved any major milestones on the program."

However in an interview, Bogdan admitted that the 3F software is, "no kidding, two months behind in flight test," meaning that all the margin has been used up—and then some. Moreover, "I'm carrying four months more of risk downstream." He thinks those months could be recovered, but software remains one of the "big schedule drivers … that worry me."

Rework is another. "Every lot of airplanes we deliver … is different [from] the one before it," Bogdan explained, because flight test is ongoing, and as new issues crop up, they must be corrected. The production line is adjusted accordingly, but aircraft already delivered to the field must be modified to keep them current with the latest configuration. An "awful lot of airplanes" must be modified "at different times, for different things," and Bogdan called this effort to attain a common configuration "a monster."

The problem is parts. "We are stressing the supply chain … to do three things at once: produce parts for … production, produce parts for current sustainment of airplanes in the field, and produce parts for kits for modifications." From the same supplier, that can mean three different versions of the same part.

"We really didn't take a disciplined, systematic approach to the mod program until last year," Bogdan admitted, because the program was focused on "pumping airplanes out." Setting hard IOC dates forced the program to confront the mod issue.

The Marine Corps needs "58 different modifications to those 10 airplanes" to achieve IOC on time. They are grouped in three depot-level activities and "one or two field-level activities." Rather than take the time to send all the airplanes through depot, field teams have been dispatched to make the changes wherever the airplanes are.

There's room for guarded optimism because more suppliers are coming on line. "The way Lockheed structured this was, as the ramp rate went up, that's when the industrial participation for partner countries started to kick in," Bogdan explained. This year the program is set to produce 43 airplanes; next year, 57 in Lot 9; and in Lot 10, 74. "So between now and three years from now, we'll [nearly] double production," and after that the rate goes to 117 a year. More production means more parts being generated and more suppliers.



Lockheed Martin photo by Paul Weatherman

The numbers matter quite a bit. Bogdan said that holding quantities intact—high volume—accounts for 80 percent of the unit cost of the airplane. "If you built the perfect production line and wrung out all the inefficiencies in it, you'd save only 20 cents on the dollar," he said. Still, on a program now valued at about $800 billion, including 53 years' worth of support, that's a big deal. Everything possible is being done to push costs down.

After an F-35 executive steering committee meeting in June, Pentagon acquisition, technology, and logistics chief Frank Kendall said the program would seek to stabilize the ramp rate—at risk in the US due to the likely return of sequester in Fiscal 2016—by finding ways to fill in with foreign buys if the US defers some of its F-35 purchases.

Typically at maturity, a program will seek permission from Congress to enter "multiyear" status—a commitment to buy a certain number over a given period beyond the usual two-year budget cycle. With more certainty about what they'll be building, contractors can hire and train a more efficient number of people and order materials in more efficient quantities. It always saves money.

The F-35 isn't considered mature enough for a multiyear contract yet, however, so the program seeks to bring in partner production early, for those air services that already have approval from their governments to buy their share of F-35s.

"Bunch that together, contract for it one time, and then reap those savings," Bogdan explained. The supply chain, he said, "is thirsting for this. They want it really bad, because they'll have years of known production now where they can

Above: Lt. Gen. Christopher Bogdan, the F-35 program executive officer, at Edwards last January. Here: An F-35C—the carrier variant—passes over USS* Nimitz *during at-sea trials in November.

US Navy photo courtesy of Lockheed Martin by Andy Wolfe



A Marine Corps F-35 Lightning II flies in formation with two RAF Typhoon jet aircraft during a simulated coalition mission scenario.

Lockheed Martin photo

invest and drive costs down." For Lockheed Martin, "it's good … because they know what's coming instead of year by year by year of guessing. For me, [it's fewer] contracting actions, and the savings are there to be had." Foreign partners will buy on the same contract as the US government, with "a separate set of terms and conditions for that block of airplanes."

Bogdan wants to get the F-35 flyaway unit cost down to about $85 million—in 2010 dollars—by 2019. As part of that effort, he's entered a deal with the contractors called "Blueprint for Affordability." Under it, the builders invest about $170 million in materials, processes, or parts changes to reduce costs.

Lockheed Martin F-35 program manager Lorraine M. Martin, briefing reporters in September about the initiative, said it "saves the government approximately $1.8 billion by 2019" and will reduce the cost of each F-35 by about $10 million.

Some 66 such projects are underway. They include changes to the way the canopy is made; the old method had repeatability problems and rework created waste. For an investment of $342,000, there will be savings of $31.5 million, Martin said. Other projects include robotic painting, producing rudder parts with less touch labor and weight, and virtual testing. The projects are the most surefire among hundreds suggested by the major suppliers.

STEALTHIER THAN A RAPTOR

The contractors will get their money back out of the savings generated.



The first F-35 bound for an international customer, the UK, at the Lockheed Martin factory at Fort Worth in 2011. Britain will use the STOVL version of the F-35 for training and operational tests.

"Here's the part I like the best," Bogdan said. When the government and Lockheed Martin agree to a project, "I get to book that savings before it ever happens," meaning the expected cost reduction is included in the first production lot after the project is approved.

"When I go in to negotiate Lot 9, right off the negotiated price comes … the return on investment savings for that initiative, whether it happens or not." In order to get paid back, "Lockheed needs to make it happen" and so has a strong incentive to make the improvement pay off quickly. Down the road, Lockheed Martin's lower costs turn to profit, while the government reaps the savings for every lot thereafter.

The cost of the F-35 will be the least of the Pentagon's problems, however, if the airplane doesn't perform as needed.

Gen. Gilmary Michael Hostage III, then head of Air Combat Command, said at AFA's September conference that the F-35 "has drawn a lot of criticism" for some of the sacrifices USAF has had to make to pay for it. However, "it is my professional judgment that recapitalizing our aging legacy fleet with a fifth generation capability is a national imperative," he declared.

Hostage caused a stir in late spring when, in press interviews, he said the F-35 would be stealthier than the F-22, its larger USAF stablemate. Conventional wisdom had pegged the F-22, with its angled, vectored-thrust engines, as a stealthier machine than the F-35. Hostage also said the F-35 would be unbeatable when employed in numbers, which is why the full buy of aircraft is "so critical."

"I would say that General Hostage … is accurate in his statement about the simple stealthiness of the F-35 [with regard] to other airplanes," Bogdan said in the interview. The statement was accurate for radar cross section, as measured in decibels, and range of detectability, he said, and he scoffed at the notion that anyone can tell how stealthy an aircraft is just by looking at it.

The comment about the effectiveness of F-35s together "has less to do with stealthiness and more to do with overall survivability," he said.

"We are going to ask the F-35 to do things that no other airplane—fourth gen or otherwise—is going to be able to do in the future," he stated. For some of those missions, "it would be much better to do it with more than one F-35."

Besides their stealthiness, the F-35s share information and can perform electronic warfare, electronic attack, and cyber missions.

"When you put two F-35s in the battlespace, … they become even more survivable when they do it together," Bogdan asserted. With two or more, "the sum of the parts is greater than the whole," especially when the aircraft are teaming up "from different parts of the airspace, on the same targets. It becomes quite effective." ✪

Fixing the F135 Engine

In June, a pilot was readying for a training sortie in F-35A AF-27 at Eglin AFB, Fla., when his airplane caught fire. He shut down the engine and exited the jet aircraft safely, but the F-35 fleet was largely grounded while specialists with three services, Lockheed Martin, and Pratt & Whitney studied the problem. The delay slowed flight testing and prevented F-35Bs from making a flying appearance at the Farnborough Air Show in Britain.

Program Executive Officer Lt. Gen. Christopher C. Bogdan explained at the Air Force Association's Air & Space Conference in September that the mishap aircraft had been maneuvered in an unusual way three weeks before the accident. The pilot did nothing wrong, but pulled Gs, rolled, and yawed the aircraft simultaneously, and this affected the still-new engine. The engine naturally "expands and contracts" when it heats up and also "flexes" during high-G maneuvers. "We plan for that," Bogdan said. During the earlier flight, fan blades from one of the compressors dug too deeply into the rubber-like material surrounding them in the engine, "where the titanium blades and the stationary part of the engine interact."

Normally, over time, the blades will cut a "trench" in the rubber-like material, but this engine was new enough that the groove had not yet been worn into it. Rubbing against the casing material during subsequent training flights, the fan blades heated up too much and developed "micro cracks," Bogdan explained. On the mishap sortie, blade pieces broke off and flew into a fuel tank, causing the fire.

The aircraft wasn't totaled, but may be used in mandatory live-fire testing.

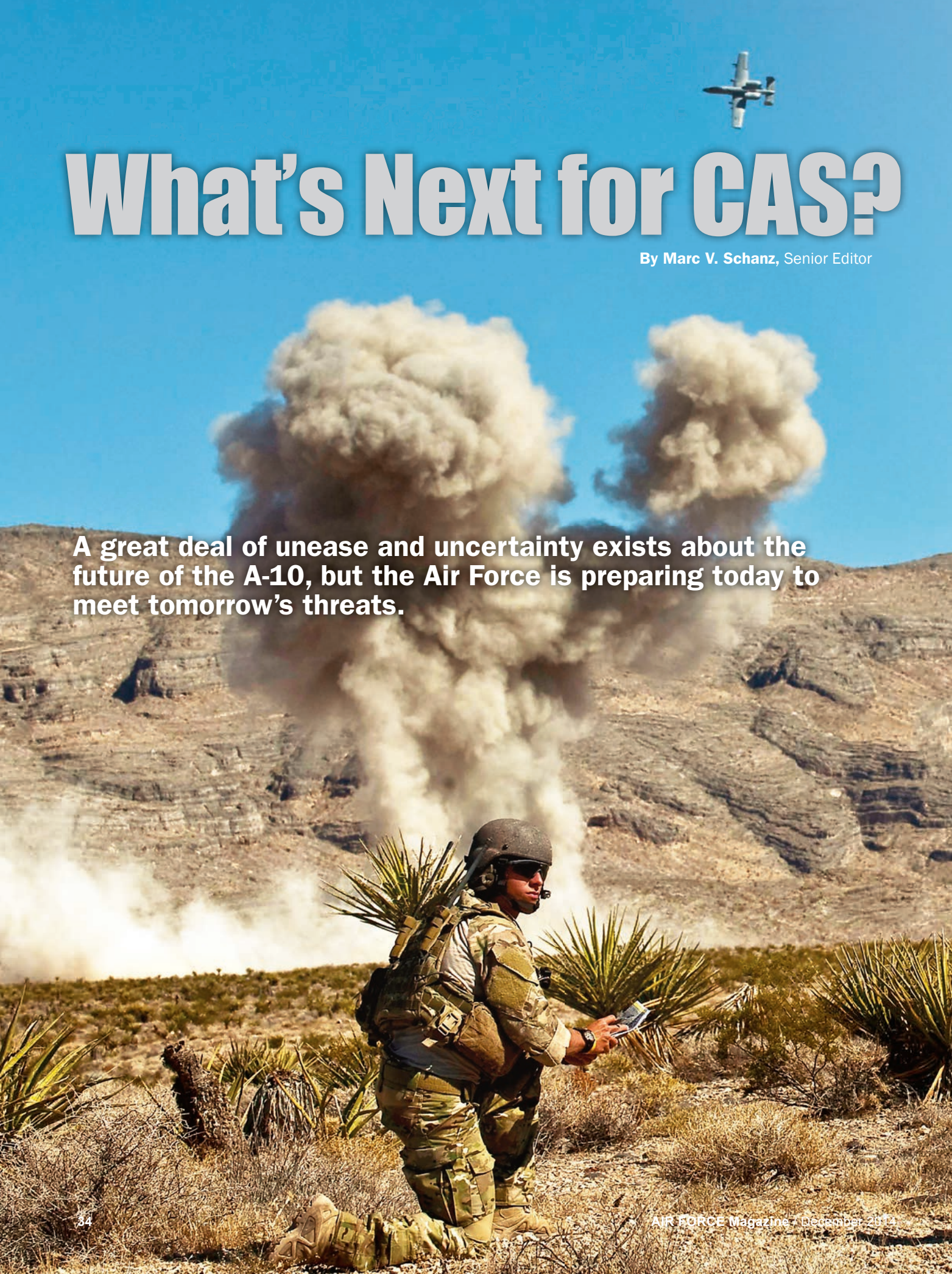
In the short term, Bogdan said at a November press conference, fixes will either be a burn-in period for newer engines or to "pre-trench" the rubber-like casing material. Longer-term, the fan blade tips may be treated to withstand higher temperatures.

While interim safety measures included restricting the hours that could be flown and frequent inspections, those restrictions had eased in late fall.

In an interview, Bogdan said Pratt & Whitney had agreed to bear the full cost of correcting the problem, but "I don't think this is a massive cost, simply because the engine is modular. You can remove the fan section quite easily from the rest of the engine." He guessed that "the most expensive thing will be the manpower to take the engine [apart] and replace" the affected parts. Pratt & Whitney will bear both the material, engineering, and labor cost of the fix, he said.



Lockheed Martin photo by Randy A. Crites



What's Next for CAS?

By Marc V. Schanz, Senior Editor

A great deal of unease and uncertainty exists about the future of the A-10, but the Air Force is preparing today to meet tomorrow's threats.

The Air Force's 2015 budget proposal to retire the A-10 Warthog—famed for its fearsome 30 mm gun and rugged survivability—elicited a firestorm of protest from A-10 fans and some ground troop supporters—many of whom seem unwilling to accept any other USAF platform for delivering close air support.

Air Force leaders, pilots, and even officials from the ground services admit, though, that the CAS mission is far more expansive than the future of one aircraft and it must adapt to changes in threats, technology, and future combat scenarios. Using experience gained in Iraq and Afghanistan across the fleet, USAF's combat air forces are now experimenting with new approaches to CAS and related tasks—some also performed by the A-10—using assets such as remotely piloted aircraft and bombers.

In more than a decade of combat, mostly in support of ground troops, the Air Force has shown it has tremendous versatility in how it delivers CAS, according to Maj. Gen. James J. Jones, then the Air Force's assistant deputy chief of staff for operations, plans, and requirements. Talking with reporters in March, Jones—who retired in June—said that by and large "those capabilities are already" in the force structure and that many functions now often assigned to the A-10 will be picked up by other platforms, such as the F-16.

The Air Force asserts it has no choice about the A-10, due to budget demands. To pay the bills, USAF must retire 283 A-10s over the next five years in order to invest in multimission aircraft crucial not only to the close air support mission but to others such as air superiority, global strike, and intelligence, surveillance, and reconnaissance.

Sen. Kelly Ayotte (R-N.H.), Sen. John McCain (R-Ariz.), and others have condemned the Air Force proposal. In a joint May statement, Ayotte, McCain, and others called the plan "shortsighted and dangerous" and said that premature divestiture would put ground troops in "serious additional danger in future conflicts."



SrA. Corban Caliguire and TSgt. Aaron Switzer, both joint terminal attack controllers with the 21st Special Tactics Squadron, watch an A-10 release its munitions during a close air support training mission at the Nevada Test and Training Range.

USAF photo by TSgt. Michael R. Horzyom



USAF photo by SSgt. Clay Lancaster

A1C Joseph Farmer, tactical air control party member, sets up communications with overhead aircraft during a mission in Kunar province, Afghanistan, in 2012. Air-ground connectivity is vital to effective close air support operations.

Air Force Chief of Staff Gen. Mark A. Welsh III has taken the brunt of the criticism, often directly. An A-10 driver during the latter days of the Cold War, he's pushed back, arguing that CAS is a mission bigger than just the A-10. About 80 percent of all CAS sorties in Afghanistan since 2001 were flown by other aircraft, Welsh explained.

That figure shouldn't be a surprise, Welsh said. At an April Senate hearing on USAF's force posture, he said F-16 pilots have trained in full CAS tactics alongside the Army since the late 1970s and have gained vast experience conducting such missions in both Iraq and Afghanistan. The F-16 alone, he noted, has flown more CAS sorties than the A-10 over the last eight years. Meanwhile, to achieve the same savings as retiring the A-10 would mean cutting 350 F-16s.

AN EMOTIONAL MISSION

Besides the F-16, the F-15E has built a solid reputation as a CAS platform and the Strike Eagle community has also perfected dropping ordnance and firing cannons in close proximity to troops, close to the enemy.

"This issue really isn't about the A-10 or even close air support," Welsh said to Ayotte, but about the capabilities the Air Force provides as an air component to a ground commander.

Welsh acknowledged that CAS is a high profile and "emotional" mission. But even though USAF's air combat has focused on air attacks and ground support for a dozen years, it can't build its future force around that mission. Looking ahead at the likely threats of the coming decades, USAF must organize, train, and equip to go after logistical infrastructure, command and control nodes, provide air superiority for ground and maritime forces to allow freedom to maneuver, and other tasks codified in its service doctrine. That adds up to a "full spectrum fight against a well-trained foe," Welsh said, and by doing this, the Air Force saves "big lives on a battlefield."

Army Chief of Staff Gen. Raymond T. Odierno has repeatedly sung the praises of the A-10 in congressional testimony, but has stopped short of opposing its retirement outright. "Soldiers like the A-10. They can see it, they can hear it, they have confidence in it," Odierno told the Senate Armed Services Committee on April 8.

However, Odierno said he understands and sympathizes with USAF's dilemma. In many ways the ground services must now confront the same problem set as USAF—namely, how to perform CAS in the future, in a battlespace populated by top-tier opponents employing anti-access and area-denial capabilities. These threaten conditions the American military has enjoyed, unchallenged, for 30 years: access to space and freedom from attack from the air.

"What [are] the tactics, techniques, and procedures we need to provide close air support across the wide variety of

An MQ-9 carries two GBU-12 and four AGM-114 missiles over the White Sands Missile Range, N.M. The rapid increase of remotely piloted vehicles in USAF's inventory has altered how the service performs CAS—and indicates RPAs will play a larger role in CAS missions in the future.

potential scenarios [in which] we're going to have to operate?" Odierno asked during the April 8 hearing. "We are working with the Air Force to come up with new solutions, as we move away from the A-10, if that's what the decision is."

Later in April, Lt. Gen. John E. Wissler, commander of III Marine Expeditionary Force, told reporters CAS is about more than just one type of aircraft.

"I think the A-10 is a great platform, but I also know ... the challenges that the Air Force is facing," said Wissler, the USMC's former head of programs and resources. The Air Force has made "very hard decisions about what they have to do to maximize their warfighting capability." During operations in Iraq and Afghanistan all aircraft in theater were tied to a joint tasking order, he said, and it is this approach to CAS that has proved successful time and again in combat.

"I've never been in a situation where I said to my air officer, 'OK, give me a Marine Corps jet,'" Wissler said. "I've called everybody's platform. I really don't care if it's a marine on the other end or not. I cared that it's a guy who can put a bomb on target."

Wissler's point is one USAF leaders are trying to make despite congressional pushback: The mission of CAS has diversified and changed since the A-10 first entered the force in the mid-1970s, thanks to precision weapons, RPAs, and other developments.

"The truth is, when you are pinned down and hiding between rocks, trees, and telephone poles, the fact that I can make the adversary go away with a precision weapon or a 20 mm [cannon] strike or a Hellfire [missile] strike, in the end that's what ground forces care about," said Air Combat Command's Gen. Gilmary Michael Hostage III in September, when asked by reporters how USAF is retooling to perform CAS in a force without the A-10. "I can do [CAS] with the remainder of the fleet," he said. "What I can't do is air superiority with an A-10."



USAF photo by MSgt. Becky Vanshur

USAF Chief of Staff Gen. Mark Welsh (r) greets TSgt. Susana Barroso from the Idaho Air National Guard's 124th Fighter Wing during a visit to Boise Air Terminal, Idaho, in May. The 124th supports the CAS mission with A-10s.

THE HEART OF CAS

Lt. Col. Scott Mills, a veteran A-10 instructor pilot and now commander of the 66th Weapons Squadron at Nellis AFB, Nev., believes the heart of the CAS mission in the Air Force today rests with the pilots in the cockpits and the effects they can produce on the battlefield. "As a community, we adhere very strongly to the idea that CAS is about the person," he said, or as he tells his pilots, it's about "killing targets who are killing friendlies."

