

April 2014/\$10

# **AIR FORCE** *Journal of the Air Force Association*

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## **MAGAZINE**

**Smaller, But Still the Best**

**AFA's Air Warfare Symposium  
Nuclear Readiness  
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**About the cover:** An F-16 on the ramp at Duluth, Minn. See "Smaller, But Still the Best," p. 22. USAF photo by SrA. Donald Acton.





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**AIR** NATIONAL  
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## Crimea and Punishment

WASHINGTON, D.C., MARCH 21, 2014

**I**N 1938, Adolf Hitler decided to bring Czechoslovakia's Sudetenland under German control. Sympathetic Germans rioted, Czechoslovakian forces responded, and Hitler decried alleged "atrocities" against the Sudeten Germans. He declared the right to defend the Germans in Czechoslovakia—by force if necessary.

That September, in one of the more disgraceful 20th-century decisions, British, French, and Italian leaders met with Hitler in Munich and agreed to give the Sudetenland to Germany. Czechoslovakia was not present for the talks. Hitler was neither appeased nor finished.

Fast-forward 76 years, and there are disturbing parallels playing out between Russia and Ukraine.

When Ukraine earlier this year overthrew despotic President Viktor Yanukovich, Russian President Vladimir Putin refused to recognize Ukraine's new government. Putin instead declared the right to protect ethnic Russians in Ukraine—by force if necessary.

Russian forces soon spread out and seized Ukraine's Crimean Peninsula, an area with a majority-Russian population. The pretext was that ethnic Russians were threatened by Ukrainian lawlessness and terrorists. "Not a single piece of credible evidence supports any one of these claims," replied Secretary of State John F. Kerry.

Putin even claimed the occupying forces were not Russian military but concerned militia forces. Nearly no one believed this fiction as the forces wore Russian style uniforms, drove Russian military vehicles, and in one case took over a Ukrainian airfield after arriving aboard Russian Il-76 aircraft.

Putin has shown little tolerance for Ukrainian sovereignty and with the peninsula firmly under Russian military control, on March 16 the people in Crimea voted to leave Ukraine and become part of Russia. The White House declared in advance that this referendum "would never be recognized by the United States."

Allegedly, more than 95 percent of the voters chose unification with Russia in a highly flawed election held under military occupation. The ridiculously lopsided margin must have made old Soviets proud.

Russian forces ramped up large military exercises near Ukraine's border and seized a natural gas terminal farther into Ukraine. On March 18, Putin took the next step and officially claimed Crimea as part of Russia.

The civilized world now has a choice. It can either stand up to Putin and fight (literally or figuratively) to return Crimea to Ukraine. Or it can declare the problem too difficult to solve and allow Russia to seize another's territory.

**This is a quarrel in a faraway country, between people of whom we know nothing, but that is enough.**

The US has asserted all along that Russia must respect Ukrainian sovereignty and Russian forces must return to the bases they lease in Crimea.

In 1938, British Prime Minister Neville Chamberlain described Czechoslovakia's struggle as "a quarrel in a faraway country, between people of whom we know nothing."

There are plenty of reasons not to take action for Ukraine either. Russia holds all the military cards in the region. The people in Crimea are Russian anyway. Crimea "only" became part of Ukraine in 1954. The excuses should not matter.

Putin will not stop threatening his neighbors until he is made to stop. Under his leadership, Russia has already effectively annexed parts of Moldova and Georgia. The eastern half of Ukraine, which also has large numbers of ethnic Russians, could be the next area to require "protection."

Talk is cheap. The US and its allies must be willing to take firm action to convince Putin to back down and restore the international order. Several important first steps have already been taken.

■ The US moved six additional F-15C fighters and two KC-135 tankers to Lithuania to bolster the USAF-led air defense mission on Russia's northwest border.

■ USAF deployed a dozen F-16s to Poland for allied exercises and beefed up the detachments that host Viper and C-130 training rotations there.

■ The US Navy moved a destroyer into the Black Sea for exercises with Romania and Bulgaria.

■ NATO began flying AWACS aircraft over Poland and Romania to monitor their borders with Russia.

■ The US suspended military-to-military engagements with Russia.

These moves send a powerful message that the US is committed to defending its allies, but they are not nearly enough to force Russia to back down.

To be clear: This is not a call for war. There is not (yet) a vital US interest at stake in Ukraine, so this territorial dispute is not worth having Americans die over. But the US military action on Russia's periphery adds considerable credibility to the accompanying economic action.

The US has halted preparations for a G-8 meeting of leading industrial nations in Sochi, and has instituted some financial and travel restrictions on people with ties to the Crimean takeover.

The US should next ramp up its international fuel sales to increase supply, lower prices, and weaken Russia's main economic strength. The seven truly democratic members of the G-8 should also immediately set a deadline to kick Russia out of the group.

If Russia still does not return Ukraine's territory, the US and Europe must undertake much stronger and broader sanctions targeting Russian elites and institutions. Hit Putin, his cronies, and Russia's oligarchs where it hurts—in their wallets (through asset seizures and trade bans) and in their lifestyles (through travel bans).