Mills' 66th WPS is the home of CAS instruction at the USAF's Weapons School, the proving ground for the Air Force's latest combat tactics. Whether a weapons officer in the back seat of an F-15E or a pilot operating an MQ-9 Reaper, "we want [pilots] to understand they need to think about the ground commander" when flying a CAS sortie, no matter what is happening or what aircraft is involved.

"How can I enable [the ground commander's] freedom of action or best protect those around him, ... and how can I teach that empathy to understand how to be a better, more effective combat arm?" Mills asked. Aircrews must understand the pluses and minuses of using their aircraft in close proximity to friendly troops, regardless of events on the ground, and act accordingly, he said.

This involves constantly improving the mastery of time, and the perception of time from the cockpit. One of the techniques used to train for troops-in-contact scenarios, or TICs, is to have multiple aircraft in the air, from F-16s to MQ-9s, in a given block of airspace, then



Photo by Jim Haseltine



USAF photo by SrA. Brett Clashman

An A-10 flies out after releasing an AGM-65 Maverick missile during CAS training at the Nevada Test and Training Range. If the A-10 goes away, F-16s will likely take on more of the Warthog's armed observer and forward air control responsibilities.

begin by declaring a ground maneuver unit under fire.

"The time from which the pilot knows that that [scenario] is going on, to the time [he or she] can do something about it, we look at that time very, very closely—almost second by second," Mills explained. It's important to track what is understood, when the aircraft receives the information, and when the pilot or crew understood it, "because those are often two separate things," Mills said.

Flying F-16s, F-15Es, and other aircraft over Iraq and Afghanistan has built up a foundation of experience to build better CAS tactics on, Mills said. Some of those lessons have come at great cost, as pilots have been lost in accidents—both in training and in combat—often due to spatial disorientation.

In particular, fighter crews have improved tactics through years of dropping bombs in close proximity to firefights, while working hard to grasp the dangers and limits of putting fast-moving combat jet aircraft in mountainous terrain where ground collisions are never more than seconds away. Through hard-won experience, crews have learned when close-in strikes and strafing runs are appropriate and the "pluses and minuses" of various scenarios.

The rapid increase of MQ-1 and MQ-9 remotely piloted aircraft in USAF, both in strike and ISR roles, has also altered how the service performs CAS, and they will likely play more of a CAS role in the future. When the Weapons School activated its 26th Weapons Squadron, the dedicated MQ-9 and MQ-1 RPA squadron in 2008, Mills said there were natural points of collaboration.

The 26th Weapons Squadron commander knew "they were going to have to do other missions" than CAS and couldn't focus on it as much as the 66th WPS did. But since then the pilots and instructors have grown "incredibly capable," Mills said. The skill and tactics in RPA weapons employment, communications with other aircraft, and leveraging of their sensors in close-in fights "have come a long way."

USAF continues to experiment with other tasks where CAS-capable elements can help with other missions.

In his March briefing with reporters, Jones said F-16s would probably assume greater responsibility for armed observer and forward air control work formerly performed by the A-10. However, this requires a great deal more training and testing, especially for the combat search and rescue role. In 2013, fast jet aircraft, rather than A-10s, participated in the joint CSAR exercise Angel Thunder. It was a test of the concept, and there were some tough lessons learned.

TRICKY TASKS

Because of the specialized training associated with "Sandys"—armed escorts that often accompany rescue helicopters and help with ground surveillance—the task is tricky, and the A-10 is well-suited for this role. "Where that goes, I don't know. We're doing tests right now to see who can handle [forward air control roles]. I know that's a big push now, and we're working on it," Mills said. But there are limitations in other platforms as well, due to training and mission priorities in those communities.



An F-16 fires an AGM-65 Maverick during a weapons test. The F-16 has flown more CAS sorties than the A-10 over the past eight years, Air Force officials say.



USAF photo by SSgt. Aaron Allmon

An F-15E flies over the rugged Afghanistan mountainscape. Flying Strike Eagles and other aircraft over Afghanistan has built up a foundation of experience on which to build better CAS tactics.

At Nellis, Lt. Col. Bryan Callahan currently commands the 26th WPS. To preserve training time in other mission areas, his MQ-9 students cut back on training with CSAR sorties in the newly revamped Weapons School curriculum, he said. If the A-10 goes away, combatant commanders around the world are counting on Reapers in the near term to step into certain Warthog tasks, and pilots at the Weapons School "don't get as much practice at that as they used to," he said.

Pressed on this point, Hostage said CSAR would evolve along with CAS in a force without the A-10 because it must, to adapt to new threat environments.

"If you're envisioning [the Vietnam War], where the Sandy concept came from, ... that's just one niche of combat rescue," he said in a September interview. "What's the battlefield look like?" In a high-end, anti-access environment, such as the Asia-Pacific, an A-10 "won't get anywhere," and dependence on tankers is a big limiting factor.

Besides adapting to a tougher threat, USAF will have to get creative in how it performs CAS and CSAR. It now has sufficient numbers of Special Operations Command CV-22 and other "nontraditional capabilities" to try new approaches, Hostage said.

For him, the conversation always returns to forecasting the threat.

"The idea of doing opposed CAS in an environment where an A-10 can survive, that's … the past," Hostage asserted. The A-10 flies too low and slow to survive modern air defenses, let alone those of the not-too-distant future. It's also why CAS training increasingly focuses on potential scenarios distinctly different from the sorties flown in Afghanistan in the last decade, Mills said.

The 66th WPS now emphasizes conducting CAS in major combat operations and contested and denied environments, Mills said. "Though we may not see very much of that downrange right now, we still train as if that's what's going on." When a squadron of fighters deploys to combat, they train to do CAS across a threat spectrum, he said. Without going into details, Mills said these scenarios push pilots and crews to balance threats to themselves with threats on the ground. "If the risk [to the ground commander] is extreme, I am allowing myself to go into those high-risk situations," he said.

Young instructors at the Weapons School have put together challenging tests and scenarios to exercise CAS decision-making skills.

"I've gone out and gone through them, and they are very tough," Mills said. Connectivity is important to effective CAS, and in heavily defended combat space, the reliance on communications links and tactics built up during operations in permissive Afghan airspace becomes severely strained. "The training we do, on the ground and in the air, is what matters," Mills said. When aircrews and their counterparts in combat are highly trained in contested denied operations, "there's no amount of electronic jamming which will put a damper on what they're trying to do."

From service leaders down to experienced CAS fliers such as Mills, there is a sense that a great deal more work needs to be done, both working with the ground services and building up the skills in other aircraft that have been for a long time specific to the Warthog community.

While unease and uncertainty exists about the future of the A-10, Mills said the vast CAS experience gained from countless rotations to Iraq and Afghanistan have informed the tactics that instructors teach students today to confront tomorrow's threats.

"It's never OK to sit back and watch a situation [on the ground] when action is required," Mills said, be it in a high-threat environment or in a training exercise. Internalizing what is happening on the ground, understanding it, and acting fluidly are skills that will prove their worth in any aircraft.

Even when the A-10 leaves the force, the pilots who have flown it will take that experience with them and apply it to other aircraft and platforms called on for service in CAS. "They are professional military officers," Mills said. "You can't squash that knowledge out of them." ✪



Photo by Jim Haseltine

Airmen are working to overcome rising threats to their networks and runways.

Fighting Through

By Rebecca Grant



WHAT does research on pelletized asphalt have to do with airpower and national strategy? Plenty, it turns out. Exercises and experiments on methods for airfield damage repair are just one area where USAF airmen are preparing to deal with the effects of disruptive attacks at forward bases. Why? Because damaged airfields, snarled communications, and sporadic command and control are all possibilities in fights of the near future.

Airmen roll it up into a common phrase: "fighting while degraded." Rarely heard a decade ago, planning to do without key capabilities in the cockpit or at forward bases is now part of the way USAF prepares for war. And success with airpower hinges on convincing adversaries—and Washington policymakers—that the Air Force can project power even through degraded conditions.

Picture dozens of ballistic and cruise missiles pelting a forward air base in the Pacific. Sections of the main runway are pockmarked with holes and the strikes have also damaged flight line buildings and munitions areas. To make matters worse, communications have dwindled to a minimum because satellites are unavailable.

It's a serious challenge. "Our adversaries are sinking massive resources into denying our forces access to tools such as position navigation and timing, data links, communication networks, and radars," warned Gen. Gilmary Michael Hostage III at the Air Force Association's Air & Space Conference in September. At the time, Hostage was commander of Air Combat Command.

Fear over damage at forward bases has raised force structure doubts, too. Fortunately, USAF has quietly focused on airfield damage repair, contending with denied communications, and other essentials for fighting while degraded.

Fighting from bases under attack is nothing new. The former Balad Air Base in Iraq was dubbed "Mortaritaville" due to hundreds of hit-and-run shelling attacks aimed at the sprawling base during Operation Iraqi Freedom.

Further back in time, Soviet forces were so close to NATO bases in the Cold War that USAF developed advanced techniques for airfield survivability.

Yet Hostage and others are talking about a problem on a far larger scale. Potentially unfriendly actors have developed more ballistic and cruise missiles with greater range and accuracy. Looming ahead are intensive threats that could jeopardize sortie generation during a crisis. For example, Iran tested its Shahab family of missiles in 2012, simulating attacks "on



A C-17 takes off from an air base in Afghanistan in 2002 as servicemen make repairs to the runway. Priority No. 1 for rapid airfield repair is to resume sustained aircraft sortie generation.

File photo

transregional forces' air bases" effective out to 186 miles. And both North Korea and China possess missiles with ranges and accuracies sufficient to reach allied and US air bases.

The problem has increasingly concerned analysts. A 2009 RAND study led by David A. Shlapak and David T. Orletsky devoted several chapters to analysis of China's ability to suppress sorties by cutting runways. Specifically, they found that as missiles reduced their circular error probable to less than a hundred feet, as few as five missiles could cut a runway.

China's ballistic and cruise missiles launched at forward bases "will force US aircraft to operate from distant bases and will greatly reduce their sortie generation rates," CSBA analyst Mark A. Gunzinger postulated in a 2010 study. "Operations in the Western Pacific region would be particularly problematic," he said, because bases such as Kadena Air Base on Okinawa and Kunsan Air Base and Osan Air Base on the Korean Peninsula are so near China, "they are under threat of devastating air or missile strikes."

Chinese military doctrine writers have made unambiguous statements, like this one cited by RAND analyst Roger Cliff: "If an attack is aimed at disrupting the enemy air strike plans, one should target the enemy's command and control systems and fuel and ammunition supply systems; if it is aimed at degrading an enemy aviation corps group to reduce the pressures from its air strikes, one should target the aircraft parked on the tarmacs of airports housing the enemy's main bomber and fighter-bomber aviation corps."

Officials have been blunt about the threat. Chinese capabilities "are increasing, so subsequently, the risk to our force increases," said Gen. Herbert J. "Hawk" Carlisle, in an interview with Japan's *Asahi Shimbun* in April when he was head of Pacific Air Forces. "But at the same time, we're continuing to counter that risk," he said. According to Carlisle, who now heads ACC, priorities include airfield resiliency.

PASSIVE DEFENSE

The implications are clear: Credible airpower depends on fighting through initial attacks as they degrade key functions at the air base.

Oddly, official terminology calls this "passive defense," because it doesn't involve shooting back. "We are working the passive defense piece of the puzzle, ... including hardening, concealment, dispersal of assets, rapid runway repair, and support for a fluid force operating in a distributed manner," said Carlisle, in a *Breaking Defense* interview.

However, airmen are anything but passive in this mission. Fighting while degraded requires a combination of savvy, initiative, and sweat.

Opening airfields is essential, but so is restoring command and control. Two threats stand out. One is cyber attack. The other is disruption of satellites. China demonstrated how easy it was to knock a satellite out of orbit by targeting one of its own back in 2007. The result was a field of space junk. In the future, a satellite strike might be able to inflict degraded communications on US forces.

Effective control is at the core of responsive airpower. Over the past 20 years, that control has come to depend on instant communications across satellites and in cyberspace. Secure links allowed commanders to share data, redirect aircraft, and employ up-to-the-minute ISR in pursuit of important targets. Like open runways, fine-tuned control has long been a hallmark of US operations, but some believe complacency is setting in.

Potential anti-access scenarios forced new thinking about how to operate in an austere communications environment. Hostage made plain that nothing guarantees secure and continuous links in the next war.

Aircrews regularly train for the "lost-link" environment. For example, Red Flag exercises now routinely include missions where everything from radio to radar drops offline.

While airmen are training to contend with interference in the tactical



L-r: SSgt. Jerrel Washington, SrA. Rezeq Khalifeh, and SSgt. Richard Simmons clear dirt from the runway during a combined airfield damage assessment exercise at Kunsan AB, South Korea. Kunsan and other Pacific region air bases are vulnerable to air and missile attacks.

USAF photo by SrA. Clayton Lenhardt



Airmen clear damage debris during a simulated missile attack on Andersen AFB, Guam. Rapid airfield repair calls for both manual labor and heavy machinery.

USAF by A1C Marianique Santos

environment, a larger question is how to prevent degraded operations from slowing down the air campaign.

For example, the Chairman of the Joint Chiefs of Staff, Army Gen. Martin E. Dempsey, listed 30 joint operational requirements in the 2012 Joint Operational Access Concept.

No. 1 and No. 2 were "the ability to maintain reliable connectivity and interoperability among major warfighting headquarters and supported/supporting forces while en route," followed by "the ability to perform effective command and control in a degraded and/or austere communications environment."

To address the operational level, Hostage suggested introducing a new concept of distributed control. "Through the concept of centralized command, distributed control, and decentralized execution, we can diminish the impact of a temporary break in the link between CFACCs [combined force air component commanders] and their forces," he advised. Distributed control and its tactics, techniques, and procedures will "ensure that we remain effective." The concept complements the core tenet of centralized command, distributed control, and decentralized execution. Hostage characterized it as a "healthy adaptation to the realities of contemporary warfare."

Some of the command and control challenges demand technology advances. USAF is well-aware of the priority on sustaining and restoring communications links via adaptive planning. A recent Air Force Research Laboratory industry solicitation noted, "A lack of dexterous network management and recovery mechanisms makes it hard to provide the necessary level of network reliability and survivability at the battlefield. This is nowhere more factual than in A2/AD [anti-access, area-denial] environments where the ability to make rapid adaptations based on the situation is crucial."

COMMANDER'S INTENT

Coping with austere communications requires two main elements. First are mobile, "spare" communications devices. Command and control can often be run from VHF and nearby frequencies. The other element is improving airborne networks so that aircraft, unmanned vehicles, ships, and other surface units in the right position can form a relay network. Rapid and even automated backup network formation can restore information flow among tactical platforms and to operational control nodes.

Commanders expect USAF forces to train for all the ways future adversaries may try to trip them up. But fighting while degraded can affect command at the highest levels. Reinvigorating time-tested principles of command is another part of keeping all elements of the campaign moving forward at the operational level.

"The keys to effective use of distributed control are the clear articulation of intent and standing directions that will continue to allow ... our forces to operate in a broken-link environment," said Hostage. Commander's intent is the mental map of the entire campaign that allows units temporarily cut off from communications to make decisions to support the plan, not hinder it.

Commander's intent stems from ongoing discussions with senior leaders and eve-of-battle articulation of key elements in the plan. Standing directions can help fill in alternatives. An example would be instructions on where to divert if returning strike aircraft find their home airfield closed down.

Going back to that cratered runway, priority one is to resume sustained aircraft sortie generation. Airmen must launch, recover, rearm, refuel, and turn strike aircraft. Forward bases also have to receive incoming mobility aircraft with fresh supplies and personnel and be able to send out aircraft on medical evacuation.

"Rapid airfield repair has been done the same way for years: Get on the runway,



RED HORSE airmen train at a simulated runway at Nellis AFB, Nev. Not only do they expedite airfield surface repairs, they evaluate supporting infrastructure for follow-on forces.

USAF photo by SSgt. Christopher Hubenthal

find the holes, fix them using large, slow equipment, bolt down a huge, heavy mat over the repair, and pray that it lasts for a hundred sorties," wrote two USAF experts, R. Craig Mellerski and Craig A. Rutland, in their 2009 article, "The New Face of Rapid Airfield Repair," in *Air Force Civil Engineer.* "If heavies and fighters have to land on the same repair, you have a problem," they said.

The Air Force acknowledged the problem back in 2008. One result was a joint capability technology demonstration on rapid runway repair sponsored by USAF and the Office of the Secretary of Defense.

The critical runway assessment and repair, or CRATR, initiative focused on two types of repairs: expedient repairs capable of lasting for 100 sorties and sustainment repairs, upgrading to support 5,000 sorties. According to officials, the CRATR tested new materials and techniques for airfield damage repair under specific threat scenarios and weather conditions.

The work fell to two types of Air Force units with long histories: Rapid Engineer Deployable, Heavy Operational Repair Squadron Engineer—better known as RED HORSE—and Prime Base Engineer Emergency Force, also known as Prime BEEF.

Fast forward to Malmstrom AFB, Mont., on an early spring night in 2012. Temperatures hovered at 30 to 35 degrees—tough on both airmen and materials, according to an Army news release. "The demonstration at night was a good secondary test because visibility was decreased and the airmen's energy levels were lower due to working earlier during the day," said test team member Lulu Edwards. "This is more representative of what may actually happen during an actual attack."



USAF photo by A1C Meagan Schutter

Aircraft crowd the ramp at Yokota AB, Japan. Eighteen aircraft were diverted to Yokota from USAF's Kadena Air Base and Marine Corps Air Station Futenma on Okinawa to avoid the dangers of two incoming typhoons in 2013. Weather, as well as adversaries, can render an airstrip unusable.

Next the team conducted a wet-weather test at Tyndall AFB, Fla., in June. A sprinkler system soaked repair crews with nearly half an inch an hour. "It was hot and we were all red within minutes of going onto the airfield test area, but we had to give the airmen a chance to work in the wet conditions," said Haley Bell, a test monitor.

These efforts led to a streamlined capability to figure out how to get airplanes in the air again, fast.

Step one in airfield damage repair is sending out teams to assess the damage—even while under attack. Locating unexploded ordnance is part of the task. Remote sensors contribute, too. The objective is to select the portions of the runway to activate as the minimum airfield operating strip, or MAOS. Multiterrain loaders then maneuver to clear



USAF photo by MSgt. Jack Braden

An airfield damage repair team clears debris during an operational readiness inspection at Kunsan. In addition to patching craters, such teams repair lighting and carry out myriad other tasks necessary to get the runway usable.

debris, mark craters, and prepare for filling, capping, and curing.

After that, options depend on factors ranging from materials and equipment available to air temperature. Crushed rock of high quality creates an excellent fill layer—but it's long been known to be much less effective if laid in the rain. Over the years, USAF has worked with fiberglass-reinforced plastic (FRP) mats, precast asphalt concrete block, bolt-together FRP panels, magnesium phosphate cement, special polyurethane grouts, and even precast concrete slabs. Each method had advantages and drawbacks in time to repair, cost, and availability.

New materials innovation has advanced the science considerably. And some of the help has come from the Army's Engineer Research and Development Center along with the Air Force Research Laboratory and Naval Facilities Engineering Service Center.

According to Mellerski and Rutland, one promising development is an easy flowing fill made from rapid-setting cement and sand. Another is high-density foam to fill craters fast. "The foam expands up to eight times its original volume and can fill even the largest craters in a few minutes," Mellerski and Rutland reported. The foam-filled crater is then capped with several inches of rapid-set concrete and can support a fully loaded C-17 or F-15E.

Hot mix asphalt is another speedy solution. Sacks of pelletized asphalt can be stored at a base then mixed with aggregate when needed. Mobile asphalt recyclers can produce five tons of hot mix asphalt every 30 minutes. "When paired with the rapid setting flowable fill, this becomes a formidable repair technique," the authors noted.

Airfield repair teams need fast solutions. Their goals are to resume operations in some cases in less than four hours.

FARP AND RAPID RAPTOR

Airfield repair skills translate directly to opening expeditionary bases. One of the best examples is Forager Fury, a regular exercise held at Tinian Island near Guam. Aluminum matting was laid down on new "Baker" and "Charlie" runways supporting Marine Corps MV-22 Osprey operations, reported a Marine Corps press release. "A FARP [forward arming and refueling point] allows for expedient refueling, arming, and dearming of aircraft as well as providing the opportunity to get an aircraft forward to the fight without having to return back to a home port to get fuel," said Gunnery Sgt. Earl Masterson, a Marine Corps fuels chief, after the December 2013 exercise.