If Russia's elites cannot access large chunks of their money, conduct business with the West, or shuttle at will between New York, Paris, and London, they will soon be calling for relief. Putin is unlikely to alienate his own supporters for the sake of Crimea.

The US has been far too compliant toward Russia's recent military expansionism. The world community needs to take serious action, and the US will have to lead the way.

A war over Crimea would be devastating for the US, Russia, and Ukraine, but America has the economic and political strength to match its military prowess. This should make war unnecessary. The US is only helpless against Russia if it chooses to be. ■



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## Give Peace a Chance

Prediction: The letter by retired USAF Col. Robert J. Sallee in the February issue of *Air Force Magazine* [*"Imagine All the People,"* p. 6] will generate more responses than any single letter (or article for that matter) in recent memory. Some will attack his suppositions paragraph by paragraph. I will concede there are readers who agree with Colonel Sallee. Possibly, the last commander in chief of Strategic Air Command (SAC), Gen. Lee Butler, among them.

Here is my view: What begins as a thoughtful and coherent thesis devolves into a hyperbole-laced piece seemingly opined by a sandal-wearing, pony-tailed, sign-waving, aging hippie/peacenik left over from the 1960s.

I would point to just two (of many) of his more ludicrous statements: his inference of a pre-emptive nuclear strike on an enemy country by the United States. Never, repeat, never, in its history has this nation, its government or military, ever espoused a such policy or strategy beyond a theoretical discussion.

Secondly, Sallee apparently believes that the success of the nuclear deterrence provided by SAC during its existence is not borne out by history. A clear rebuttal to that inane position is that a nuclear Armageddon never happened. In the words of President George H. W. Bush, "The Cold War didn't just 'end.' It was won."

What other overriding evidence is needed?

Lt. Col. Max R. Moore,  
USAF (Ret.)  
Bellevue, Neb.

Colonel Sallee made some interesting comments in his article, especially when he advocates the elimination of all nuclear weapons. It would be a

great move in the right direction if all countries that have nuclear weapons would take positive action to eliminate their nuclear weapons and stockpiles of plutonium. It will never happen, and I would venture to say that no nation is going to give up its nuclear deterrent capabilities.

Russia has the largest underground city and storage of plutonium, and Russia maintains more ICBM missiles, etc., to include submarines with nuclear weapons. China has just put into operation its new nuclear submarines with such weapons. It is apparent that world leaders want this type of weapon as a deterrent, and I suspect this has been so since the introduction of nuclear weapons. Iran will soon have its nuclear weapons—they believe they have the right to join the nuclear teams around the world. President Obama has declared that the United States needs to eliminate its nuclear weapons program altogether.

Don't think for one minute that such countries like North Korea, Iran, China, or Russia would even consider doing such with their nuclear programs.

Yes, it is a horrible weapon, but if it were not nuclear, countries would then come up with deadly chemical weapons, just like the one Chemical Ali in Iraq used to kill 5,000 people—and all living creatures—in the small town where he used them. No, Colonel Sallee, I don't believe giving up nuclear weapons is the answer. Getting world leaders to work in harmony just doesn't seem to stop the madness that is always ongoing in the world. There will always be wars and rumors of wars. It will never change!

Lt. Col. Donald E. Evett,  
USAF (Ret.)  
Bountiful, Utah

I'm old and grumpy enough to know when to shut up and keep quiet;

hence, I do not write (or email) my opinions frequently, if at all—no social networker am I. But there are just some times when I read something so outrageous and unbelievable that I have to grump out loud.

I am referring to the letter from Col. Robert J. Sallee, who earned his "BS in SAC-ology." First, let me just state that I served in SAC from 1958 to 1966, and with all due respect, must submit that "BS" must stand for some type of bovine excrement, not the SAC I knew.

[Sallee asks:] "Would we [the US] really ever employ nuclear forces to annihilate a sovereign nation we see as our enemy?" Ans: I sure as hell hope so!! SAC was ready to do just that, and that threat did keep the peace. We should remember that.

"Our national propensity to attack other foreign powers ... communicated to the world that the US is a dangerous aggressor." Aw, c'mon, Colonel Sallee, that sounds like worn-out Soviet propaganda. I hope you didn't mean that, but you did say it.

"Nuclear weapons had no role in deterring the Soviets during the Cuban missile crisis; they were deterred by the presence of US naval forces." Well, the Navy will love you for 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 name and city/base and state are not acceptable. Photographs cannot be used or returned.—THE EDITORS



Colonel, but a lot of historians do not agree.

I think the good colonel needs to read more—or read closer—the “history” books on his shelves. Nuclear weapons are here to stay and have served us well, from the cities of World War II Japan through the not-so-Cold War. We should be thankful for that.

Peter M. Hansen  
Torrance, Calif.

My five years working at the State Department in arms control treaties certainly brought home the insanity of nuclear Armageddon, but it also engrained the reality that the State Department, if allowed, would “give away the farm” in military power—that’s why GIs were detailed to State, to preclude such folly.