Of course, Air Force RED HORSE units—some with airborne training—have this capability, too. "They are configured to do a rapid assessment and repair of a runway," said Capt. Brent Legreid, airborne RED HORSE project manager, in a 43rd Airlift Wing news release. "In addition to that, because they've got plumbers, electricians, and others, they can also do a good assessment of the facilities on the base or in the local area."

Airmen are fortunate to have a culture of decentralized execution. This has fostered an ability to think and react, traits that are more important than ever while under pressure.

In that spirit, the Air Force has exercised the Rapid Raptor capability, where F-22 teams exercise recovery at a bare base. "Airmen from the 703rd Aircraft Maintenance Squadron in full chemical protective suits launched jets and led patrols in the wake of a simulated attack. The aircraft landed at Eielson Air Force Base in Fairbanks, Alaska, a simulated bare-bones runway with no supplies, no amenities—no toilets, spare jet fuel, or ammunition—and carted their equipment onto the runway," a press release on the concept stated this May.

Rapid deployment is part of a strategy of hopscotching among bases in an area of operations. There are several reasons for moving when air operations are under pressure. One is to avoid a base where attacks have briefly shut down operations or limited the maximum number of aircraft that can be handled on the ground. Flexible forces can flush to new bases if attacks are imminent, or land at alternate fields after missions. Even if no attacks occur, aircraft may be moved around to activate more bases, forcing an adversary into unforeseen targeting choices. Done right, the rapid deployment strengthens the US position while complicating an adversary's calculations.

Perhaps the greatest challenge will be continuing to apply steady effort to the problem of fighting while degraded. USAF faced the problem decades ago in Europe and learned much from it. "Survivability is not glamorous," wrote Maj. Stephen C. Hall in an *Air & Space Power Journal* essay back in 1982. "It is one thing to spend US dollars for shiny new airplanes whose construction and operation will employ many American workers. ... Survivability enjoys no natural constituency and thus competes at a disadvantage for scarce dollars."

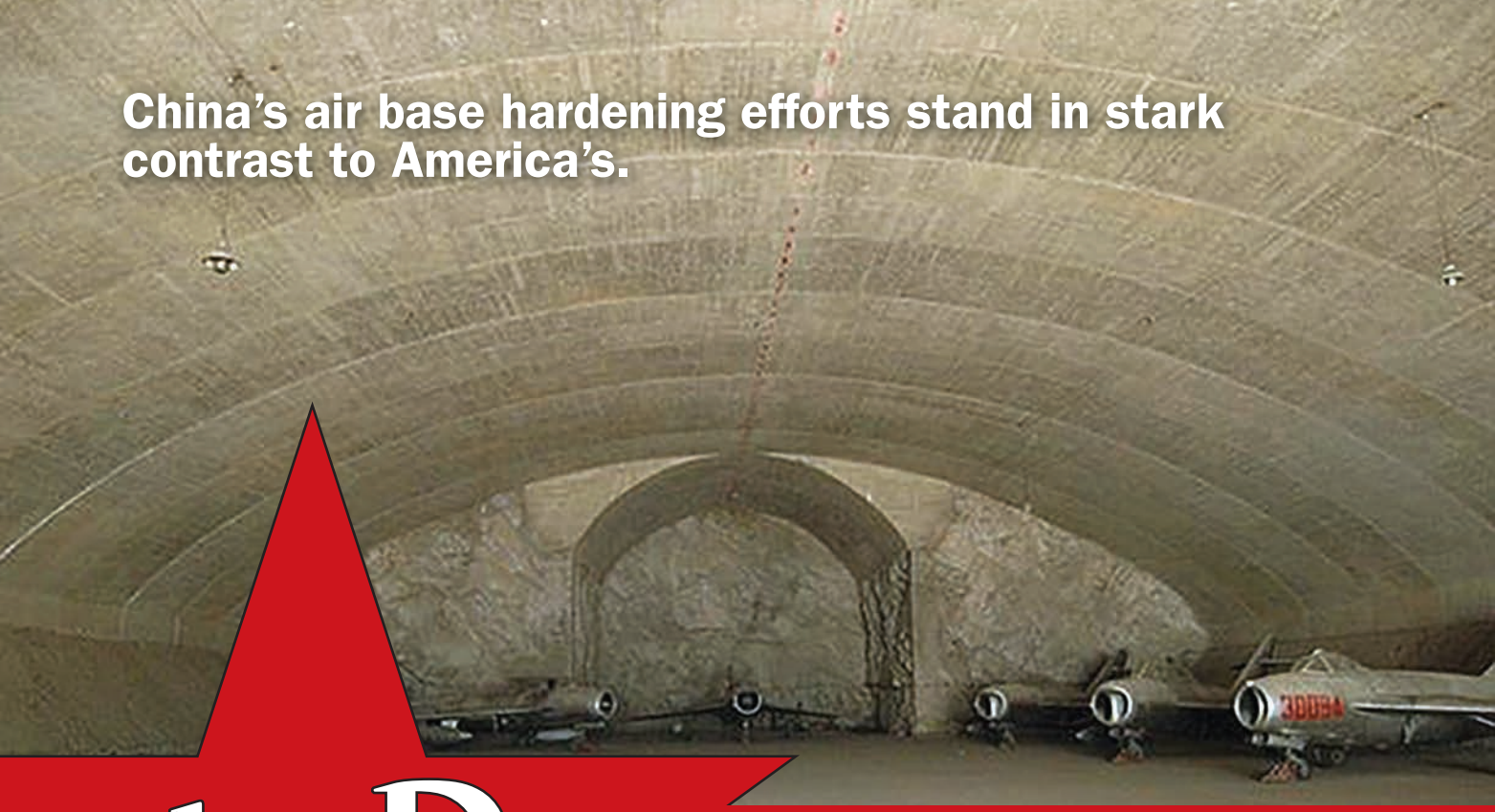
However, the benefit may not be measured in dollars. Increasing the Air Force's ability to fight while degraded offers an ultimate operational pay-off: Potential adversaries will always have to reckon with American airpower. ✪

Rebecca Grant is president of IRIS Independent Research. Her most recent article for Air Force Magazine was "Escaping the Continent" in the October issue.

China's air base hardening efforts stand in stark contrast to America's.

The Dragon Pours Concrete

By David Lewton





Chinese J-6A aircraft in a hardened shelter.

At the outset of the 1967 Arab-Israeli War, the Israeli Air Force executed a masterful attack against Arab air forces, destroying approximately 400 aircraft in the first day and shattering Arab airpower capabilities.

Israel's air force demonstrated that without appropriately hardened shelters or underground hangars, fragile aircraft are easily subject to damage and destruction by blast, fragment, and fire. The Israeli strike prompted extensive base hardening efforts around the world that have continued at varying levels of effort to this day. Offensive counterair strikes against air bases typically form a key element in efforts to gain control of the air. Hardened air bases make succeeding in that job much more difficult.

Decades later, US and allied airpower capabilities are vital to deterring Chinese aggression. As part of its anti-access, area-denial strategy, China has deployed a growing and increasingly modern arsenal of ballistic missiles and advanced land-attack cruise missiles that pose a significant threat to allied airpower bases. But what has received much less attention is the significant efforts China has made to harden its air base infrastructure. By utilizing open source satellite imagery, the general public can see these important developments and the implications for the United States and its allies.

China has a long history of tunneling and underground defense fortification for strategic and military purposes. In more modern times, China pursued the Third Line Defense tunneling efforts from 1964 to 1979. They were initiated by Mao Zedong in response to concerns of an imminent US attack as US military involvement increased in the Vietnam War.

PEASANT HOURS OF LABOR

After a short break from 1966 to 1969 due to China's Cultural Revolution, tunneling efforts renewed in earnest after deteriorating Sino-Soviet relations led to border clashes in 1969. The Third Line Defense was a massive engineering undertaking, requiring millions of peasant man-hours of labor, that sought to relocate China's perceived strategically vulnerable coastal industries and cities deep into China's interior, roughly 435 miles from China's coastline and 620 miles from its western border.

As part of these efforts, China developed significant numbers of underground facilities to house its fighters and medium bombers. Many of these underground tunnels and facilities were built in the 1960s and 1970s, apparently modeled on Warsaw Pact underground shelters.

Google Earth imagery and previous work by Australian analysts reveal China today has roughly 40 underground hangars (UGH), with about 30 of them being utilized by tactical aircraft. These provide the capacity to shelter roughly 1,100 fighters and medium bombers. The current disposition of UGHs reflects the threats that Chairman Mao perceived throughout the 1960s to 1970s and before his death in 1976. Significant numbers are located deep inside China.

With the People's Liberation Army (PLA) tasked to defend nearly 14,000 miles of land border and 9,000 miles of coastline, the mostly interior position of the UGH still provide the PLA a capable defense-in-depth strategy and robust infrastructure for supporting offensive operations. An adversary would need to penetrate deep within China to hit many of the UGHs—and thus be exposed to an increasing array of integrated air defenses for an extended period. Roughly half the UGHs could only house fighters, based on the dimensions of the hangar entrances. Presumably, these would provide shelter for Chinese fighters to



PLAAF Shenyang J-8 fighters are towed into one of the many underground air base shelters tunneled into the sides of hills. China has some 40 underground hangars.

Internet photos

enable them to survive initial strikes and then contest control of Chinese airspace. Nearly half of them have entrances wide enough to house China's medium bombers. In the event of an attack, the sheltered bombers could emerge from their underground lairs to begin strikes against an aggressor.

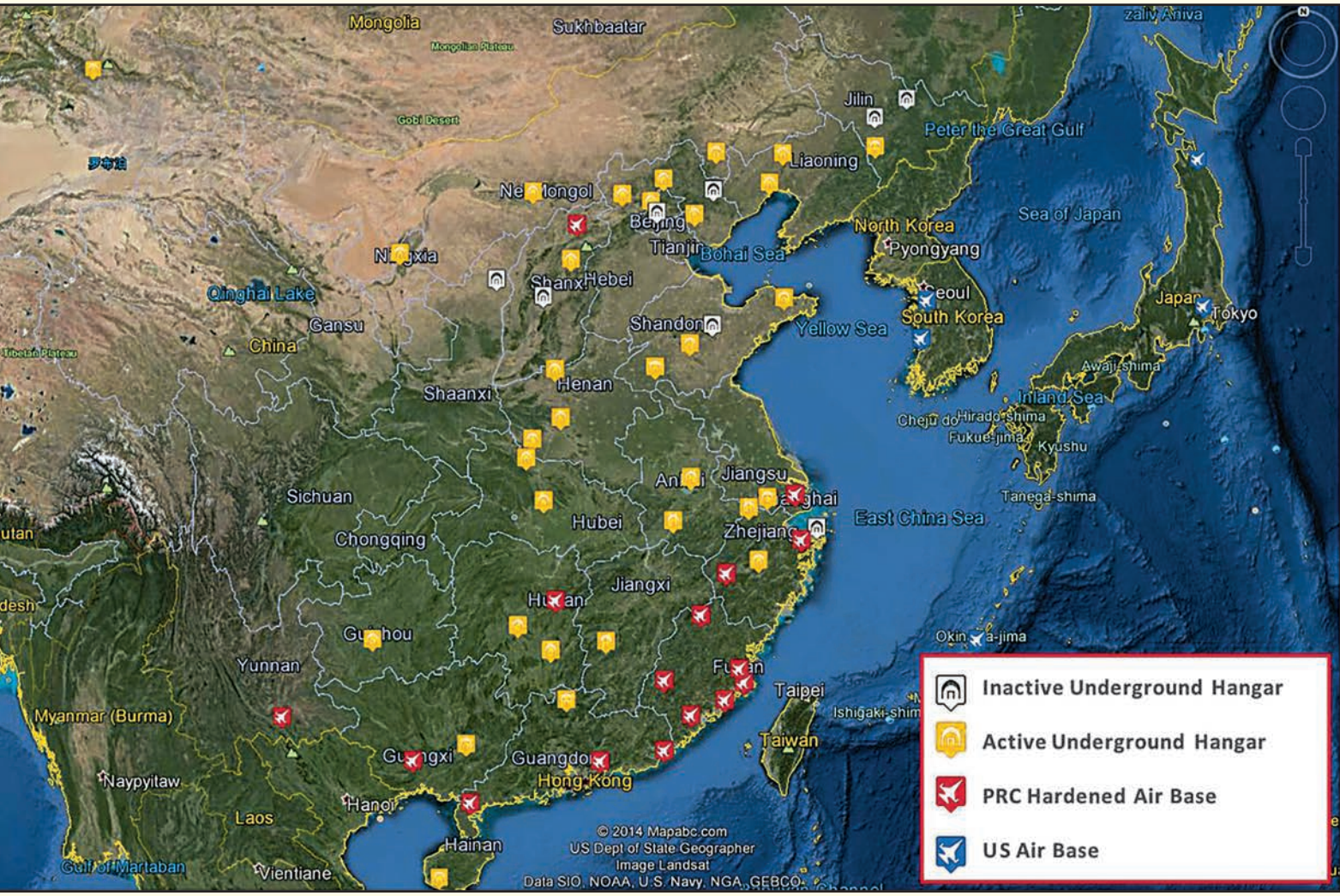
Since 2000, however, China has embarked on a significant change in its military air base hardening strategy—the building of significant numbers of above ground hardened aircraft shelters (HAS). Distributed over 15 air bases throughout Nanjing and Guangzhou military regions in the east and southeast of China, the number of hardened shelters has grown from 92 to 312 in the past 12 years, an increase of nearly 240 percent. Some of these shelters can house more than one fighter— as much as a 250 percent increase in capacity (from 92 to 324). In essence, China has built about 20 shelters each year for the past decade.

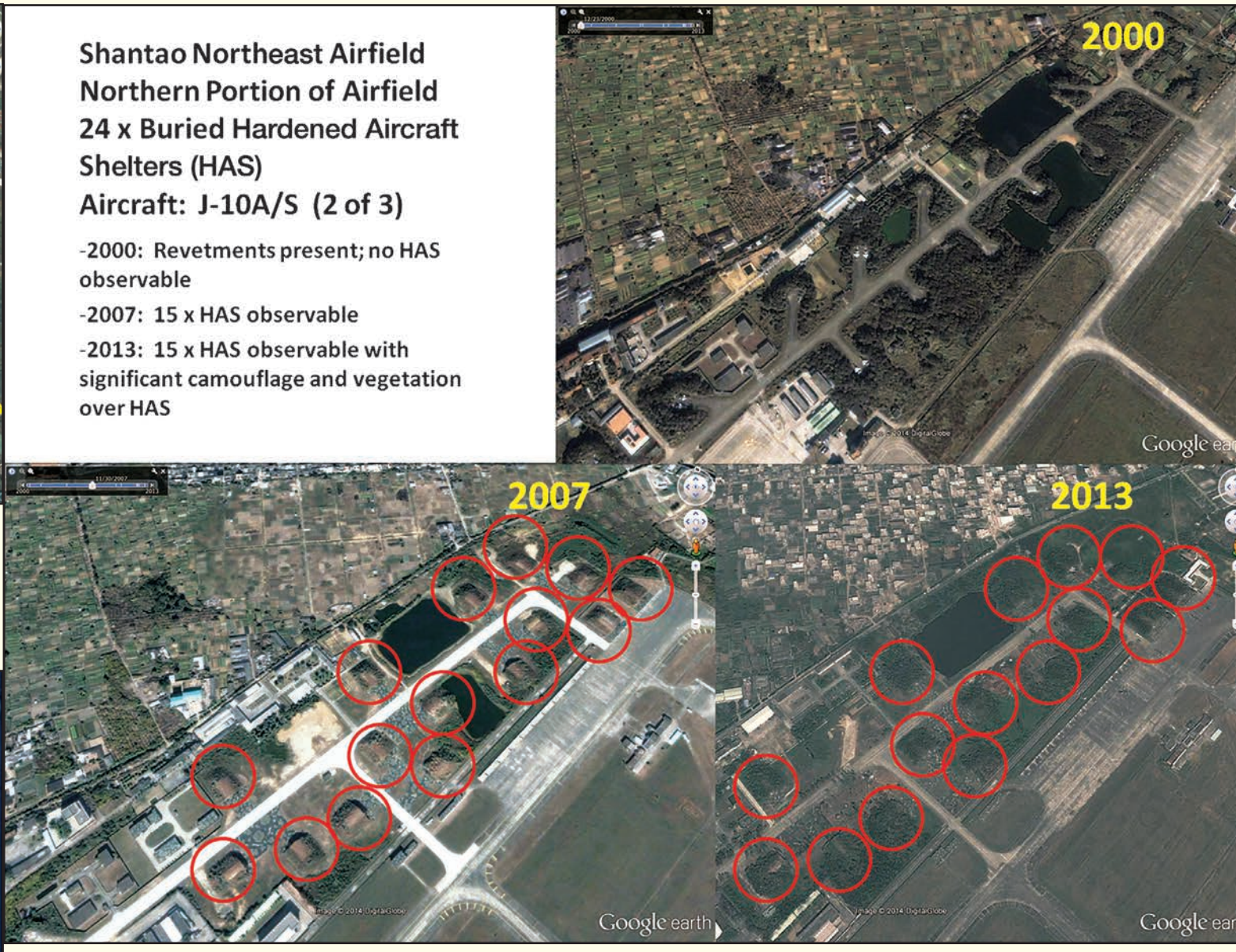
Unlike the UGHs, most of these hardened shelters are located much closer to the coast, with many less than



Above: This picture represents the PLA-Navy Yiwu Air Base in Nanjing Military Region. Note the highlighted curved entrances that seek to make it more difficult for a precision guided weapon to make a direct hit.

Below: The map depicts the current disposition of the PRC's air bases with newly deployed hardened aircraft structures begining in 2002.





Above: This picture depicts construction of 15 HAS from 2000 to 2013 on the northern half of Shantao Northeast Airfield. The airfield is located in the Guangzhou Military Region, west of Taiwan.

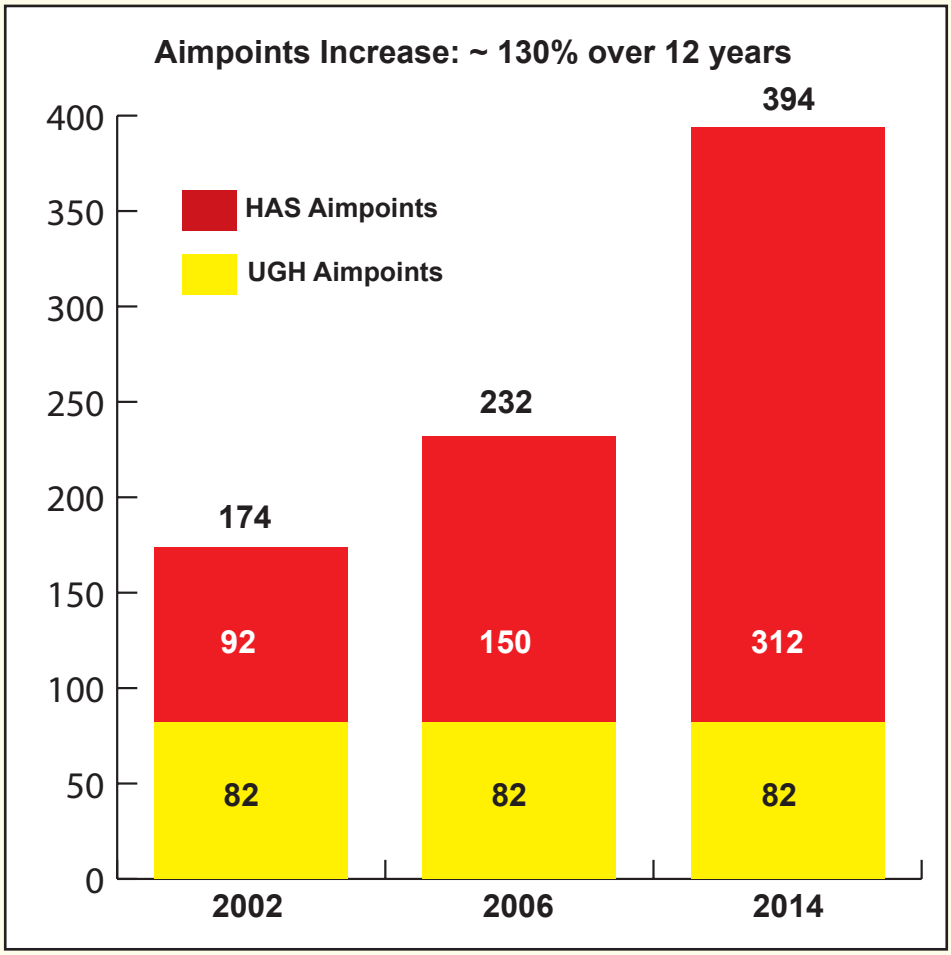
345 miles from the western coast of Taiwan, enabling the PLA to quickly muster significant combat power in the region. The increase of HAS in this area is an overt gesture and warning to both Taiwan and the United States that symbolizes China's willingness to use military force as a means to enforce its unwavering claim over Taiwan.