No major wars since nukes.

Colonel Sallee is dead wrong about the “12 Days of October” Cuban missile crisis. It had everything to do with nukes, because it was the Soviet response to our stationing nukes in Turkey and Italy, and it was indeed a MAD standoff! Khrushchev’s Oct. 24, 1962, communiqué to President Kennedy stated that [he considered] the US blockade of “international waters and air space to constitute an act of aggression propelling humankind into the abyss of a world nuclear-missile war.”

The next reality Colonel Sallee ignores: As tragic as it was to kill over 100,000 noncombatants [in Hiroshima], there is also the reality he ignores that projected casualties of protracting the war a year or two longer were at least another 250,000 US casualties and a much greater number of Japanese casualties; that’s exactly why the President authorized a nuclear attack! I could go on, but there are so many holes in Colonel Sallee’s letter, I suddenly have a craving for Swiss cheese.

Yes, the nature of warfare has significantly changed after the turn of the century, but the realities of the US unilaterally “going to zero” portend nuclear blackmail in a number of scenarios.

I would, however, posit a half measure short of zero. We might now, just as with our aircraft and submarines, “de-alert” at least a portion of the fleet—maybe even “rotate” full alert status with one base while the other two temporarily stand down. Just like, for example, aircraft carriers, the crews stand down for a while (most of the time) back in port and the assets/systems are refitted/modernized as necessary. Applying this concept to missile bases, two of them could relax, train, refit in a more casual,

appropriate for the times atmosphere, and still maintain a viable triad against all threats and technology surprises/bolt-out-of-the-blue (this is the enduring justification for the triad). If we had reduced to 50 Peacekeepers with 10 warheads, this would have freed up a few billion dollars for the global counterterrorism fight, especially against the WMD threat. However, even the partial de-alert mode will free up a modicum of funding. And there’s always going back to multiple independently targetable re-entry vehicles (MIRVs), since the Russians just announced a new MIRV missile. We could restack three warheads at one existing Minuteman base and shut down the other two. (Malmstrom is the best base.)

I’ll shut up now and get off the stage. But I felt compelled to respond when yet another in a long line of misguided, jaundiced, twisted, half-truth histories is presented (once again) as bearing truth about a lack of justice in the American way. So many times I’ve wished folks would get their facts straight and tell the whole, true story; but that’s why I abhor politics.

Lt. Col. Bob Stevens,  
USAF (Ret.)  
Fairfax Station, Va.

### **I Never Promised You a Rose Garden**

I take exception to the premise of your editorial [*“Compensation Controversies,” February, p. 4*] that our government must honor and totally fulfill any and all so-called “promises” made or imagined by previous Administrations or by previous senior government officials. Our current government, and future governments that we elect, should not be bound by the so-called “promises” of previous Administrations. Circumstances change, and to be of the opinion that a current Administration must be shackled by what may have proven to be the excessive largess of predecessors is not in the best interests of our democracy. I have always believed that our government, with different Administrations, has treated military personnel and military retirees in a fair and equitable manner. I do agree that any reductions and givebacks should and must include all government civilians and all branches of government.

One area of greatly growing expense significantly disturbs me, and that is because over 60 percent of our personnel returning from duty in the Middle East are applying or have applied for service-connected disability payment. This includes Air Force and Navy personnel, whose duty requirements for the most part do not require road patrols and the hazards of IEDs.

These applications are being made for multiple causes, i.e., headaches, backaches, carpal tunnel syndrome, sleep disorder, hearing loss, depression, anxiety, PTSD, etc. I believe one buddy tells another buddy, “Hey, man, you need to apply, it’s free money for life, and the more things you list, the more likely it will be approved.” As a comparison, only 20 percent of those returning from Vietnam applied for disability. The huge and mounting costs of this out-of-control program will not affect me, but our children and grandchildren will have to bear this excessive financial burden for many years to come.

Col. Lee R. Pitzer,  
USAF (Ret.)  
O’Fallon, Ill.

As a retention tool in the early 1980s, our leaders sent us statements once a year that advertised the “true” value of our compensation as Air Force members. It always included some amusing assumptions and exaggerations, such as the value of the Aero Club memberships, which few of us had at the time. Our leaders today and, sadly, now with Air Force Association editorial endorsement, are using a similar approach. This time their campaign is to attack the pay and benefits of military members (current, retired, and future) to spend those dollars elsewhere.

This campaign’s assumptions are far from amusing. Its false premise is that the current structure of military compensation, especially for retirees, is “unsustainable” and even unfair. The leaders in this campaign are relying on fallacies to convince others and perhaps even themselves.

They use derogatory and insulting terminology to portray members as burdensome and greedy.

They mislead with errors and distortions. Their estimate for the percentage share of personnel costs went from 33 percent of the DOD budget to 50 percent in just nine months. How? Creative accounting—adding questionable costs to the ledger to artificially exaggerate the appearance of a crisis. They make obscure comparisons to faulty baselines and create shady statistics when the facts don’t support them, such as their made-up numbers for Tricare premium increases, even as they try to redirect health care funds to spend on other priorities.

They [look to] foolish and destructive solutions to their problems, such as civilianizing the military retirement system. They are desperate to believe that the sacrifices of military service can be made equivalent to private in-

dustries whose purpose is to produce financial gains for shareholders.

The stakes in this campaign are significant, not only for individual members, but also the future effectiveness of our armed forces and for national security. Caring for those “who shall have borne the battle” is a necessary and altogether worthy expense that everyone in America owes its defenders. It’s time for our leaders to begin rebuilding some credibility as principled stewards of a strong defense. That includes standing up for their people, not sacrificing them for financial convenience.

Lt. Col. Timothy M. Cook,  
USAF (Ret.)  
Dayton, Ohio

Our politicians, from the Commander in Chief on down to our newest congressman/senators, never get a cut in their annual pay or retirements—which they vote on for themselves. Why is it the first ones they want to sacrifice [are] the military retirees?

I am retired ('76) and served in the Navy and Air Force. My son was lost at sea while serving in the Navy (Jan. 23, 1985). My grandson is now serving in the Army (two tours in Afghanistan). I am proud to say my family is proud to serve our country.

Ronald Miller,  
USAF and USN (Ret.)  
Las Vegas

### Total Total Force, Please

In the February 2014 article, “Sharpening the Raptor’s Talons” [p. 26], I’m surprised nothing was said about the contribution of the Total Force (Air National Guard and Air Force Reserve) to the combat readiness of the Raptor. Since our move from Richmond IAP to Langley AFB in 2007, the 192nd Fighter Wing (Virginia ANG) has been a critical partner with the 1st FW in every aspect. I know the same can be said of the AFRC and ANG partners at Elmendorf, Holloman, Nellis, Tyndall, and Hickam. My point is not to lessen our Active Duty brethren, but given how much USAF is in a Total Force structure—as pointed out in the report on the National Commission on the Structure of the Air Force—I’m suggesting articles printed about today’s Air Force tell the whole TFI story!

Col. Jay Pearsall,  
USAF (Ret.)  
Williamsburg, Va.

I know that I’m not alone in the numbers of readers who are probably also wondering how our Raptor pilots’ monthly flying hours stack up against

the flying hours flown by our allies and our intel on how many flying hours are actually being flown monthly by our potential adversaries (Iran, China, North Korea, etc.)? As Colonel Huyck pointed out, under severe budget constraints, his Raptor jocks are limited to a maximum of eight sorties and two simulator sessions per month (newer pilots have 10 sorties and three sim sessions per month)! The Raptor is considered to be a “complex weapons system platform.” And regardless of state-of-the-art and innovative technologies to enhance a pilot’s ability to fly and fight in the Raptor, a fighter pilot *needs* all the hours he/she can get to maintain proficiency at the highest levels possible. Back in the day, if I wasn’t flying at least three to five times per week (commercial, multi-engine, instrument ratings—in a much slower bird), I would notice a slight denigration in proficiency and the ability to remain ahead of the power curve for a short period of time until I again felt totally proficient. It varies, of course, from individual to individual. And, it appears that Colonel Huyck is doing everything humanly possible, under the circumstances, to maintain maximum proficiency for himself and his respective pilots. But it still begs the question: How do our flying hours to maintain proficiency stack up against those of nations we may have to confront in the future?

MSGt. Randolph E. Whitmire,  
USAF (Ret.)  
Rochester Hills, Mich.

On p. 28 of the February edition of *Air Force Magazine* an Australian pilot is designated with the rank of major. There is no such rank in the Royal Australian Air Force (RAAF). The equivalent rank would be squadron leader.

I always enjoy your magazine, especially the articles about events in World War I and II, Korea, Vietnam, Iraq, and Afghanistan. When I am finished reading it I give it to a school library where the boys are usually eagerly awaiting the next edition. Keep up the good work.

Tibor Pietzsch  
Townsville, Queensland,  
Australia

### Beetle Bailey, You’re Not

The picture of Air Force retirees on p.18 was as disrespectful as the Beetle Bailey cartoon in the newspaper [*“Air Force World,” February*]. If your editors believe that picture is an accurate description of an Air Force retiree, they have smoked far too

much weed! I would like to meet the person who thought that picture was appropriate. To say I was offended would be a vast understatement! I’m available any time, any place.

CMSgt. Robert Sully,  
USAF (Ret.)  
Sacramento, Calif.

### Tell the Good News

When I received my [February] *Air Force Magazine* yesterday, I was concerned about two significant pieces of deliberately eye-catching information during my quick review of the content.

On p. 21: “By the Numbers” [*“Air Force World”*] talking of the 34 missile officers assigned to the 341st Missile Wing at Malmstrom AFB, Mont., initially implicated in a cheating incident during a nuclear proficiency test. Making this “announcement” in such an eye-catching way in the magazine is not consistent with the Air Force Association’s mission to honor airmen and Air Force heritage. I think it would reflect the mission of AFA better had it listed the total number of Air Force missile officers and deduct the 34 that are implicated. Better to honor airmen and our Air Force heritage by telling your readers what small percentage of the missile crew force is involved.