Two well-known China scholars, Andrew Scobell at the RAND Corp. and Andrew J. Nathan at Columbia University, assert that the PLA considers a fight over Taiwan its primary war scenario as long as the Taiwan issue is unresolved. While the development of UGHs deep within China indicate an emphasis on defense, China's more recent hardening efforts point to a stronger emphasis on offensive power projection capabilities.

Why the development of hardened shelters instead of continuing with UGHs? One possible explanation is the perceived vulnerability of UGHs to precision weapons. Most of the shelters have only a few entrances, which if struck could pin aircraft inside for an extended period. In previous decades, the chances of hitting a shelter door using unguided ordnance were very low. But as the United States demonstrated in the 1991 Gulf War and subsequent conflicts, precision guided munitions delivered by a modest number of sorties have the potential to strike the limited number of UGH entrances and significantly disrupt operations.

Precision strikes against the taxiways leading to the entrances could also hinder operations. Although aircraft inside may survive, it could prove difficult to extract them from their underground lair and launch. In addition, it might be possible for the first precision guided munition to penetrate the doors with a follow-on weapon to detonate inside the UGH.

The newly perceived vulnerability of UGHs to precision weapons could thus have spurred the Chinese to build hardened shelters. Given the pace of building, the end result is a greatly increased potential number of aimpoints that must be struck to disrupt operations and destroy aircraft. Typically, hardened shelters provide protection from blast, fragment, and fire, but are vulnerable to direct hits by penetrating weapons. Chinese construction efforts have increased the number of aimpoints by nearly 130 percent from 2002 to 2014. In particular, the



number of aimpoints that must be struck to disrupt Chinese combat operations near Taiwan has significantly increased. Offensive counterair efforts aimed at these PLA airfields within range of Taiwan would need to strike a much greater number of targets. The additional HAS also adds a layer of deception, making US and allied planning and targeting more difficult. With roughly 200 additional HAS spread over 15 air bases, the PLA can now disperse its squadrons more effectively to confuse targeting efforts.

US HARDENING EFFORTS

Currently, the US military has 207 HAS dispersed among four bases in the Western Pacific, with a significant majority in South Korea. This number reflects an almost minimal increase of 2.5 percent in HAS construction over the past 12 years. The hardening infrastructure of Air Force bases in the Western Pacific was, for the most part, built in response to Cold War threats and vulnerability assessments.

Great care was given to deter and protect foremost against Soviet, North Korean, and Chinese aggression in the Western Pacific as part of a larger US effort to mitigate Soviet threats in Western Europe. In the 1970s and 1980s, USAF invested tens of billions of dollars in Western Europe to minimize theater base vulnerability from Soviet threats, but since then, investment in base hardening has proved minimal.

As numerous analysts have outlined, China has aggressively invested in deploying large numbers of ballistic and cruise missiles armed with cluster weapons as part of its larger plan to shift the military balance in the Asia-Pacific region.

Andrew F. Krepinevich, president of the Center for Strategic and Budgetary Assessments, points out that while China does not use the US term anti-access, area-denial, it does use the Chinese term *shashoujian,* or "assassin's mace," which has the same meaning. Krepinevich states: "Today, *shashoujian* weapons and combat methods are essentially those potentially capable of deterring a superior adversary like the United States or of being employed to surprise and cripple US forces at the onset of a conflict." Analysts from CSBA report, "PRC strategists refer to shashoujian capabilities and 'combat methods' as those powerful enough to deter a superior adversary—the 'inferior defeats the superior.'" Ballistic



Hardened shelters for China's Su-30 MK2 fighters. A direct hit by a penetrating bomb could destroy such hangars, but the structures protect the aircraft inside from most other threats.

Internet photo

and cruise missiles combined with modernized combat aircraft are two of the capabilities associated with the assassin's mace.

The general consensus is that should hostilities break out, China would conduct a pre-emptive strike against US and allied air bases in the region. With the advent of China's Dong Feng 26 ballistic missile, capable of reaching Guam, and the potential use of submunition warheads, anti-access challenges and air base vulnerability concerns are heightened. Kadena Air Base on Okinawa, located just 460 miles from the Taiwan Strait, houses F-15s and occasionally F-22s—and large numbers of other USAF aircraft—but possesses only 15 shelters.

Andersen Air Force Base on Guam hosts a range of strategic assets, such as B-2 stealth bombers and RQ-4 surveillance aircraft, but has no hardened shelters.





Above: The super-hardened exterior blast doors of a HAS in China. Left: Chinese air and maintenance crews pose in front of a Su-27UBK fighter just rolled out of a hardened shelter.

Warheads filled with submunitions could be devastating against aircraft parked in the open. In a 1999 RAND analysis, John Stillion and David T. Orletsky note that one guided ballistic missile with conventional submunitions could effect the same damage as nearly a dozen cruise missiles on an entire USAF fighter wing exposed in the open. Similarly, retired Naval War College professor Marshall Hoyler calculates China has 350 to 400 CSS-6 ballistic missiles capable of reaching Kadena that could either deliver unitary warheads to crater runways or deliver cluster munitions to destroy unsheltered aircraft on the ground.

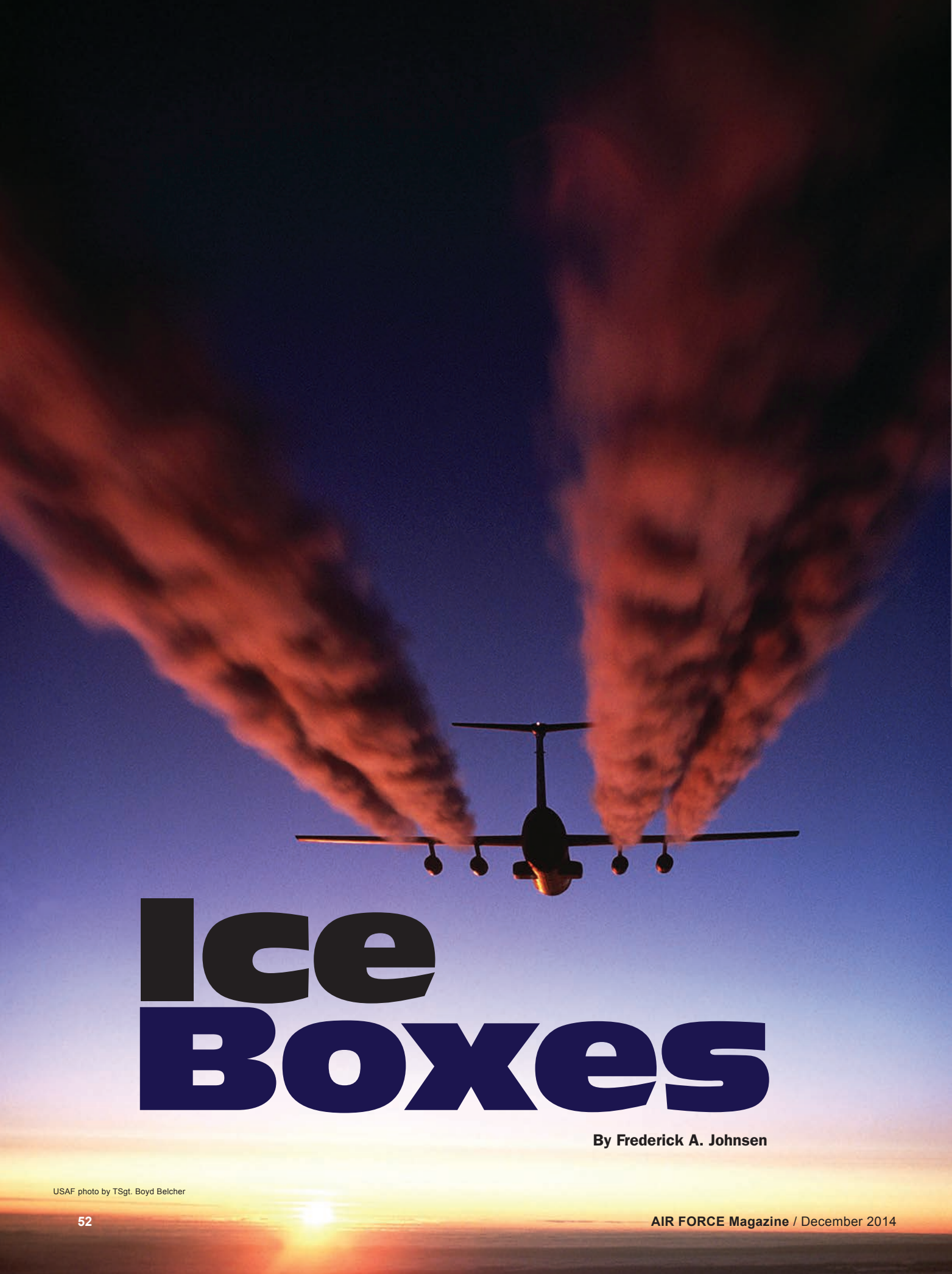
Given the short flight times of ballistic missiles, it would be difficult to gain sufficient warning time to launch unsheltered aircraft. China could follow up with strikes by combat aircraft that could deliver significant quantities of munitions against runways, shelters, fuel depots, and maintenance facilities.

In contrast, China's air base hardening efforts would greatly increase the level of effort required to disrupt Chinese operations—instead of striking just dozens of aimpoints to pin aircraft in the UGHs, the US and its allies would need to strike hundreds. Would such a riposte be possible after absorbing the initial Chinese strikes? The potential end result could be local Chinese control of the air and the devastation of US and allied land-based airpower in the Pacific.

The United States and its allies are clearly far behind a potential adversary in their base hardening efforts. Given the threat and the new challenge illustrated by Chinese air base hardening efforts, US facilities in the Pacific Theater may need a new hardening initiative to maintain effective deterrence. Although resource allocation is always difficult, it should be noted that roughly 20 new hardened shelters can be purchased for the cost of a single fourth generation fighter.

The United States and its NATO allies made great strides in hardening their airfields in Europe during the Cold War. A similar coalition approach may be overdue to maintain deterrence in the Pacific. ✪

David Lewton served 15 years in US Special Forces and is a master's degree candidate at Georgetown University's Security Studies Program in the Edmund A. Walsh School of Foreign Service. This is his first article for Air Force Magazine.



Ice Boxes

By Frederick A. Johnsen

USAF photo by TSgt. Boyd Belcher

In 1983, a new unit was tasked with delivering supplies to Antarctica and the South Pole.

Parachute-laden crewmen standing near open doors of a C-141B Starlifter during a midwinter Antarctic airdrop in 1983 were told they could pull the D-ring ripcord if they fell overboard—or just not bother. The chance of being safely recovered in the darkness and 100-degree-below-zero temperatures was practically nonexistent.

The requirement for year-round habitation at the South Pole exceeded the ability to resupply the southernmost outpost by traditional overland means in the 1980s. The Air Force's Military Airlift Command used airdrops to fill the need in the middle of the Antarctic winter.

Landing was not an option on the darkened snowbound continent for several months of the year. But C-141B Starlifters, refuelable in the air, could extend their reach to the South Pole from Christchurch, New Zealand.

The mission had been flown before by another wing, but the 62nd Military Airlift Wing of McChord AFB, Wash., brought something new to the party when it got tasked for the mission in 1983. With only one small roll-up paratroop door on each side of the Starlifter's fuselage available for container delivery system (CDS) bundle drops over the South Pole, the McChord crew spent the spring of 1983 perfecting a system of baffles for the troop doors to help keep CDS bundles from wedging or moving prematurely.

That year marked the first time two separate drops were set for McMurdo Station, on the near edge of Antarctica, and would involve the largest number of CDS containers dropped on a single pass over McMurdo.

As they prepared for the Antarctic adventure, the McChord crew knew one of the 62nd Wing's Starlifters, tail No. 65-0229, had a pedigreed past as the first C-141 to land on Antarctica in November 1966, a time of the year—spring—when landings were possible. This C-141B was requested in the frag order as the Antarctic bird for 1983's midwinter sorties.

Mission commander Maj. John A. "Tony" Kent Jr. had made an Antarctic airdrop previously. Some on his 1983 crew had not, and they were banking experience this year for the future. The Starlifter landed on a cold, damp Christchurch runway on June 16. The first Antarctic airdrop was scheduled for June 21. In the meantime, the crew configured the C-141 for the first airdrop and spent time in the hotel adjacent to the airport, poring over airdrop data and assessing various scenarios that could beset the risky flights ahead.

The task was not without peril. The Starlifter had to rendezvous with a KC-10 tanker to complete the mission, and early on, the C-141 team on the mission the author accompanied decided not to open the Starlifter's huge petal doors over the South Pole, lest they freeze in position. In fact, the concern was so great that the crew pre-emptively planned to use only the flush troop side doors when over the distant South Pole station.

The drag of the huge extended petal doors would increase fuel consumption to the point where return to Christchurch might be impossible. For the dual mission to McMurdo and the South Pole, the KC-10 Extender took on an additional refueling task dictated by unusually frigid conditions. The tanker would refuel the C-141 just before the Starlifter began its descent to airdrop at McMurdo. The C-141 would still be in its closed-door configuration for this refueling. This was important because, if the doors stuck open over McMurdo, it was unknown whether the C-141 could, in its slow airdrop state, conduct an aerial refueling.

But that refueling just before an airdrop added its own variables to the crew's planning. The Starlifter would be over McMurdo for the drop at a weight of about 320,000 pounds—significantly heavier than the maximum published airdrop weight of 273,000 pounds. MAC headquarters issued a waiver for the heavyweight airdrop over McMurdo. But the extra weight meant the normal airdrop speed of 150 knots calibrated airspeed (172.6 mph) was perilously close to stalling speed for the loaded C-141B. The crew's answer was to make the McMurdo drop at a faster speed of 165 KCAS (190 mph).

Nor did this end the computations and calculations necessary to pull off this unorthodox airdrop mission. Warehouse-style conveyor rollers, including 90-degree curved sections, were laid on the Starlifter floor to quickly allow crew members in the back of the C-141 to position bundles near the doors in time for the green light drop sig-



Left: A C-141 prepares for an airdrop over Antarctica. Here: A KC-10 greets the C-141 the author was aboard, for this 1983 mission. Two midair refuelings were necessary to complete the mission.

Photo by Frederick A. Johnsen

USAF photo



Unloading the first C-141 to land at McMurdo Station, Antarctica. C-141s were used for resupply missions from the 1960s until 2005.

nal over the South Pole. Drops would use 26-foot ring slot CDS parachutes that up to then had only been used aboard Starlifters experimentally. One of the mission navigators, Lt. Col. Harold Blagg, had to take the 500-pound weight of each CDS container, plus the faster 165 KCAS airspeed, and modify the existing experimental airdrop tables for the parachutes being used.

This information was vital for deriving the computed air release point. The CARP allowed the crew to time the bundles so they landed within the drop zone—especially important in the Antarctic winter darkness where a mild day was considered 100 degrees below zero Fahrenheit.

The crew selected for the 1983 Antarctic airdrop included airmen with extensive C-141 experience. They gave weight to the issue of petal door freezing. Twenty-second Air Force sent a message instructing the crew to drop all of the CDS bundles—even those intended for the South Pole—over McMurdo, using the side troop doors if opening the petal doors became a problem.

Aircrew List

McChord 1983 Midwinter Antarctic Airdrop Crew:
Maj. John A. Kent Jr., mission commander
Lt. Col. Jerry L. McKimmey, pilot
Maj. William J. Larson, pilot
Col. Roger R. Utley, pilot
Lt. Col. Harold Blagg, navigator
Lt. Col. Richard D. Paprowicz, navigator
1st Lt. Steven F. Baker, navigator
CMSgt. Billy C. Chramosta, flight engineer
CMSgt. Leonard J. Davis, flight engineer
SMSgt. James M. Walganski, loadmaster
MSgt. Michael L. Wright, loadmaster
SSgt. Benhard J. Nesheim, loadmaster
MSgt. Scott A. Ellestad, loadmaster
TSgt. Harold A. Harris Jr., loadmaster
Pete Lochow, 62nd MAW public affairs
Frederick A. Johnsen, 62nd MAW historian

THE ONE THAT COUNTS

The crew discussed other scenarios, too; this was no routine airdrop. Notionally, the crew pondered what might happen if the C-141 were accelerated to tear the drag-producing petal doors off if they were stuck in the open position. This was quickly rejected as unsafe due to the possibility of the petal doors striking vital parts of the aircraft as they departed. Other choices included making a forced landing at McMurdo in darkness or ditching in the frigid ocean on the way back to Christchurch.

A forced landing at McMurdo in winter had uncertain ground rescue prospects, and a winter ditching at sea



Photo by Frederick A. Johnsen

was considered unsurvivable for the length of time it would take rescuers to reach the scene. The heavyweight refueling before McMurdo was the only option that afforded a margin of safety in the event the petal doors froze open.

"There are lots of options," Blagg told the crew June 18 in a planning meeting. "We're just figuring the worst one. That's the one that counts."

Fuel was critical for the long distance return flight from the South Pole to Christchurch. Kent figured 80,000 pounds would be burned on that leg over inhospitable ice and sea. Since the South Pole airdrop required several racetrack orbits to get all CDS containers pushed out the small side doors, the airlifter still needed fuel once over the South Pole. Kent instructed the C-141's flight engineers with dark humor: "Engineers, when we hit 80,000 pounds and we haven't left the South Pole, you start taking crash axes and kill pilots."

During this planning session, some crew members said they wanted to make the McMurdo drop even if the KC-10 tanker became unavailable. Kent rejected that idea out of hand since a petal door malfunction would preclude reaching Christchurch without the additional fuel only the KC-10 could provide. The logistics of the effort to resupply McMurdo and the South Pole station in the dead of winter were staggering. Kent had ordered one million pounds of jet fuel to be available at Auckland, New Zealand, for the KC-10 to use in refueling the Starlifter.

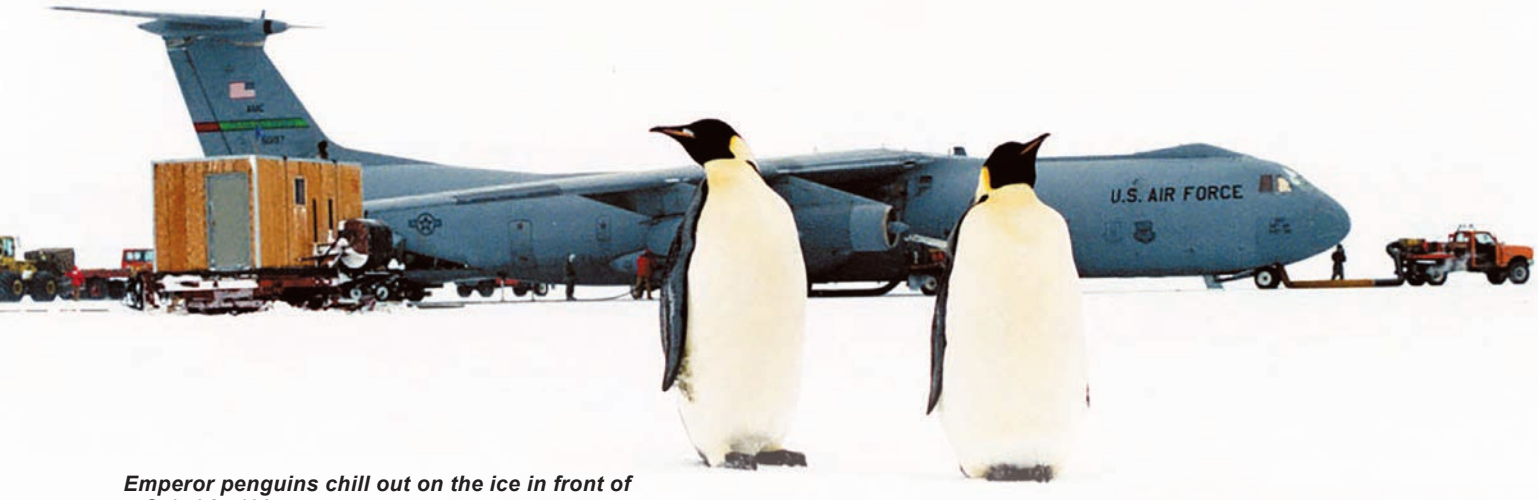
A loaded KC-10 needed more runway space than Christchurch offered, making Auckland, farther north, the best option. And a KC-10 was needed for the Antarctic missions because it could loiter longer than a smaller KC-135, enabling the Starlifter to refuel twice during the rigorous run over both McMurdo and the South Pole scheduled for June 21.