Additionally, on p. 22, the retelling of the Major General Carey drunk-in-Russia story is another inconsistency. This has been reported broadly in the news and in this information era, I’m sure the majority of the readership of *Air Force Magazine* has heard this story. It doesn’t reflect well on the hundreds of thousands of Total Force airmen who uphold the core values daily and execute the mission in tough financial times to put these two stories at the front of your magazine.

*Air Force Magazine* is likely the only contact some members of the American public get with the United States Air Force and it is important that the full story be told in a way that matches the Air Force Association mission “to promote a dominant United States Air Force and a strong national defense and to honor airmen and our Air Force heritage.”

The magazine continues to improve, and I hope there is no effort to make it compete with *Air Force Times*. That is where stories such as Major General Carey’s failure to represent the Air Force in Moscow and the failures of these missile launch officers to uphold their core values are front-page news. And that is why *Air Force Times* is frequently found in the same retail position as *The National Enquirer*.

Thanks for telling the Air Force story

in your magazine—I look forward to every issue.

Lt. Col. Thomas Cooper,  
USAF  
Alexandria, Va.

It would be interesting to know how many, if any, of the officers implicated in the recent cheating scandal involving missile crews were also involved in the cheating on a calculus exam at the Air Force Academy a couple of years ago. Back in the day, as they say, cheating on an exam would have been grounds for immediate dismissal from any one of the service academies. However, those cadets were allowed to remain at the Air Force Academy. Sometimes what you see is what you get. On a SAC combat crew in the '50s and '60s we were constantly tested on special weapons procedures, positive control, aircraft emergency procedures, etc. I was never offered a crib sheet for any of those exams and never provided one to anyone else. You knew the people you flew with and might have to go to war with were competent professionals. Wouldn't it be nice if we could get back to that?

Lt. Col. Neil V. Mesler,  
USAF (Ret.)  
Canton, Ga.

#### Hail and Farewell.

It was with both a deep sense of pride and sadness that I read the story of the last of the World War II Doolittle Raiders' reunions [*"Mission Accomplished," February, p. 40*]. In the closing moments of the 1954 classic film "The Bridges at Toko-Ri," Fredric March's character, RADM George Tarrant, mutters to himself, "Where do we get such men?" Where, indeed.

In the summer of 2001 I attended the two-day Joplin Air Fest at Joplin, Mo., as a member of the Oklahoma Wing of the CAF. A Sunday show is traditionally slow in generating crowds until after church services, and on this Sunday morning a friend from the Kansas Jayhawk Wing asked me if I would like to take a trip into Joplin and meet a real war hero. He said that because of his advanced age we would only stay a brief while, and only my friend, myself, and two others would be going. On the way into town they told me that the war hero was retired Air Force Col. Travis Hoover. Col. Hoover flew the second B-25 off USS *Hornet* on that April 18th morning.

At the house we were let in by a very gracious lady named Ellen Lawson. Ellen was the widow of Capt. Ted Lawson, author of the World War II best-seller book *Thirty Seconds Over Tokyo*.

Ted and Travis had been friends since their cadet days, and the couples remained close over the years. With the death of Travis' wife in 1990 and Ted in 1992, both he and Ellen stayed in touch and in a great stroke of good fortune she was visiting this very weekend.

In 1944 MGM released the film "Thirty Seconds Over Tokyo." It starred Hollywood's perennial World War II boy-next-door heartthrob Van Johnson as Ted Lawson and Phyllis Thaxter as Ellen. The film was highly praised and considered to be one of the most genuine films to come out of the war. At one point I was able to ask Ellen what she thought of the movie version of Ted's book.

She smiled and told me that she was so embarrassed because Phyllis Thaxter was so much prettier than she was. She said Ms. Thaxter was gracious as well, and over the months of shooting a friendship grew between them. When I asked her what she thought of Van Johnson's portrayal of Ted Lawson she smiled again and said he was a perfect gentleman and a wonderful actor but added, "He is not nearly as handsome as my Ted!"

Sadly, Travis Hoover passed away on Jan. 17, 2004. Ellen Lawson died on Feb. 5, 2009. She and Ted are together at the Chico Cemetery, Butte County, Calif.

SMSGt. Rich Lindsey,  
ANG (Ret.)  
Mustang, Okla.

Nice article by Peter Grier entitled "Mission Accomplished," concerning the Doolittle Raiders' final toast ceremony.

I would like to make one small correction concerning an omission.

The commemorative wooden presentation cases containing custom labeled bottles of Hennessy cognac were presented to the Doolittle Survivors by the Liberty Aviation Museum on behalf of the remaining operators of flying B-25 Mitchell bombers in honor of the raiders. (The Liberty Aviation Museum's B-25 *Georgie's Gal* was also one of the B-25s that participated in the commemorative flyover that weekend.)

Of note concerning the design is that the boxes were entirely handmade using American black walnut. The boxes are held together with 16 Japanese cherrywood bowties.

The bowties represent the 16 B-25s used in the mission. The predominance of the use of American walnut over the Japanese cherry represents the United States' swift response to the Pearl Harbor attack and eventual overwhelming defeat of Japanese forces culminating with the end of World War II.



## Air Force Association

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### AFA's Mission

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

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

*Advocate for aerospace power and STEM education.*

*Support the Total Air Force family and promote aerospace education.*

I would like to commend the Hennessy Corp. for their past and continuing support of the Doolittle Raiders, especially since they downplay their substantial role of support and do not utilize their association with the raiders for profit or gain.

The Liberty Aviation Museum was very proud, but also very humbled, to be invited to this most solemn event to honor some of the greatest Americans who ever lived.

Edward G. Patrick Jr.  
Port Clinton, Ohio

### The Fog of History

I read with interest the histories of the Doolittle raid and the sad ending of the crew of the B-24 bomber, *Lady Be Good* [p. 70] as told in the February issue of *Air Force Magazine*. It rekindled a nagging personal struggle I (and possibly four other Air Force officers) have had over the past 40+ years and that also involves history.

I had returned to Southeast Asia in 1972 for my third tour there, having already flown 100 missions over North Vietnam in EB-66s during Rolling Thunder. Now I was back when the F-111s of the 474th TFW were deployed there in the latter half of '72. Since 7th AF had no experience with the Aardvark, four of us were seconded temporarily to Saigon to educate the staff on how to use this great (and still probably the best) attack aircraft. I went into target intelligence to help select suitable targets for the 111s and briefed General Vogt, 7th AF/CC, every afternoon on the targets.

I was soon appointed to the MiG Kill Board as one of its five members. We met to evaluate the claims of enemy kills by our airmen. The head of the board was a two-star general, whom I will not name as it appears he might still be living at an old age. Our five were composed of captains and majors, to include F-111 and F-105 crew members, with combat experience over North Vietnam and Laos, and intelligence officers.

We were really conscious of our obligation to history and to fairness, and to award a kill, we thought that the claim had to be irrefutable—a witness other than the claimant had to confirm that the enemy plane had been really destroyed, or its pilot had ejected, or it had been seen to have crashed, or if its destruction could be confirmed by gun camera film, etc. There were claims we denied with reticence, such as if a descending and smoking MiG were not actually confirmed destroyed as it went into heavy clouds and its end was not actually seen or filmed, etc. Then along came Linebacker II,

the B-52 component of which had us all open-mouthed in astonishment of its sheer lunacy, reminding me of the British saying of their soldiers in World War I, that they were lions led by donkeys (their generals). Here we had the most lethal air defenses in history, and SAC was sending their slow, unmaneuverable bombers into them in single-ship attacks. In the EB-66 at least we could split-S down and evade the SAMs, but not so the B-52s, in which I had some experience in four years in the old B model.

After Linebacker II we began to get claims of MiG kills by B-52 gunners. We were sympathetic to the SAC crews, as their courage was outstanding and we recognized it, and they deserved any rewards they received, but we did not understand the claims of the gunners, and the evidence offered was unverifiable. Most of their attacks were at night, there were no other witnesses, and their sole claim was that after firing their guns, their scopes “bloomed.” That was it.

After much discussion as to how to award these “kills,” we knew we would have to break the rules of evidence, and we thought that the “blooms” of the gun radars might even have been the returns of their own shells going out, as their radar frequencies would have had to be of a high order. We finally denied the claims.

On reading our report, the general walked into the room and personally ordered us to change our vote. His reason was simple: SAC was hurting, their morale was low, and they needed a boost to their spirits, so with a single order, we manufactured some history for SAC’s morale and for future historians. Medals were handed out to gunners, MiG Killer badges were made, etc., and given their courage in just flying those missions, I have no problem with all that.

I really do not know if any MiGs were shot down by B-52 gunners—the claims may well have been true, we just did not think we had enough evidence to award them. But I am pretty sure that the Air Force Security Service, which monitored enemy radio transmissions, would know, and only they could really verify these claims. The British Y Service monitored enemy air, sea, and land transmissions in World War II, so there is no secret in thinking that we had not discarded this technique 30 years later.

My only concern is in reading official histories now. I wonder how much has been written to make us all feel good.

Col. Peter M. Dunn,  
USAF (Ret.)  
Columbia, Mo.

Thank you so much for your excellent article on *Lady Be Good* in the February issue. My cousin, Bob LaMotte, was a 24-year-old radio operator on the B-24 and he bailed out with the rest of the crew before it crash-landed in the Sahara Desert in 1943. His mother was my dad’s sister.

Bob was the sixth child in his family of eight, born in Lake Linden, in the Upper Peninsula of Michigan. His mother, Alvina, and father, John, both lived to see their son’s body found in 1960 and brought back home for burial. On the day of the burial (about the first week of May) there was an unexpected blizzard and all the guests wore borrowed cold weather gear. Bob’s youngest brother, George, is the last of Bob’s immediate family and still lives in nearby Houghton with his wife, Henrietta.