Back at Christchurch, a US Army load specialist requested the McMurdo drop, off the back ramp, be made with a nose-high deck angle of six degrees instead of the usual five degrees. With a specified increase in the Starlifter's auto throttle setting at the time of the drop, the steeper



Above: The crew pushes out bundles of supplies over the South Pole on June 21, 1983. Here: A KC-10 refuels a C-141B during a return flight to Christchurch, New Zealand, after a supply mission to McMurdo Station.

DOD photo by Garfield F. Jones



Emperor penguins chill out on the ice in front of a C-141 in 1997.

Photo by SMSgt. Bob Pederson

deck angle would result in a tighter ground spread for the McMurdo bundles, making their recovery by ground teams in the frigid darkness easier. Drop altitude over McMurdo was set at 1,000 feet above ground level; over the South Pole, it would be 1,500 feet AGL.

Load crews packed everything from perishables to periodicals in the tall CDS containers. At the base of each CDS box was a cushioning pallet of honeycomb cardboard several inches thick, designed to crush and absorb impact shock when the CDS package reached the ground. Loading for the June 21 mission was complete by June 19.

Early on the morning of June 21, crew members stuffed duffel bags of Arctic survival gear in remaining nooks on the loaded C-141. The fuselage was filled with rows of CDS containers, staged for release first over McMurdo and then for manual ejection from the side doors over the South Pole. In 1983, satellite communications were new enough and scarce enough that a special hatch-mounted SATCOM antenna was put in place of the normal escape hatch on the C-141 in Christchurch. A SATCOM operator flew the mission, using his radio gear to communicate with the outside world from the airspace over Antarctica.

Starlifter 0229 launched into the darkness at 4:11 a.m. local time. When still 90 minutes outbound from McMurdo, the flight engineers began lowering the cabin temperature to preclude any drastic shock when the petal doors were opened for the first airdrop of the day. Soon the chemical toilet froze in the aircraft's lavatory. Crew members who would perform the airdrops began donning Arctic gear.

THIRTEEN SECONDS HERE

About six hours after leaving Christchurch, with petal doors swung open, the Starlifter released 15 tons of supplies in an instant as power was notched up to expedite the rearward slide of the CDS bundles on the roller tracks. Crew members crowded atop the South Pole CDS containers at the front of the cargo bay to witness the rapid exit of the McMurdo bundles amid the characteristic roar and the inevitable cloud of dust, debris, and static lines as the mass of containers plunged out the back of the fuselage like a giant piston. Powering up further, the C-141 climbed from the drop zone. Through the still-open petal doors, McMurdo was visible only as a dim orange light pattern around the drop zone in an otherwise black void.

Unspoken relief settled across the crew as the petal doors hinged shut properly. The South Pole drop was now on.

In the chilled cargo compartment of the Starlifter, riggers rearranged the roller tracks to create a track down both sides of the floor. The South Pole CDS bundles would be pushed on them toward the side troop doors, where 90-degree radius curved roller sections would aid each bundle out the open jump doors.

At about 12:20 p. m.Christchurch time, Starlifter 0229 made its first run over the South Pole drop zone. Two CDS containers exited the left troop door and three were pushed out the right door before the run was closed. On the second pass, intended to be the last, two bundles made it out the left door but none on the right side as one container jammed in the doorway. A third pass was successful and delivered the remaining bundles out the right side door. Even over the howl of the slipstream and the Starlifter's four TF33 jet engines, the bundles' static lines could be heard beating against the fuselage.

The mood was celebratory in the back of the Starlifter as the crew took whiffs of oxygen from a bottle as a precaution for the exertion they had just performed at an altitude more than 10,000 feet above sea level.

Navigation at the pole was complicated by the fact the C-141 crossed many lines of longitude in seconds as it circled the pole, rendering the aircraft's then-state-of-the-art inertial navigation system erratic and unreliable. To get flight headings so close to the South Pole, Kent relied on the attitude heading and reference system. Landing at Christchurch came at 7:08 p.m., nearly 15 hours after takeoff, and the crew partied that night with the earned satisfaction of a tricky job well done.

The final sortie of the midwinter airdrop series called for a full load of CDS bundles to tip off the rear ramp over McMurdo, with a return to Christchurch. Deteriorating weather conditions of blowing ice and occasional loss of radio communications with McMurdo put the mission on hold June 23.

The next day, the entire planeload of CDS containers roared out the back of the Starlifter in less than 13 seconds at the shallower standard deck angle of five degrees. This was done because there had been concerns that the steeper angle of the previous McMurdo drop might have piled containers atop each other.

Mission accomplished. ✪

Frederick A. Johnsen participated in the 1983 Antarctic midwinter airdrop as historian for the 62nd Military Airlift Wing from McChord AFB, Wash. He retired as director of the Air Force Flight Test Museum at Edwards AFB, Calif., to pursue museum, writing, and video projects. His most recent article for Air Force Magazine, *"Warbirders and the Re-enactors," appeared in the September issue.*

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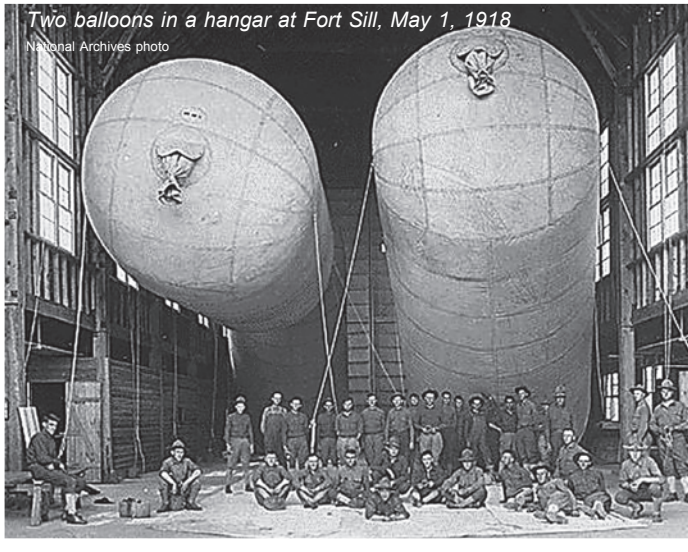
Kaboom!

In 1918, a spark of static electricity caused the explosion of a hydrogen-filled balloon at Fort Sill, Okla. Aviation ground crew had been holding the guide ropes at the time of the blast. Six died and 30 were injured. The troops at first ran from the fireball but were ordered to go back and grab the lines to keep the balloon from striking wooden barracks. The event was snapped by Capt. Roger Whitman of the US Signal Corps. A secret 1926 study of World War I censorship called it, "One of the most remarkable photographs of the war," but it never saw the light of day. Censors withheld it from publication "because it would create the impression that such accidents were common and the danger to balloonists was excessive."

Aviation explosion, 1918
US Army photo



Survivors regroup
US Army photo



Two balloons in a hangar at Fort Sill, May 1, 1918
National Archives photo

The Third Musketeer

By John T. Correll



When Ira Eaker met Hap Arnold and Tooey Spaatz in 1919, it was the start of a lifelong partnership.

When the United States declared war on Germany in April 1917, all 37 of the young men at Southeastern Normal School in Durant, Okla., enlisted in the Army. Among them was a square-jawed senior, Ira Clarence Eaker, whose family had migrated to Oklahoma from a hard-scrabble farm in Texas.

Private Eaker was a week short of his 21st birthday, but he had been close to graduating and because of that was sent to an officer training camp. A few months later, he was commissioned as a second lieutenant in the infantry.

Events took a fateful turn in November 1917 when Eaker saw an airplane land with engine trouble at Fort Bliss, Texas, and offered to help. All it took was reconnecting the spark plug lead, which had come loose, but by sheerest chance the pilot was on a recruiting drive for the Aviation Section of the Signal Corps. He encouraged Eaker to apply, and he did. Eaker received his pilot's rating in July 1918 and was assigned to Rockwell Field near San Diego.

In early 1919, Col. H. H. "Hap" Arnold returned from the war front in France to take command at Rockwell. He brought Maj. Carl A. "Tooey" Spaatz with him as his executive officer. When the post adjutant was lost in an air crash, Arnold and Spaatz picked Eaker to replace him.

They were a smooth-working team, likened to the Three Musketeers by Eaker's biographer, James Parton, and the relationship was a lasting one. Arnold was the acknowledged leader, Spaatz was his trusted deputy, and the competent and resourceful Eaker was the Third Musketeer.

The Musketeers soon went their separate ways, but they would be together again, many times, over the next 30 years and their friendship would continue for the rest of their lives. Eaker always called Arnold and his other seniors by their rank, with one exception: Spaatz was always "Tooey."

RISING STAR

Eaker did not plan to stay in service, figuring he would be at a disadvantage in competing with West Point graduates. That

fear was spectacularly unfounded. Eaker impressed almost everyone he encountered with his abilities and he soon became one of the rising stars of the air arm.

In 1922, Eaker was commander of the 5th Aero Squadron at Mitchel Field on Long Island, planning to leave the Army and go to law school. Maj. Gen. Mason M. Patrick, chief of the Air Service, was en route to Boston when his pilot was taken sick and landed at Mitchel. Eaker flew him the rest of the way to Boston and back to Washington the next day. Mason, who had authority to send a few of his officers to educational institutions, offered to sponsor Eaker at the Columbia University law school. The next semester, Eaker completed a course in contract law at Columbia.

In 1924, Eaker was in Washington as executive assistant in Patrick's office. Arnold was there, too, as chief of the Air Service information division. Arnold and Eaker worked together—despite cautions from Patrick—to support the firebrand Billy Mitchell in his challenge to the Army on behalf of airpower.

Arnold testified for Mitchell at his court-martial in 1925, as did Spaatz. Eaker's participation was behind the scenes. After the court-martial, Arnold "took on Mitchell's mantle as leader of the Young Turks in the Air Corps," said Parton.

Maj. Gen. James E. Fechet, Patrick's assistant and successor as chief of the Air Corps, as it had been redesignated, also liked Eaker, who in 1927 became his pilot and aide as well as executive officer in the Office of the Assistant Secretary of War.

However, Eaker's heart was never in headquarters duty. He continued to fly and established a solid reputation for airmanship. Captain Eaker led the Pan-American mission in 1925, a goodwill tour of 25 Central and South American countries intended to demonstrate the long reach of airpower.

He was one of the organizers of the pioneer aerial refueling operation of 1929, in which the *Question Mark,* a Fokker C-2 aircraft, set an endurance record by staying aloft for more than six days over southern California, refueled in flight 43 times by a hose from a tanker airplane overhead. Eaker was



Left: Ira Eaker poses by his airplane in 1931. He was already a trusted colleague of Hap Arnold and Tooey Spaatz and was making a name for himself as a pioneer airman. Here:* Question Mark *refuels over southern California during its historic endurance flight in 1929. Eaker was chief pilot.



Above: The crew of* Question Mark *and the Chief of the Air Corps at Bolling Field, D.C., in 1929. They are (l-r) Capt. Ross Hoyt, Capt. Ira Eaker, Maj. Gen. James Fechet, Air Corps chief, Maj. Carl Spaatz, Lt. Elwood Quesada, and MSgt. Roy Hooe.

the chief pilot and recruited Spaatz to be flight commander and hose handler.

In 1936, Eaker would make aviation history again with the first transcontinental flight on instruments alone, from New York to Los Angeles.

He was well-satisfied with what he was doing and his progress in the Air Corps. "I don't think that many people ever visualized senior rank and status in their careers," he said, looking back years later. "It was only the expansion of the Second World War that gave all of us high rank."

WINGMAN

The Musketeers were reunited in California in 1931. Arnold was commander of March Field, where Spaatz had command of a bombardment wing. Eaker was nearby at the University of Southern California, back in school on government sponsorship. He frequently went over to March on weekends to fly P-12s with Arnold and Spaatz. Arnold regarded Eaker as "on call" whenever he needed him.

After completing his degree in journalism in 1933, Eaker was assigned to March as commander of a pursuit squadron. He often went hunting and fishing in the Sierras with Arnold.

Soon they were back in Washington, Arnold as assistant chief of the Air Corps, Spaatz as the assistant exec in that office, and Eaker as assistant chief of the Air Corps Information Division. Arnold and Eaker published *The Flying Game,* the first of three books they wrote together, in 1936. Eaker, who was the better writer, did most of the work. *Winged Warfare* would follow in 1941, and *Army Flier* in 1942. Their families were friends as well, and the Eakers were frequent guests of the Arnolds.

In the late 1930s, Arnold was making his bid—by no means yet assured—for leadership of the Army air arm. He was chief of the Air Corps, but control of the force was split with a rival organizational entity called the "GHQ Air Force," to which the tactical squadrons were assigned.

One of his strengths, which helped him prevail, was the team he had assembled. "Arnold's troops were some of the handful who had served with him since the early days, the few who had been there from the beginning and would remain to the end, no matter what the end was," said DeWitt S. Copp, author of *Forged in Fire.* Spaatz, chief of plans and "for 20 years Arnold's closest confidant in or out of the office, was there to advise and shape strategy." Eaker, Arnold's executive officer "and trusted wing man, was there to backstop his Chief in any encounter."

In 1940, Eaker was given command of a pursuit group at Hamilton Field, Calif., but it was not long before Arnold had another special task for him.

PINETREE

When the United States entered the war following the attack on Pearl Harbor, Arnold told Eaker that he was sending him to England "to understudy the British and start our bombardment as soon as I can get you some planes and some crews." Eaker pointed out that all of his service had been in fighters. "Yes, I know that," Arnold said. That's what we want, the fighter spirit in bomber aviation."

Eaker was promoted to brigadier general as he undertook his assignment in January 1942. Arnold presented Eaker the stars he had first worn himself as a new brigadier general. (Many years later, Eaker gave the Arnold stars to Gen. Russell E. Dougherty, who passed them along to new generations of airmen.)

The mission to Britain had several aspects. Eaker was to establish a headquarters for VIII Bomber Command, which he would head, and prepare to receive the advance echelon of the parent unit, Eighth Air Force, which would be commanded by Spaatz, who was now a major general.

Eaker was also to pave the way for the organization and strategy Arnold wanted: a US air command that would cooperate with, but be independent of, the Royal Air Force, with daylight precision bombing as its core operational concept.

The British had a different idea. They wanted the Americans to blend into their established effort under British control and participate in the area bombing at night. The RAF had tried

precision bombing and failed at it. A directive in February 1942 said the primary objective should focus "on the morale of the enemy civil population and in particular industrial workers." Prime Minister Winston Churchill's scientific advisor called it "dehousing" the Germans.

When Eaker and his six-man party arrived Feb. 21, they got a cool reception from Maj. Gen. James E. Chaney, commander of US Army forces in the British isles. Chaney wanted no part of Arnold's scheme for a separate air command under Spaatz and Eaker. Chaney was a problem until he was replaced in June by Maj. Gen. Dwight D. Eisenhower, who got along well with Spaatz and Eaker.

The welcome was much warmer from Air Marshal Arthur T. "Bomber" Harris, the new chief of RAF Bomber Command. Harris was a strong advocate of city bombing but he liked Eaker and hoped to convert him to British thinking.

Headquarters for VIII Bomber Command, code name "Pinetree," was at High Wycombe, 30 miles west of London, close to RAF Bomber Command headquarters. Eighth Air Force headquarters, "Widewing," would be at Bushy Park, closer to London.

Many British, including Churchill, were charmed by Eaker. Air Chief Marshal Charles Portal, the RAF chief of staff, was one of his strongest supporters. Speaking at a public gathering at High Wycombe, Eaker said, "We won't do much talking until we've done more fighting. After we've gone, we hope you'll be glad we came."

DIVERSION

Spaatz arrived in June and the first B-17 bombers reached England in July. By then, Churchill had persuaded President Franklin D. Roosevelt to agree—against the advice of US generals and admirals—to a change in strategy. The Allies would delay the direct offensive across the English Channel and shift their emphasis to the Mediterranean, first in North Africa, where the British had been engaged against the Germans since 1940, and then into Italy and up through the "soft underbelly" of Europe.

Twelfth Air Force, code-named "Junior," was spun off from Eighth Air Force and set up in North Africa. Junior siphoned 27,000 men and 1,100 airplanes from Eighth Air Force, and Eaker's VIII Bomber Command was left with less than 150 aircraft and even fewer crews.

Eisenhower was relieved of his post in Europe and appointed to command the newly created North Africa theater of operations. Air Chief Marshal Arthur Tedder was the commander in chief for Air, but Eisenhower took Spaatz with him as commander of the Northwest African Air Forces.

Eaker was promoted to major general in September 1942, but he did not have enough aircraft and crews to mount large bomber operations. More than half of his remaining resources were assigned to attacking German submarine pens—a high priority for the British—even though bombing had little effect on these hardened facilities.

To the horror of Arnold and his colleagues, Churchill had almost convinced Roosevelt to halt the daylight precision bombing and join the British in nighttime operations against German cities and other area targets.

EAKER OF THE EIGHTH

Eaker took command of Eighth Air Force in December 1942. The appointment was understood to be temporary, until Spaatz returned from the Mediterranean, but it lasted for a year during which Eaker's name became forever linked with Eighth Air Force.

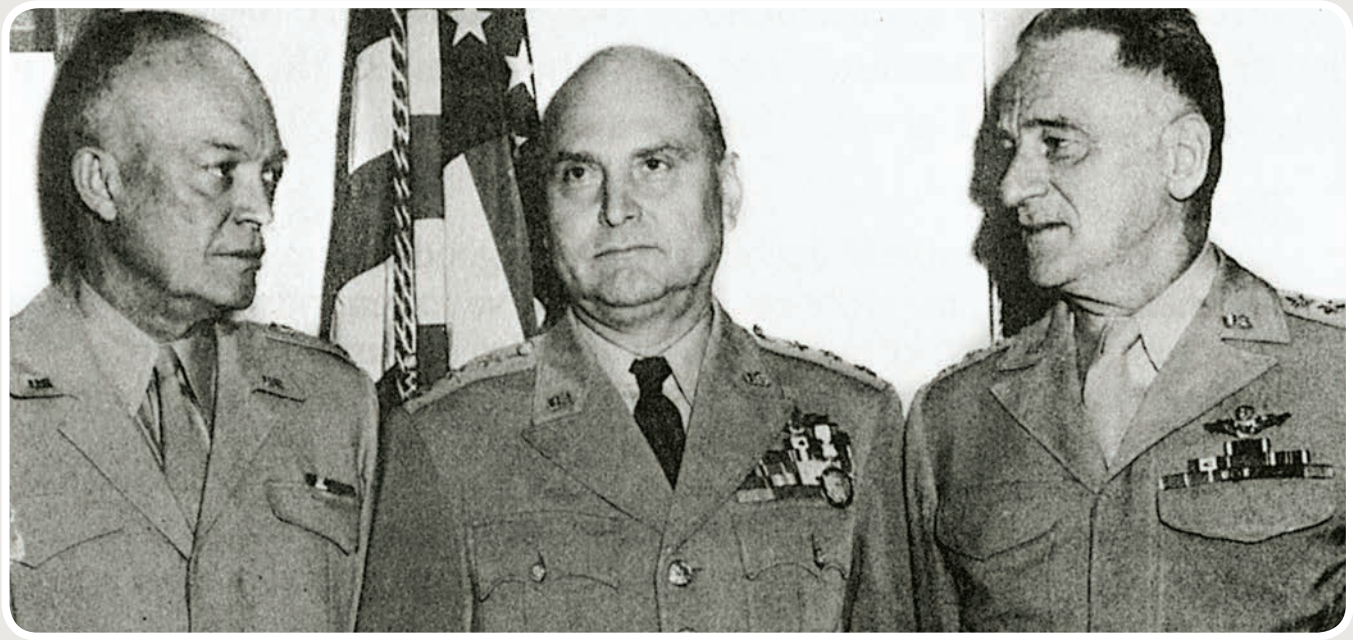
In January 1943, Eaker got an urgent summons from Arnold to come to the big Allied conference in Casablanca, Morocco, where Roosevelt was on the verge of agreeing to Churchill's proposal for a bombing strategy change. If anybody could talk Churchill out of his determination, it was Eaker.

They met for 30 minutes in Churchill's villa and Eaker persuaded Churchill that the two bombing efforts complemented each other and kept round-the-clock pressure on the Germans. "I decided to back Eaker and his theme, and I turned round completely and withdrew my opposition to the daylight bombing by the Fortresses," Churchill said in his memoirs.

More of Eaker's aircraft and crews were transferred to North Africa in January 1943, so Eighth Air Force was operating against Germany with less than 100 heavy bombers. Replace-

Eaker, now a brigadier general, speaks with members of the press after a B-17 combat mission over Europe in April 1942.





Gen. Dwight Eisenhower (l) presented Eaker (c) with an Oak Leaf cluster for his Distinguished Service Medal as Spaatz (r) looked on. Eaker retired shortly thereafter, in 1947.

ments were offset by losses in ensuing months, and there were seldom more than 200 B-17s flying out of England.

Even so, Arnold was not satisfied with the sortie rate or the results. He understood that Eaker was shorthanded but thought he should be getting more missions from the resources he did have. Arnold was never critical of Spaatz but he did not hesitate to lash out at the junior Musketeer, urging Eaker to "toughen up" and crack down on subordinates who did not produce. Spaatz was unfailingly supportive of Eaker and acted as a buffer between him and Arnold.

Arnold was under great pressure himself to deliver results from airpower in Europe. He pushed on relentlessly despite a heart attack in March 1943, the first of a number that would eventually kill him. There was encouragement for Eaker as well. On a visit to England in September 1943, Arnold announced Eaker's promotion to lieutenant general and his designation as commander of all US air forces in the European theater of operations.

In a meeting with Eaker in 1976, Albert Speer, Germany's minister of armaments and war production, gave an assessment from the enemy's perspective. "You in fact had started a second front long before you crossed the Channel with ground forces in June 1944," Speer said. "Air Marshal Milch told me that your combined air effort forced us to keep 900,000 men tied down on the so-called 'West Wall' to defend against your bombers. ... I suspect that well over a million Germans were ultimately engaged in antiaircraft defenses, as well as 10,000 or more an antiaircraft guns. Without this great drain on our manpower, logistics, and weapons, we might well have knocked Russia out of the war before your invasion of France."

In November 1943, Twelfth Air Force in the Mediterranean divided into two parts, the bombers going to the newly created Fifteenth Air Force with Twelfth Air Force becoming a fighter command.

EAKER DEPARTS

Eaker's tour at Eighth Air Force ended in January 1944 with the return of Eisenhower and Spaatz to England. "It is necessary to find a good man for the post of air commander in chief of the Mediterranean," said Supreme Allied Commander Eisenhower in a message to Gen. George C. Marshall, the Army Chief of Staff. "It would appear to me to be something of a waste to have both Spaatz and Eaker in England."

Spaatz was named commander of US Strategic Air Forces in Europe, which included both the Mediterranean and European theaters.

Eaker's new job was commander in chief of Mediterranean Allied Air Forces, making him head of two American and two British air forces. In an editorial entitled "General Eaker Moves Up," the *New York Times* called it "a well-deserved promotion," but Eaker did not see it that way. He was deeply disappointed to leave Eighth Air Force as the war was reaching a critical juncture.

"It is an entirely different kind of job and requires different technique for the employment of your aircraft," Arnold wrote to Eaker. "I am of the opinion it will do you a considerable amount of good. It will increase your experience and give you a reputation along other lines than that in which you were engaged in England. In other words, you should come out of this a bigger man by far than you went into it."

Spaatz had operational control of the air forces in both Italy and England but he made a practice of routing directives for Fifteenth Air Force through Eaker, who was authorized to make alterations as he thought best because of weather or unpredictable factors.

Eaker carried out Operations Strangle—the interdiction campaign in Italy—and Diadem—the Allied advance on Rome—but his driving interest was in working with Spaatz on Operation Pointblank, the American part of the combined bomber offensive against Germany.

Arnold's criticism abated. "The tension between the two men, which had reached such strained extremes the year before, now was almost completely gone," Parton said. "They had returned to their longtime roles of revered patron and respected protégé."

However, Eaker would not remain in his post to see the end of the war. In January 1945, Hap Arnold had his fourth heart attack and Marshall decided to bring Eaker back to Washington to take over some of the load. Eaker became deputy commanding general of the Army Air Forces in April.

Arnold retired in January 1946. Eaker continued as deputy to Spaatz, who followed Arnold as commanding general of the AAF. When Eaker himself retired in August 1947, a few weeks before

Joseph McNarney: The Famous General You've Likely Never Heard Of



Süddeutsche Zeitung photo

You probably know that Henry H. H. "Hap" Arnold was the Army Air Force's first four-star general (date of rank March 19, 1943), but who was the second?

It wasn't Arnold's chosen successor, Carl A. "Tooey" Spaatz. He followed Arnold as leader of the AAF and was the first Chief of Staff of the independent Air Force, but he was the fourth Air Force officer promoted to four-star grade. (DOR March 11, 1945.)

It wasn't George C. Kenney, wartime commander of air forces in the South Pacific. Kenney, who had strong support from Army Gen. Douglas MacArthur, was the third AAF four-star. (DOR March 9, 1945, making him two days senior to Spaatz.) Nor was it Ira Eaker or Jimmy Doolittle. They left active duty as lieutenant generals and did not become four-stars until 1985, by special act of Congress.

AAF's second four-star was Joseph T. McNarney, with a DOR of March 7, 1945, deliberately timed to give him two days seniority over the competition.

McNarney is seldom remembered today. He was not one of the big names of World War II and, even in 1945, not famous. But he was well-known where it counted. His colleagues rated him highly and most important, Army Chief of Staff Gen. George C. Marshall thought he was one of the best and smartest officers in the Army.

McNarney was commissioned as a second lieutenant of infantry at West Point in 1915, earned his wings in 1917, transferred to the aviation section of the Signal Corps and flew in France in World War I.

He spent the 1920s and 1930s mostly in staff and nonoperational assignments. He was both a student and an instructor at the Field Officers School, which later became the fabled Air Corps tactical school. McNarney was also an instructor at the Army War College from 1933 to 1935.

For a time, he was assistant chief of staff at GHQ Air Force, which encompassed all of the tactical units of the Air Corps. When his friend Maj. Gen. Frank Andrews, commander of GHQ Air Force, expressed concern that McNarney was no longer flying much—he was averaging only about 50 hours a year—he said that if he got a flying command, he would fly. He was not among those campaigning most intensely for airpower independence.

Nevertheless, he steadily established a reputation as dependable, tough, capable, and—always—extremely intelligent. McNarney got his first star in April 1941 and was sent to London at chief of staff of the Special Observers Group.

By 1942, he was back in Washington, had advanced to lieutenant general, and was deputy chief of staff of the Army. Marshall assigned him to lead a major reorganization in which the service took on its wartime structure of three separate and autonomous commands: the Army Air Forces, the Army Ground Forces, and the Services of Supply. McNarney finally got into the field in October 1944 as deputy supreme allied commander in the Mediterranean Theater and commanding general of Army Air Forces in the Mediterranean.

Following his promotion to four-star rank, McNarney succeeded Eisenhower as commanding general of US Forces in the European Theater and commander in chief of US occupation forces in Germany. He returned Stateside in 1947 as senior member of the United Nations Military Staff Committee in New York. After that, he was commander of Air Materiel Command and chief of the Department of Defense Management Committee until his retirement in 1952.

McNarney was president of Consolidated Vultee Aircraft and president of the Convair division of General Dynamics following a merger of the companies. He died in 1972.

the Air Force became a separate service, Eisenhower sent him four "good luck" coins—one each from Britain, Africa, France, and the US—that Ike had carried in his pocket throughout the war. He hoped they would remind Eaker of the "days we spent together in World War II."

THE LAST MUSKETEER

Eaker, 51, still had work ahead of him. He was vice president of Hughes Tool Co. and Hughes Aircraft from 1947 to 1957 and of Douglas Aircraft from 1957 to 1961. He hit his stride, however, with a weekly column syndicated to 180 newspapers for 18 years in the 1960s and 1970s. He was a frequent speaker for Air Force professional military education classes, especially at Squadron Officer School. Eaker characteristically took time to notice and encourage younger members of the force.

He and Spaatz built a fishing cabin on a remote cliff overlooking the Rogue River in Oregon. They gloried in the lack of electricity or a telephone and hosted groups of their cronies who came to fish and play poker. Eaker won often. He had learned to play as a child, sitting in the laps of cowboys who believed he brought them luck.

Eaker, who died in 1987, was the last of the Musketeers. Arnold had passed away in 1950, Spaatz in 1974. Eaker was active in his later years. "Until April 1981, he regularly put in a seven-day week at his office, walking the two miles from his house every day that weather permitted," Parton said.

There was one final honor. In 1985, Eaker was promoted to four-star general on the retired list by special act of Congress. Eaker's fourth star was presented in the Pentagon two weeks after his 89th birthday. Gen Charles A. Gabriel, Air Force Chief of Staff, pinned one shoulder, and Eaker's wife, Ruth, pinned the other. It was the first time Eaker had ever worn the blue uniform. The Air Force had still been part of the Army when he left in 1947. ✪

John T. Correll was editor in chief of Air Force Magazine *for 18 years and is now a contributor. His most recent article, "Adjusting the Threshold of War," appeared in the November issue.*

The Grounded Spies

Since its inception, the Air Force has been involved in developing and operating a multitude of overhead systems to conduct intelligence, surveillance, and reconnaissance operations. Those systems have included low-flying remotely piloted aircraft, high-flying jet aircraft, and satellites—and have produced high-resolution images or intercepted a multitude of electronic signals.

For most of its history, though, the Air Force has also relied on decidedly ground-based means of collecting information. People—collecting bits of trash, taking pictures (overtly and covertly), and simply chatting up acquaintances—have also provided an intel bonanza.

Some ideas for collecting intelligence seemed brilliant, but yielded little value. For at least four summers, from 1953 to 1957, airmen walked the Alaskan coastline looking for washed-up Soviet material on the shore, under the unimaginatively named Operation Beachcomber.

"Data stenciled on a packing crate, or a manufacturer's part numbers, have always been excellent sources of intelligence information. Resupply routes, factory locations, production figures, unit strengths and positions ... can be pieced together from the patient, long-term examination of such material," explained an article in the December 1953 Alaskan Air Command *Intelligence Review.*

Beachcomber I was a two-month effort, covering 704 miles of coast, including the shoreline of St. Lawrence Island, around the Seward Peninsula from Nome to Cape Espenberg, and the coast of the Chukchi Sea from Sheshalik to Point Hope.

The effort turned up a radiosonde that used a new type of tube—of interest to the Air Technical Intelligence Center—electrical equipment, and wood products bearing manufacturing and shipping data. A message in a bottle with a rude Russian message inside was also found; it had no intelligence value.

Air attachés at the US Embassy in Moscow, who were far better-placed for gathering intelligence, achieved better success in learning useful information about Soviet military air and missile capabilities. The Soviet penchant for showing off their military hardware at May Day and Revolution Day parades, and the Soviet Air Day Show in Moscow, presented opportunities too good to pass up.

In November 1948, Col. Howard M. McCoy, Air Materiel Command's chief of intelligence, estimated that "95 percent of the qualitative intelligence on Russian aircraft, and usually first knowledge of the existence of new types of aircraft, becomes known to our air attaché during the 1 May air show and the earlier practice flights."

The attachés employed the most sophisticated photographic and electronic equipment they could bring, overtly or covertly, to the parades. These items included a binocular camera and a variety of tripod arrangements with zoom lenses and telescopic sights capable of still and motion-picture photography. By November 1948, the quality of the cameras had improved substantially, making it possible to get detailed images of the engine, armament, gun sighting, navigation, and communications equipment of aircraft parading overhead.

Acting air attaché Maj. Edison K. Walters was present on July 17, 1949, at the Soviet Air Day Show at Moscow's Tushino Airdrome. Walters reported on 21 events, including a mock battle between nine Tu-2s and four fighters. "All firing was observed to come only from the lower portion of the nose of the fighters," he said. He also had a piece of leadership intelligence to convey,



The Air Force doesn't just spy from above.

By Jeffrey T. Richelson

noting that Joseph Stalin was at the show and "appeared to be in excellent health and had a suntan."

On some occasions the attachés had to use their equipment under difficult circumstances. In one instance, the air attaché found men from the Ministry of Internal Affairs standing on both sides of him as three cameras photographed his actions. Another time, to provide a protective barrier, he surrounded himself with the British and Canadian attachés, as well as his wife, "to ward off the possibility of any undesirable person asking to use the equipment ... for the ostensible purpose of watching the show."

Attachés spied on facilities where they were not guests. On April 30, 1950, Walters photographed a portion of an airfield near Moscow, from the northern side of the road opposite the airfield. The resulting photograph showed two radar systems, nine Army trucks, four dug-in huts for housing gun crews and radio operators, and eight anti-aircraft guns.

Attachés collected electronic intelligence. On March 3, 1953, Maj. George Van Laethan drove along the Kiev Highway on the way to Moscow's Vnukovo Airport, carrying a vest-pocket device. He was able to intercept radar emanations that were then stored on a wire-recorder. Thirteen miles south of the highway, his detector picked up the signals from a new, temporary anti-aircraft artillery position being installed.

On July 30 of that year, during an authorized visit to Ramenskoye Airfield southeast of Moscow, the US air attaché photographed an aircraft similar to the B-47. His images showed it to be 50 percent larger than the main Soviet bomber, the Tu-4, with a tail section and fuselage similar to those of the B-47. He also reported observing 35 Tu-4s; 25 to 30 Il-28s; 15 to 20 MiG 15s; and a number of small, unidentified aircraft.

By 1967 the Air Force's Humint effort involved two organizations. The Foreign Technology Division, at Wright-Patterson AFB, Ohio, had units at Wiesbaden, West Germany (Det. 3), and Yokota AB, Japan (Det. 4). After an aerial battle between the

Left: Western observers and air attachés are among the viewers of a Soviet air show in Moscow. Center: Joseph Stalin (left) and the Soviet Defense Minister Nikolai Bulganin at the Tushino air parade in Moscow during the summer of 1947. Below: An early Soviet Tu-95 Bear bomber and two MiG-17s fly over Tushino Airfield in August 1955.







Israeli and Syrian air forces resulted in three MiG crashes in Jordan, Det. 3 personnel journeyed to the crash sites, an activity designated Operation Blue Fly, to set the stage for US recovery of the aircraft.

The bigger and more traditional human intelligence effort was conducted by the 1127th Field Activities Group. It had 201 personnel (59 officers, 110 airmen, and 32 civilians) at the beginning of 1967, the year it would receive the Air Force Outstanding Unit Award. Those personnel were based at its Fort Belvoir, Va., headquarters, overseas locations, and eight domestic stations: Chicago, Denver, Detroit, Los Angeles, Miami, Minneapolis, New York, and San Francisco. During the first half of 1967 those domestic stations produced more than 650 intelligence reports.

One of the group's efforts was designated Sentinel Shotgun and began in Scotland. At the time, Soviet aircraft entering or departing the United States —such as the airplane carrying Soviet Foreign Minister Andrei A. Gromyko in July 1967—were required to carry escort crews. The crews, consisting of a pilot provided by the 1127th, navigator, and radio operator, boarded the airplanes in Prestwick, Scotland, for inbound flights and provided escort to Prestwick on outbound flights. The Air Force pilots were responsible for keeping their eyes and ears open during the flights. This resulted in 15 intelligence reports during the second half of 1967.

A complementary project was Sentinel Sentry, whose "ostensible purpose," according to an official history, was to ensure the Soviets did not visit closed areas. On five occasions during the last half of 1967, members of the 1127th escorted the Soviet air attaché or his assistant on trips to New York in connection with the arrival or departure of Soviet aircraft. What the escorts were also doing, apparently, was gathering whatever information they could on the Soviets they were escorting—as the official history notes that on two of the trips the Air Force escort "was able to service requirements levied by the Federal Bureau of Investigation."

A third project was Sentinel Echo, the debriefing of prisoners of war released by North Vietnam. In February 1968, when Maj. Norris M. Overly, Capt. John David Black, and Ens. David P. Matheny were released, the chief of the group's Evasion and Escape Branch was involved in planning their debriefings, focusing on obtaining information on the whereabouts or deaths of personnel listed as captured, suspected captured, or missing in action but not returned.

In 1972, the 1127th took on a new name when USAF headquarters directed its inactivation and transferred its functions to the newly created Air Force Intelligence Service, which established the 7602nd Air Intelligence Group to carry them out. While the group was new, its mission was the same, including conducting worldwide human source intelligence collection and coordinating and staffing the Humint activities of other Air Force elements.

In 1973, as result of the US-North Vietnamese agreement to end the war, the 7602nd had a far larger group of returnees to debrief than the 1127th had had in 1968. North Vietnam began returning American POWs on Feb. 12, with the final transport arriving in the continental US on April 1. By the end of the month, the group had completed all intelligence debriefings, focused on lessons learned from the captivity experiences of the returnees.

The scope of the group's activities, beyond interviewing returnees, is suggested by the location of its detachments at the end of June 1974. They were located in Tokyo; Seoul, South Korea; and Taipei, Taiwan; Bangkok; and Frankfurt, Germany; with other worldwide operating locations.

By 1981, the Air Force's central Humint organization had undergone another identity change and was now the Air Force Special Activities Center (AFSAC). By the end of December 1982, it comprised 76 officers, 99 enlisted men, and 77 civilians. While that was not a trivial number, the historian of the Air Force Intelligence Service would assess that more personnel were needed. AFSAC represented the high-water mark for Air Force Humint in the 1980s. During 1984, in addition to the Fort Belvoir headquarters operations, there were three US-based detachments: two at Fort Belvoir and one at Foreign Technology Division headquarters at Wright-Patterson.

A peek into AFSAC's Humint activities were the contents of a June 6, 1984, pamphlet, "Air Force Humint Highlights," distributed by AFSAC to interested parties with the proper clearances. Those highlights included the Defense Liaison Program and the production of intelligence reports concerning communist bloc military capabilities, scientific and technical matters, the Third World, and Soviet missile and space programs.

AFSAC was not the only Air Force organization involved in Humint activities. Through at least the 1980s, US Air Forces in Europe conducted a collection program designated Creek Grab. It relied on exploiting targets of opportunity, when military and civilian USAF personnel—as well as other US employees—had access to information of intelligence value. Personnel were encouraged to photograph foreign aircraft that crashed or landed without incident. A USAFE regulation explained procedures for photographing aircraft, specifying that these shots would be most useful if they showed the cockpit interior, weapon systems controls, panel instruments, seats, weaponry, electronic gear (avionics, radar, black boxes, etc.), propulsion systems (air intake, variable geometry, fuel parts, and fuel tanks), and documents or management records.

Intelligence activities or organizations sometimes fade from view because they enter the "black" or secret world. At other times, it is a matter of the outfit or activity being eliminated or sharply reduced due to budget cuts or organizational changes. In the case of Air Force Humint it was the latter.

On Oct. 1, 1991, with the establishment of the Air Force Intelligence Command, AFSAC was deactivated and AFIC assumed responsibility for Air Force Humint. Exactly two years later, AFIC was redesignated the Air Intelligence Agency, and management of the Humint operations—the responsibility of the command's 696th Intelligence Group—moved to a Humint office within the intelligence agency.

By that time, Deputy Defense Secretary William J. Perry and CIA Director R. James Woolsey Jr. had decided to establish a Defense Humint Service (DHS) that would absorb all clandestine human intelligence collection activities conducted by DOD, leaving the services with only the





Photo by Vitaly V. Kuzman

limited mission—if they wanted it—for overt, "nonsensitive" collection to satisfy service-specific requirements that the new DHS could not.