In 1970, a propeller from *Lady* was brought to Lake Linden and mounted above an honor roll in front of the Lake Linden city hall.

Mary E. Breault Thornton  
Millstadt, Ill.

### Dragon Lady

In your February 2014 issue, it was great to see the U-2 Dragon Lady in the “Airpower Classics” section [p. 80]. There are a few corrections/clarifications I’d like to make:

“Because it takes so long to descend from its very high flights (70,000+ feet), a pilot must wear a ‘space suit’ at all times.” The length of the descent has nothing to do with our wearing of the pressure suit. It has to do with the fact that, in the event of cabin pressure loss, the suit is required so you don’t “boil” and die. Remember “Armstrong’s Line” from high school science?

- 104 were built, not 90.
- Endurance: in excess of 14 hours.
- Max Range: in excess of 7,000 miles.
- Cruise speed: 475 mph.
- Wingspan: 104 ft. Easy to remember: 104 were built, and the F-104 was used as a template for a lot of the jet.
- Max gross weight we can ever take off with is 40,000 pounds.

Test pilots: Keep in mind that Darryl Greenamyer and Skip Holm, while legendary test pilots, only flew the U-2 one time each. I spoke to Mr. Holm a few years ago, and he doesn’t remember too much about it, other than someone gave him the opportunity to do a flight in it. In any case, they were not involved with U-2 development, as best as I can tell. Now you know.

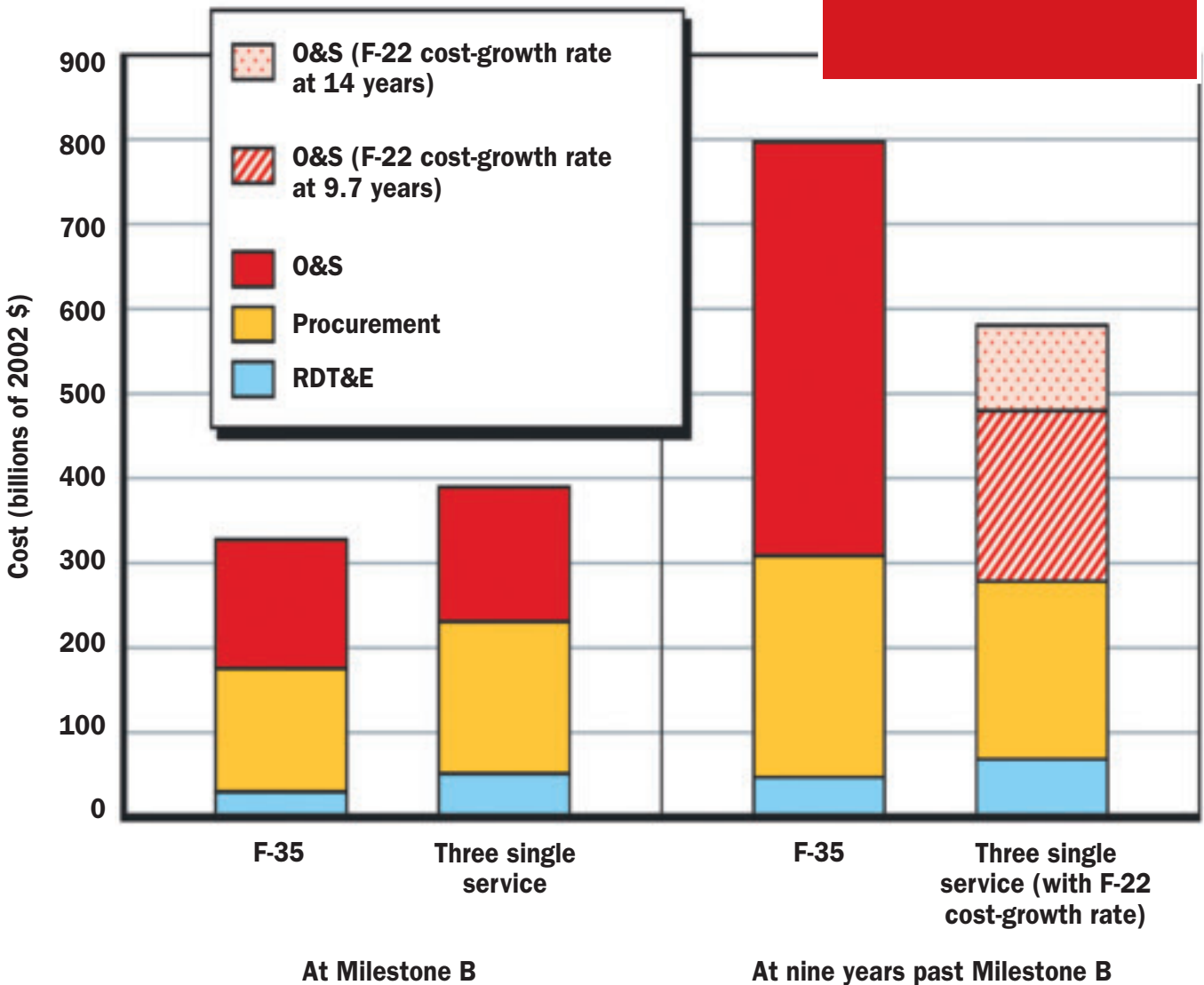
Lt. Col. Jon Huggins,  
USAF, U-2 instructor pilot  
Beale AFB, Calif.