The Air Force did try to maintain some Humint capability. In August 1995 a small flight was established within the AIA's 67th Operations Support Squadron to provide support to more than 50 reserve interrogators. Then in June 1996, Maj. Gen. Michael V. Hayden, who himself had some Humint experience, directed creation of an Active Duty Humint flight of 15 personnel within the 67th Intelligence Wing's operations support squadron. Its mission included collecting and reporting information from human sources (defectors, emigrés, travelers) and captured documents in response to requirements from Air Force component commanders.

By 2007, the CIA's Directorate of Operations had become the National Clandestine Service and the Defense Humint Service was closing down, with its case officers being transferred to the NCS. At the same time, a nascent Air Force Humint effort had been established at Wright-Patterson Air Force Base: Operating Location Dayton.

On Nov. 16, 2007, an upgraded version of OL-Dayton, Det. 6 of the Air Force Intelligence, Surveillance, and Reconnaissance Agency, was activated at Wright-Patterson. The new detachment was expected to have 17 operations personnel. Their primary targets were the secret aircraft programs of China, Russia, and other potential adversaries.

Then in August 2008, the Air Force website carried a story announcing that "Air Force officials re-established [USAF] human intelligence ... as a core intelligence discipline to focus on critical Air Force Humint requirements." Maj. Gen. John C. Koziol, commander of AFISR Agency, said, "Our efforts are reintegrating Humint into the Air Force ISR arsenal" to meet combat requirements.

The press release also noted that the detachment would transition to a squadron-level effort in the next few years. That prediction came true in August 2010, when the AFISR Agency activated the Global Activities Squadron at Wright-Patterson.

As of October 2013, the squadron—with detachments at Colorado Springs, Colo., Joint Base Pearl Harbor-Hickam in Hawaii, Ramstein AB, Germany, and Bolling AFB, D.C.—was administratively subordinate to the Global Exploitation Intelligence Group of the National Air and Space Intelligence Center at Wright-Patterson.

Future Air Force Humint efforts are uncertain for two reasons.

One is a history of internal wavering as to the priority that should be assigned to Humint.

The second is external. The Pentagon has at various times sought to centralize control of all departmental and service clandestine and strategic Humint. In the late 1960s, the Defense Intelligence Agency established the Washington Field Activities Support Center, with the mission of coordinating DIA and service Humint activities. But it soon proved ineffective and was disbanded, although not before becoming known among its detractors as the "Washington Duplication and Delay Center."

Formation of Defense Humint Service led to the termination of the Army's substantial Humint effort and the end of the smaller Navy and Air Force programs. Then the DHS was eliminated.

Now, with the 2012 creation of DIA's Defense Clandestine Service it remains to be seen how much flexibility the services will have to conduct their own strategic or clandestine human intelligence programs. Given the history of on-again, off-again defensewide Humint initiatives—and service dissatisfaction with the relevance of both CIA and Pentagon human intelligence support—there may be more of a service willingness to fight to retain Humint capability.

Left: Western news crews film an air show in the Soviet Union. Center: Crowds watch a parade of Soviet weaponry in Red Square. The observers with cameras are almost certainly not Soviet citizens. Right: The MAKS air show at Ramenskoye Arpt., Russia. The end of the Cold War and collapse of the Soviet Union made it easier to get photographs of Russian weapon systems, but Humint is still a critical, if much smaller, requirement for USAF application of airpower.

The Air Force's interest in Humint can be gauged by a document issued under the auspices of Lt. Gen. Robert P. "Bob" Otto, deputy chief of staff for intelligence, surveillance, and reconnaissance. "Air Force ISR 2023: Delivering Decision Advantage" states, "Air Force Humint is a modest but essential area for investment. ... Air- and space-specific Humint requirements do not often break the national Humint system's threshold for collection priority. Even so, these requirements are critical for the [Air Force's] application of airpower and must be satisfied."

Whether the Air Force human intelligence effort prospers remains to be seen—by those approved to see it. ✪

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Eisen

A Mitchell bomber was specially modified to serve as General Eisenhower's personal frontline transport.

As Supreme Allied Commander in Europe during World War II, Gen. Dwight D. Eisenhower needed to be able to travel—quickly—to meet with top alliance leaders and field commanders and get a close-up view of the unfolding war.

Eisenhower had an eclectic collection of aircraft at his disposal for a variety of uses, but only one was specially made for him. It was a heavily converted B-25 Mitchell medium bomber, built and modified by North American Aviation, the same company that produced the B-25s that attacked Japan in 1942 in the famous Doolittle Raid. Eisenhower's B-25—serial No. 43-4030—is poorly documented and deliberately so.

The year it was built, American P-38 pilots in the Pacific executed a daring, long-range mission to shoot down a bomber known to be carrying Japanese Adm. Isoruku Yamamoto, who had planned and carried out the 1941 Pearl Harbor attack. His death was a severe blow to Japan's strategic effort and morale. Army censors did not want German pilots to be able to repeat that success by shooting down Eisenhower, and so photography of his aircraft was severely restricted—especially because it had a unique profile.

Although by early 1944, B-25s were rolling off the North American-operated Kansas City plant at a sustained pace of about 300 per month, a VIP version of the Mitchell was a wartime rarity. Serial No. 4030 came to be known as RB-25J(3), denoting that it was a rebuilt airplane and only the third Mitchell to be specially modified.

The factory-fresh aircraft, with full combat capability and wearing camouflage paint, flew from Kansas City to North American headquarters at Inglewood, Calif., on Feb. 29, 1944. There it was immediately turned over to the Field Services department for extensive modifications. A small cadre of the large plant's most capable mechanics and technicians was assembled and then divided into two work shifts. Presaging today's concurrency in aircraft construction, modifications were accomplished even as the engineering paperwork was being drawn.

Donald H. Kennedy was the factory engineer designated to oversee and document the modifications. There were two reasons North American wanted extensive records of the build: First, the company wanted to be able to defend its work should the airplane, with an American icon aboard, ever be lost to suspected structural failure. Second, if it proved a success, the company wanted to be able to build more like it if orders were received.

Photographs taken during the modifications confirm what Kennedy wrote decades later: "No effort was made to hide work on the special B-25, which stood in the open among others undergoing changes too late to include on the production line. Obviously, the best concealment was none at all."

Kennedy held frequent consultations with a number of specialists who would visit the work site. The Stress Department engineer would stop by for at least 30 minutes daily. Others from heat and vent, fuel systems, and the talents of an "electrical man" were called on to ensure project integrity.

THE PRESSURE WAS ON

Kennedy was "impressed by the worker who accomplished the life raft installation in the tail gun compartment entirely on his own, with no drawings, so that a cable from the pilot could open the hatch and deploy the raft."

As D-Day—the invasion of France—approached, the Army became increasingly anxious for delivery. "I had a hard time keeping up with the two shifts of workmen that modified the plane," Kennedy noted. "Sometimes the day crew would curse and tear out something done by the night gang. When possible, I made sketches before the work, but there was no way one could keep ahead. The pressure was on."

From Douglas aircraft, "commercial [airliner]-type blue wool aircraft seats were obtained … and installed. Plastic sheets were carried up the sides about halfway and blue or gray cloth the rest of the way, including headliner. The installation was not too good, as the workmen had no experience with cloth," Kennedy recalled. The airplane could comfortably seat 10 people—including pilots and other flight crew.

A folding map table extended the full width of the narrow passenger compartment, the lavatory was relocated farther aft, and a telephone was installed for contact with the pilot or ground stations.

Now bearing the military designation VB-25J, the Mitchell was test flown, photographed, and accepted by Army Air



Eisenhower's B-25 at the North American Aviation plant in Inglewood, Calif., on the day of delivery to the Army Air Forces, May 12, 1944.

hower's B-25

By John Fredrickson

Forces for flyaway on May 12, 1944. After intermediate stops, North American was informed that it safely arrived at Eighth Air Force in England. No further updates were provided as to its fate.

Hoping for any shred of information about "his" airplane, Kennedy followed the war news closely. A War Department dispatch dated July 29, 1944, disclosed that Eisenhower, in "air-conditioned comfort," had visited the front twice in a secretly constructed fast medium bomber, with blue cloth upholstered armchairs, folding worktable, and a telephone, to observe allied armies. The dispatch identified the flight crew as Maj. Laurence J. Hansen, pilot, and Capt. Richard F. Underwood, copilot. (The dispatch contained at least one bit of puffery since the B-25 had no air-conditioning).

The dearth of further information led aviation historians to speculate that Eisenhower seldom utilized it; however, recent research has turned up evidence that he used the B-25 frequently—but not exclusively—during the year following the D-Day invasion of June 6, 1944.

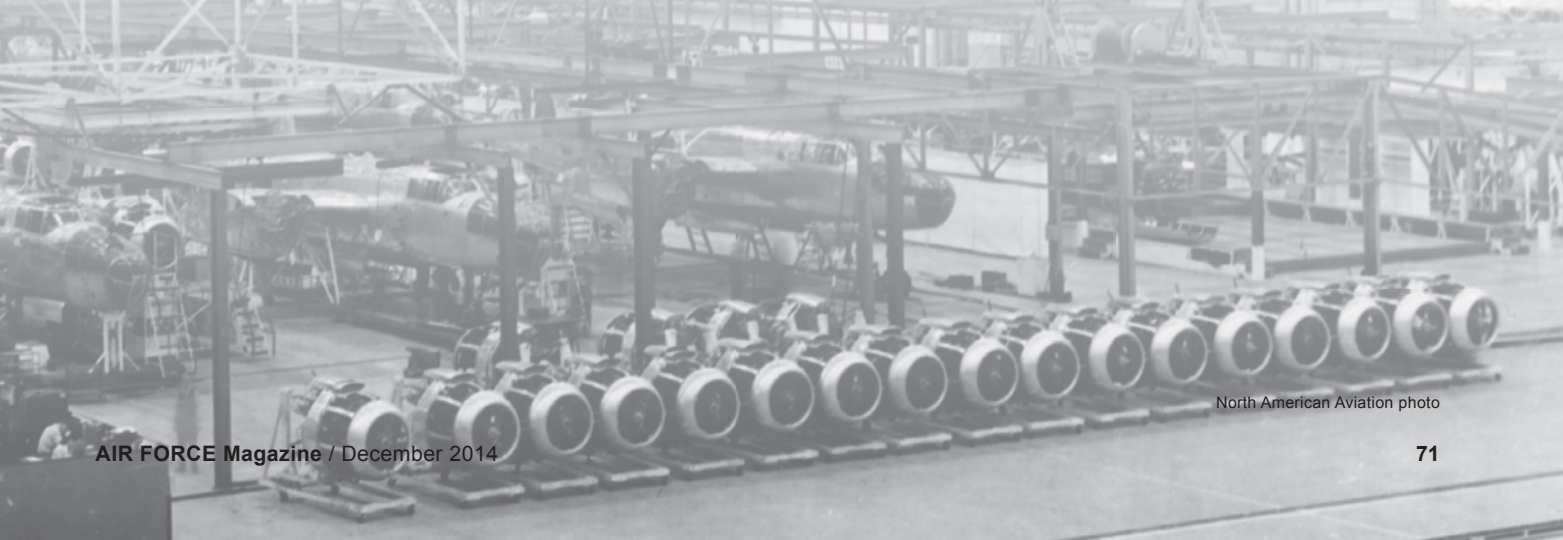
Hansen became one of Eisenhower's personal pilots. Born in 1917 and raised in Cleveland, he spent his teen years first dabbling in model airplanes, before flipping two dozen damaged motorcycles for profit after repairing them. He saved his earnings and spent them on pilot training.

By 1942, First Lieutenant Hansen was piloting Boeing B-17s on combat missions from England to France. In November, he received temporary orders to proceed to North Africa; his bombing days were over. For the next four years his new role would be as a VIP transport pilot—at first in B-17s—with other aircraft types to follow. It was at Algiers, Algeria, where Hansen first met Eisenhower. The two men subsequently established mutual trust and forged a lifelong friendship.

Hansen wrote about the arrival of a new B-25 airplane, which was to be used for fast, escorted flights back and forth across the English Channel. After the beachhead in France was established, they began to use the B-25 frequently, and many times there would be as many as 18 Mustang and Spitfire escorts for cross-channel protection.

Kay Summersby, who started out as Eisenhower's chauffeur and became a commissioned US Army officer and his aide, wrote of one such crossing in her 1948 book, *Eisenhower Was My Boss.*

"On July 29 I flew over with him in a B-25 escorted by fighters. We landed on a muddy airstrip known simply as 'A-9.' It was my first visit to Normandy and my first step on liberated Europe. … We stayed only a few hours and then returned to England."



North American Aviation photo



USA photos via Dwight D. Eisenhower Library

1



2

Airfield A-9 was an austere and temporary P-51 and P-38 forward operating base near the Normandy town of Le Molay. The single runway of steel mesh was 4,000 feet long.

Only one image of 43-4030 in wartime service or with Eisenhower has been located. The serial number on the tail is not visible; however, the unique side windows in the aft fuselage, combined with special sheet metal modifications to cover the tail gun mounts, make it evident that the aircraft is Eisenhower's special B-25J.

External modifications bestowed a unique appearance on the Mitchell. The aircraft was shorn of turret and all other armament. The nose was customized, and there were extra windows installed in the aft fuselage. It was likely the only B-25 in Europe during 1944 with this distinctive profile, thus making it a much sought-after prize for Luftwaffe pilots.

There is documentation that during this same time, Eisenhower also commuted in a special two-seat P-51 because it was faster and safer. As Allied battle lines advanced, a favorite activity was surprise visits to the troops on the front. Eisenhower made one or two of these ad hoc inspections per fortnight while also conducting many scheduled meetings with Allied military and civilian leaders.

The usual channel crossing was between Portsmouth, England, and the Cherbourg Peninsula. This was some 60 miles of open water. Several weeks after the invasion, Eisenhower moved his temporary headquarters to Granville, France, where Summersby and the other personal staff took up residence in a small, but cozy, oceanside villa.

IT GOES DOWN

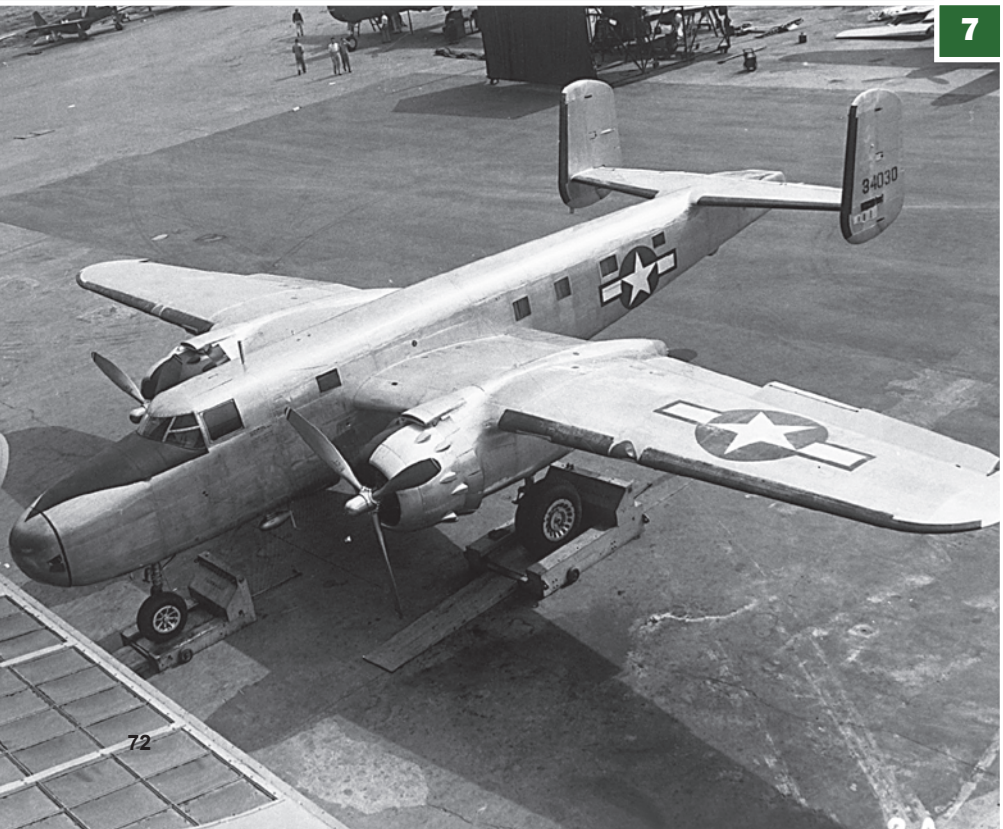
Eisenhower operated from Granville with the B-25 until American troops were several miles beyond Paris, when his headquarters was relocated forward to the Paris suburb of Versailles.

As expected, the Mitchell was durable and reliable. It was compact enough to get into and out of the smaller, sometimes sodden, airfields close to rapidly advancing Allied ground forces.

However, on Sept. 2, 1944, even the sturdy B-25 proved susceptible to poor airfield conditions. The aircraft was damaged, which disrupted Eisenhower's travel plans and put his safety at risk. Summersby wrote that, at this time, Ike had decided to visit Gen. George S. Patton, Third Army commander.

"'I'm going up and give Patton hell,' [Eisenhower] said, worrying because the Third Army's spectacular advance

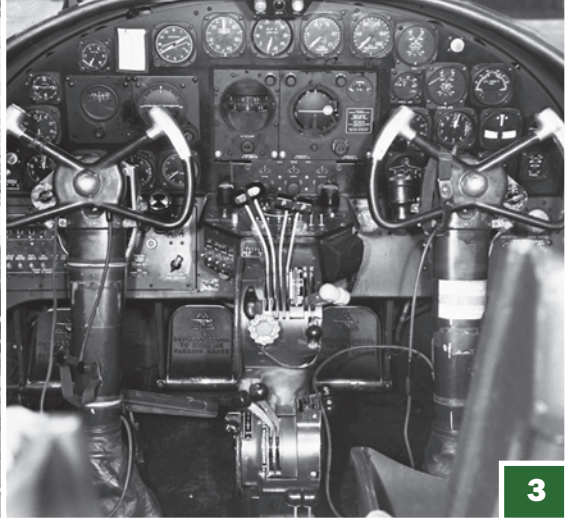
|7| Ike's modified B-25 being weighed at Inglewood the day before delivery to the Army Air Forces. The modifications changed the weight and balance of the aircraft. |8| Ike's primary pilot, Maj. Laurence Hansen.



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3 4

Photos via author

|1| Gen. Dwight Eisenhower speaks with (l-r) Gen. Jacob Devers, Lt. Gen. George Patton, and Lt. Gen. Alexander Patch in front of a C-47 transport in eastern France in March 1945. |2| The aircraft before an overhaul that included an avionics bay in the place of the bombardier's station. |3| The cockpit of Eisenhower's B-25 personal transport. |4| and |5| The B-25 at the Inglewood plant after modification. |6| Inside Eisenhower's converted aircraft.



5

6



stretched supply lines to the snapping point." Eisenhower departed in the B-25 early the next morning for planned face-to-face discussions with other generals.

Hansen continued the story: "On Sept. 2, 1944, we took off early in the morning in the B-25 to Laval, France, to pick up [Maj. Gen.] Hoyt Vandenberg. General Eisenhower was aboard, en route to a meeting with Gen. Omar Bradley at Chartres, France. Upon landing at Laval, we found nothing but a mud hole, and the field was very rough. I radioed to four P-47 escorts not to land because of the condition of the field. I was in a hurry to get airborne because we were holding the escorts overhead."

During the hasty departure, they found themselves on a collision course with a British Piper Cub taking off at their 90 degree position. A controller fired a flare to divert the Cub. Hansen continued: "I was at this point very unmaneuverable and just above the point of stall." The challenges of the day were just beginning and they would continue until after darkness fell.

At Chartres, the planned lengthy meeting between the generals was shortened when reports of bad weather to the west came in.

"We took off as quickly as possible and right after takeoff we noticed the right engine was on fire. Flames were shooting out around the engine nacelle and we immediately landed again." The airplane was evacuated on the runway.



South Dakota Air and Space Museum photo

The aircraft on display at the South Dakota Air and Space Museum near Ellsworth AFB, S.D.

The fire was the result of multiple broken exhaust stacks on one of the engines caused by the rough runway at Laval. Hansen stayed with the damaged B-25 and ferried it out later that same day, but Eisenhower, a warrior constantly on the move, did not have the patience to wait for repairs.

With the fire-damaged B-25 temporarily out of commission, Eisenhower commandeered Hansen's copilot, Underwood, and another airplane. They flew westward to Pontorson, another French coastal town just a short drive from Granville. Instead of spending the night or proceeding by automobile, Eisenhower elected an overwater flight back to his Granville residence with Underwood piloting a small L-5 liaison type aircraft that was kept at Pontorson as part of the Eisenhower's small fleet of various aircraft types. Eisenhower liked the L-5 and sometimes took early evening pleasure hops in them as a means to relax and unwind.

"He [had said that morning] he would be back in a couple of hours," Summersby wrote in her book. She and the other household staff at Granville grew increasingly alarmed when daytime faded into evening and Eisenhower failed to return. They called various airfields "only to learn the great Allied army had no trace of its own Supreme Commander."

Underwood took off with Eisenhower as the weather deteriorated, the airfield was hidden by clouds, and the remaining fuel supply was getting low. They elected to make an emergency landing on the deserted French beach—the second forced landing of the day.

Hansen wrote, "In order to save the plane from the incoming tide, the general and Dick [Underwood] pulled the airplane higher on the beach and in doing so the general wrenched his knee." After securing the aircraft, the pair staggered nearly a mile in the darkness to a road. A soldier, driving a jeep, stopped then stared incredulously at the Air Force pilot and the limping Army general who were both dripping wet and muddy. The GI asked no questions as he rushed them down the road to a warm and emotional reunion at the Granville villa.

Eisenhower was laid up for the next three days with a stiff leg and throbbing knee.

The press reported that Eisenhower had crashed. However, there was no crash and Ike suffered only the wrenched knee.

Hansen persisted for decades in the defense of his copilot, saying, "Underwood did a wonderful job with the uneventful landing on the beach in spite of possible mines and other obstacles."

WHAT HAPPENED AFTERWARD

As Ike's stature and entourage continued to grow, Hansen recognized the need for a bigger airplane with more range. The first of two new C-54s arrived in May of 1945.

With a gap in the trail of evidence, it's assumed that Eisenhower's B-25 was then relegated to the transport of other officers about the European Theater of Operations. In the turmoil following V-E Day, POW repatriation, postwar occupation of Germany, and constant squabbling with the Russians, the connection between Ike and 43-4030 faded from memory. The historical link was not re-established until 1981.

America was awash in surplus warplanes by late 1945. B-25s were cheap, abundant, and docile to fly. They filled a medium-size transport niche in a market then lacking in suitable alternatives. A cottage industry quickly evolved, turning surplus combat B-25s into corporate transports, firefighters, pilot trainers, and airborne filming platforms.

In the decade following the European war, Eisenhower became the 34th President of the United States. Coincidently, his B-25 was also in Washington, D.C. The Mitchell left Europe and arrived at Bolling Air Force Base in Washington, D.C., as a run-of-the-mill bomber-converted-to-transport aircraft with the new designation of CB-25J in January 1947. Since it lacked a large cargo door, it was better suited as a VIP transport.

In 1958, 43-4030 was reassigned to the 1001st Air Base Wing at nearby Andrews AFB, Md., where it served as a government VIP transport for travel back and forth within the US. Eisenhower may have even seen the diminutive airplane parked on the tarmac with the others as his presidential motorcade arrived and departed Andrews for travels aboard Air Force One.

In December 1958, the B-25J bearing the serial No. 43-4030 was retired, ferried to the "Boneyard" at Davis-Monthan AFB, Ariz., stricken from the rolls in February 1959, declared surplus, and sold for civilian use.

As the economic utility of the war surplus Mitchells faded, some ended up as crash victims while others were sidelined as weary, broken-down hulks at various airports. Many met their fate by becoming scrap metal while a fortunate few found new lives as restored museum pieces.

Eisenhower's airplane passed through several private owners and ended up as property of the Planes of Fame Air Museum in Chino, Calif. The museum noted the factory quality modifications but had no idea of the heritage of the airplane. The top of the bomb bay on a B-25 carries load between the wings. Lowering it to make a sleeping bunk for Eisenhower dictated complicated structural changes that could best be engineered and performed by the factory.

Planes of Fame displayed 43-4030 and flew it in several air shows around California before officials there tracked down its origins with the help of North American and the Air Force.

The Chino museum put the Mitchell up for sale in mid-1981, and it was acquired by the Air Force for placement at the Ellsworth AFB, S.D., museum. After an overnight journey, it touched down and returned to military ownership on Oct. 2, 1981, and local newsmen and former B-25 crew members were on hand to greet it. Following welcoming ceremonies, the airplane was pulled into a hangar so work could begin to restore it to its original appearance.

The B-25J bearing serial No. 43-4030 can be seen at the base, near Rapid City. ✪

John Fredrickson served more than 20 years in USAF and the Reserve. In 2011, he retired as a senior manager at Boeing. Along with John Roper, he is author of Kansas City B-25 Factory, *published in 2014. This is his first article for* Air Force Magazine.

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AFA National Report

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By Frances McKenney, Assistant Managing Editor

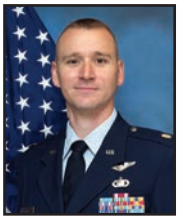
Emerging Leaders

The Air Force Association's Emerging Leaders Program began in 2013 as a way to prepare volunteers for future AFA leadership roles. Emerging Leaders serve for a year. They participate on a national-level council, attend national leader orientations, and serve as National Convention delegates.

Emerging Leaders for 2015 are: Emilie S. Boschert, Shannon M. Farrell, Deborah A. Landry, Mike Liquori, Emily C. Shay, Christopher M. Talbot, James A. Thurber, Jeremy Trotter, Eric J. Van Der Heide, and Daniel Whalen.

Here's the second profile in AFA's second group of Emerging Leaders.

Maj. Shannon M. Farrell



Home State: Missouri.

Chapter: Donald W. Steele Sr. Memorial.

Joined AFA: 1998.

AFA Offices: Central East Region Secretary and Executive Committee member. Former Chapter President and Awards VP, Eglin Chapter; Awards VP, Carl Vinson Memorial Chapter; and Membership Committee director, Montgomery Chapter.

Military Service: 12 years Active Duty.

Occupation: Engineer and program manager in weapons acquisition.

Education: B.S., University of Minnesota; M.S., AFIT; Master of Military Operational Art & Science, ACSC; M.A., American Military University.

Q&A:

How did you first learn of AFA? Arnold Air Society.

How can AFA attract new members? We've made changes to the way we've been trying to communicate—making strides in digital media. ... What we've always offered will continue to attract the same kind of people. Unfortunately, that's not the kind of people we need to attract anymore. ... We have to figure out better ways of telling young airmen about our benefits, about building a strong network. ... We have to enhance our informal mentoring.



Farrell runs in his first marathon, this past January, at the Museum of Aviation in Warner Robins, Ga.



Staff photo by Lyndsey Akers

At the CyberPatriot Program Office in Arlington, Va., Diane Miller gives an enthusiastic two thumbs up after turning on the scoring server to kick off season seven. Miller is CyberPatriot program director for Presenting Sponsor Northrop Grumman. Spring Grove High School in Pennsylvania was the first to connect to the server for CP-VII.

And They're Off: CyberPatriot Begins Season Seven

CyberPatriot, the Air Force Association's national youth cyber education program, began its seventh competition season on Oct. 24.

The CP-VII cyber defense competition involves a record 2,175 teams of high school and middle school students from 50 states, Canada, and DOD dependent schools in Europe and the Pacific. The first United Kingdom edition of the competition, called CyberCenturion, also got underway this fall.

During certain weekends in this school year, the teams will work online to find and fix cybersecurity vulnerabilities, in simulated environments, and complete other challenges. The top teams earn a trip to Washington, D.C., for the National Finals Competition.

The October kickoff began the first qualification round for high schoolers in both the All Service Division—teams affiliated with military branches—and the Open Division, encompassing all other, including home-schooled, students. (Middle school competition began in November.)

The Opening Bell in Los Angeles

In the Los Angeles area, more than 400 students from 146 teams swarmed onto the campus of California Polytechnic State University Pomona for LA's CyberPatriot weekend kickoff Oct. 25-26.

Harry A. Talbot, president of the **General Doolittle Los Angeles Area Chapter,** said, "It was an incredible opportunity to see kids together, focused on cybersecurity."

University officials from Cal Poly and Cal State Northridge thought so, too. During breaks in the competition, university representatives zeroed in on certain students. "They were out, actively recruiting our seniors," speaking to them one on one, encouraging them to apply to their universities, Talbot

"They're Always Bugging Me: 'What Can We Do, Mr. Emig?'"

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Red Tail Memorial Chapter President Michael Emig says the cadets from AFROTC Det. 150 at the University of Florida at Gainesville have turned to his chapter, looking for ideas on community service projects.

"We have a pretty close relationship," commented Emig. "They're always bugging me, 'What can we do, Mr. Emig?'" This, despite the nearly 40 miles the cadets must travel to get from Gainesville to Red Tail's center of activity in Ocala.

The chapter recently put the young volunteers to work on a fund-raising golf tournament in September hosted by the chapter and the local Civil Air Patrol squadron.

Thirty-one golfers hit the links. A chapter Community Partner, Chiropractic USA of Jasmine Square, entered three foursomes in the tournament, where they proved that good posture apparently makes good golfers: Chiropractic USA won the overall tournament. But there were no sore losers. The business donated sessions to members of the team with the lowest score.



Photo by Ben Langer

University of Florida cadets Audrey Fletcher, Lauren Hinrichs, and Christa Dizon (l-r) listen to Red Tail Memorial Chapter President Michael Emig give instructions on their tasks for the chapter's golf tournament.

The AFA chapter split the fund-raising proceeds with the CAP unit. Most of the Red Tail Chapter's portion went to the Wounded Airman Program. This AFA program complements the Air Force Wounded Warrior office and other DOD support systems, endeavoring to fill in any gaps by providing financial aid, lifestyle and accessibility equipment, or caregiver support.

pointed out. CyberPatriot experience makes the students "highly recruitable assets," he said.

The CyberPatriot crowd—not even counting some 70 other students who competed from their own high school campuses—has nearly outgrown Cal Poly's facilities. On this Saturday and Sunday, they filled auditoriums, conference rooms, and classrooms. With so many laptops, they "almost exceeded the bandwidth" available to them on the campus, Talbot said.

Among the students were the previous CyberPatriot season's champions: Team Azure, from North Hollywood High. They won the Open Division first place award at the National Finals last March. (At the same venue, a Civil Air Patrol team from San Pedro, Calif., won first place in the Middle School Division. Last season was the first time CyberPatriot opened the competition to middle schoolers.)

The Doolittle Chapter supports local CyberPatriot teams financially and helped the Los Angeles Unified School District incorporate the competition into its before- and after-school program called Beyond the Bell. Talbot is administrative coordinator for Beyond the Bell.

In the spring, CyberPatriot will introduce its elementary school initiative, designed to teach youngsters the basics of cybersecurity and encourage them to study science, technology, engineering, and math.

Chuck Yeager: In the Presence of a Legend

In World War II, he was a double ace. In 1947, he broke the sound barrier. But for all his world renown, Air Force legend Chuck Yeager still calls West Virginia his home state. So when he came to Charleston, W.Va., in October, officers from the **Chuck Yeager Chapter** had a chance to meet him.

President Herman Nicely, VP Sam Haddad, and Secretary Sandy Latimer spent nearly two hours with the retired brigadier general, along with 13 students from nearby Marshall University. The eight freshmen and five sophomores are Yeager Scholars, selected to receive full tuition and room and board at the university, as well as two opportunities to study abroad.

Yeager periodically travels from his home in California—he's a member of the **David J. Price/Beale Chapter**—to meet recipients of the scholarship funded by private donors and named for him. This time, AFA chapter representatives joined the group, gathered at the office of US Sen. Joe Manchin (D-W.Va.), an old friend of Yeager.

The scholars introduced themselves and, during a Q&A, asked Yeager questions ranging back to his World War II



Photo by Mara Boggs

Chuck Yeager (second from left) met officers of the West Virginia chapter named in his honor. At the October event are left to right: VP Sam Haddad, Chapter President Herk Nicely, and Secretary Sandy Latimer.



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years, when he earned 11.5 aerial victory credits in Europe. One student asked about Yeager's escape from German-occupied France after being shot down. (See "Escaping the Continent," October, p. 70.) Yeager replied that he'd grown up eating squirrel, rabbits, and berries in West Virginia, so survival in austere conditions was not something new.

Nicely said he was impressed that Yeager is 91 years old, yet two years ago, broke the sound barrier—again—in an F-15. The Oct. 14, 2012, flight took place over the Mojave Desert, at the same day and location where he first flew beyond Mach 1 in 1947.

How did the chapter officers gain entrée to the Yeager Scholars event? Turns out Mara Boggs, who is Machin's state director and an Army vet, attended a Yeager Chapter meeting in September and extended the invitation.

South Florida's Airmen of the Year

The **Miami-Homestead Chapter's** combined Outstanding Airman of the Year awards ceremony and Air Force anniversary celebration brought out several VIP guests.

Held Sept. 16 at the Conference Center of the Americas in US Southern Command's headquarters in Miami, the event featured remarks from Brig. Gen. Thomas W. Geary. He is the SOUTHCOM ISR director and the Air Force element commander. Geary spoke to an audience that included USMC Gen. John F. Kelly, the SOUTHCOM commander; Army Lt. Gen. Kenneth E. Tovo, the deputy commander; and USAF Maj. Gen. Mark C. Nowland, the chief of staff.



US Army Garrison-Miami photo by Arthur McQueen

Brig. Gen. Thomas Geary, USSOUTHCOM intelligence, surveillance, and reconnaissance director, addresses an audience at command headquarters in Miami. The gathering celebrated the Air Force's anniversary and SOUTHCOM Outstanding Airmen, selected with help from the Miami-Homestead Chapter.

Miami-Homestead Chapter President Rodrigo J. Huete followed Geary at the podium. The chapter established the Outstanding Airman Award in 2012, Huete told the audience. Airmen at SOUTHCOM headquarters, at Special Operations Command South, at Joint Interagency Task Force-South, and from Homestead ARB, Fla., compete for this award.

Two senior master sergeants and a master sergeant, all from SOUTHCOM, and three chapter Executive Council members vetted the candidates.

"I will tell you that it was extremely difficult to select a winner from the candidates in each category," Huete said, before naming the awardees. They were: SrA. Dustin N. Besch, from Joint Interagency Task Force South in Key West; TSgt. Bryan S. Peterson from Homestead; and MSgt. Ashlie D. Bartholomew and Capt. Katelyn M. Dorey, both from SOUTHCOM.

Following tradition, the oldest airman—Mario Garza—and the young-

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In Florida, Gold Coast Chapter's Ran Meriam (center) received an AFA Exceptional Service Award. He's flanked by Rod Edmond (left) and Chapter VP Leo Gray. Meriam is best known for ensuring restoration—twice—of an F-86 Sabre displayed at Fort Lauderdale's Holiday Park. See "To Its Former Glory," May 2005, p. 172, and "To Its Former Glory—Again," January 2010, p. 71.

USAF photo by Lt. Cory Concha



Golden Triangle President Sonic Johnson congratulates Gabriella Belardo, the Mike and Gail Donley Spouse Scholarship winner from Columbus AFB, Miss. The chapter and local Chamber of Commerce hosted a reception for her. At right is her spouse, SrA. Arne Belardo, an air traffic controller with the 14th Operations Support Squadron. Arne's sister, Stephannie Belardo is second from left. Gabriella Belardo is studying nursing at the Mississippi University for Women.

est—SrA. Brendan Allison—cut the large sheet cake decorated to highlight the 67th anniversary of the Air Force's founding on Sept. 18, 1947.

The Birthday in Sarasota

On Florida's Gulf Coast side, meanwhile, a former Air Staff official helped the **Sarasota-Manatee Chapter** observe the Air Force's birthday.

Michael I. Yarymovych, who served as the Air Force chief scientist from 1973 to 1975, was guest speaker for the chapter's September meeting. He spoke about how technology paced the development of the Air Force and described several examples, among them, the Manned Orbiting Laboratory of the early 1960s, communication satellites, stealth technology, and remotely piloted vehicles.

Chapter President Michael Richardson then announced that funds raised that evening would be given in the scientist's name to AFA's Wounded Airman Program. Donations came to $755, more than double the chapter's previous high-water mark, Richardson later wrote.

Two 91-year-old World War II veterans Richard Kanner and Louis S. Baron cut the birthday cake for this anniversary, along with 11-year-old Civil Air Patrol cadet Quinn DuBre. ✪

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Artwork by Zaur Eylanbekov

Tu-95/142 Bear



The Tu-95 Bear strategic bomber is a Cold War icon that has outlived its Soviet provenance. This large, four-engine turboprop aircraft, designed by Tupolev, was once a symbol of USSR power, mounting patrols near US and NATO countries' borders. The Soviet Union is gone, but the Bear lives on—more than 60 years after its birth—as a bomber and missile carrier in the Russian arsenal.

For the Bear, Tupolev chose turboprops rather than underpowered piston or fuel-guzzling (and therefore shorter-range) jet systems. The compromise worked. Four eight-bladed contrarotating propellers provided power and range. Fuselage design was conventional, with wings swept at a distinctive 35-degree angle. Tricycle landing gear retracted backward. It had—and still has—a tail gun. The Bear is the only prop-powered strategic bomber still in operation. Like the US Air Force B-52, it has enjoyed a long life because of adaptability. It was built to drop free-fall nuclear bombs but was modified for cruise missile carriage, maritime patrol, airborne surveillance, and electronic warfare.

The Russian Air Force fields Tu-95MS Bear-H bombers, while Tu-142 Bear-F and Bear-J maritime reconnaissance and communication aircraft serve with Russian Naval Aviation. Plans call for the Bear to remain in active service until 2040, at least. It has once again become an irritant in Washington-Moscow relations. In recent years, and especially since mid-2014, Bears have flown many missions into US and Canadian air defense identification zones, causing US fighters to scramble.

—Robert S. Dudney with Walter J. Boyne



This aircraft: Russian air force Tu-95MS Bear H—Bort 33 Black—as it looked in the early 2000s when assigned to 184th Guards Heavy Bomber Air Regiment, Engels AB, Russia.

In Brief

Designed, built by Tupolev OKB ★ first flight Nov. 12, 1952 ★ number built 500+ ★ crew (typical) of six: pilot, copilot, flight engineer, communications system operator, navigator, tail gunner ★ **Specific to Tu-95MS:** Four Kuznetsov NK-12M turboprop engines ★ defensive armament one or two 23 mm AM-23 autocannon in tail turret ★ load up to 33,000 lb, including Kh-20, Kh-22, Kh-55/101/102 air-to-surface missiles ★ max speed 516 mph ★ cruise speed 457 mph ★ max range (loaded) 5,282 mi ★ max weight (loaded) 407,848 lb ★ span 164 ft 2 in ★ length 161 ft 2 in ★ height 43 ft 8 in.

Famous Fliers

Notables: V. M. Bezbokov, A. G. Molodchi, M. P. Taran (all Hero of the Soviet Union awardees); M. M. Kharitonov, V. P. Pavlov. **Test pilot:** Alexey Pereliot.

Interesting Facts

Carried and dropped, in 1961, the 58-megaton "Czar Bomba," the most powerful nuclear weapon ever detonated ★ produced for more than 50 years (1952-94) ★ recommenced patrols in August 2007, ending hiatus of 15 years ★ misnamed for years by NATO intelligence as Tu-20 ★ in 2008 exercise, fired live, strategic-range Kh-55 cruise missiles ★ used experimentally to carry and air-launch a MiG-19 aircraft ★ provided basic airframe design for Tu-114 airliner ★ Maritime reconnaissance, antisubmarine warfare, and communications variants received Tu-142 designation and serve with Russian and Indian navies ★ has propellers whose blade tips move supersonically, making it extremely loud.

DOD photo



A Soviet-built Tu-142 Bear F reconnaissance aircraft belonging to the Indian navy (r) and a US Navy F-14A Tomcat.

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