## Facts About Joint Fighters

Do joint fighter programs save money? That is the provocative title of a RAND comparison of joint and single-service programs over 50 years. RAND's answer is a resounding, "No." It states: "The need to accommodate different service requirements in a single design or common design family can lead to greater program complexity, increased technical risk, and common functionality or increased weight

beyond that needed for some variants, potentially leading to higher overall cost, despite these efficiencies." This has ramifications for today's triservice F-35 program. RAND says the F-35 "is not on the path" to its advertised savings. As the chart shows, the life-cycle cost of the F-35, nine years past Milestone B, will far exceed the cost of separate fighter programs for the Air Force, Navy, and Marine Corps.

*For the F-35, things looked good at Milestone B. The estimate is not so good for nine years after this point. In fact, the cost of three separate-service programs would be three-quarters that of the F-35.*



Source: "Do Joint Fighter Programs Save Money?" by Mark A. Lorell, Michael Kennedy, Robert S. Leonard, Ken Munson, Shmuel Abramzon, David L. An, and Robert A. Guffey. RAND Corp., Dec. 13, 2013, Santa Monica, Calif. Full text available at [www.rand.org/pubs/monographs/MG1225.html](http://www.rand.org/pubs/monographs/MG1225.html).

## Digging deep to balance the books; Cutting tooth and tail; The unfunded priorities list; Long-range future bomber bucks ....

### THREE LEVELS OF BUDGET PAIN

The Air Force's Fiscal 2015 budget, proposed in early March, is described by service leaders as a long list of "tough choices." It includes the wholesale elimination of the A-10 close air support jet and U-2 spyplane and also offers a second set of numbers explaining what will happen if Congress doesn't repeal sequestration.

The Air Force budget request of \$109.3 billion (the official number is \$137.8 billion, but \$28.5 billion passes through the Air Force to other defense agencies) is the preferred spending amount, and still inflicts substantial pain on the service. Besides the A-10 and U-2 retirements, up to 25,000 uniformed airmen billets would be phased out over five years. These would comprise about 18,800 from the Active Duty, 3,800 from the Air Force Reserve, and 1,800 from the Air National Guard. USAF leaders have said they'll try to accomplish the reduction in force through voluntary means and attrition, but warned of some involuntary separations as well.

Service leaders said the overall effect will produce a smaller Air Force that maintains its capability and technology lead while giving up capacity to act in as many places, or as rapidly, as it has been able to in the past.

Other cuts include a further 51 F-15C fighters—leaving a fleet of 172 aircraft—and a reduction of the planned 65 combat air patrols of medium-altitude remotely piloted aircraft (MQ-1 Predator and MQ-9 Reaper) down to 55. These cuts come on top of steady reductions in force structure over the last few years, including more than 300 fighters. USAF would also start divesting seven of its 31 E-3 AWACS aircraft in Fiscal 2015, but the remaining 24 airplanes would get the Block 40/45 upgrade that improves computing power and navigation capabilities.

Uniformed pay would increase one percent, but general officers would have a freeze imposed on their compensation. Funding for commissaries would be reduced, but not eliminated, and those grocery stores that remain would have to operate more like for-profit businesses. Some service members would be asked to pay more for their health care premiums, which for some haven't gone up in nearly 20 years.

Maj. Gen. James F. Martin Jr., USAF budget director, told reporters at a Pentagon briefing that the "bottom line" of this budget is that USAF will "keep no more force structure than we can afford to keep ready." In other words, USAF won't hold onto force structure if it doesn't have the funds or people to support, train, and operate it.

The second set of budget numbers, describing further cuts if the Budget Control Act of 2009 remains in force, shows that USAF would have to eliminate the entire KC-10 fleet and RQ-4 Global Hawk Block 40 fleet and reduce its CAPs of medium-altitude RPAs to 45. Various efforts to replenish war-depleted weapons stockpiles and restore service readiness would be stillborn under continued sequester; readiness has been declining for a decade and took a nosedive when the BCA took effect last year. Last



USAF photo by Scott M. Ash

*USAF has disclosed funding for the long-range future bomber.*

spring, numerous USAF squadrons simply stopped flying, and many are still recovering even after Congress provided some sequester relief in the form of the two-year bipartisan budget agreement earlier this year.

Other sequester hits detailed by the Air Force include reduced aerial tanker and intelligence, surveillance, and reconnaissance capacity; reduced investment in new systems such as the F-35, KC-46, and MC-130J; reduced investment in science and technology; halting sensor and radar upgrades for fighter and other platforms; slowed recovery from readiness problems; continued degradation of facilities; and "reduced ability to meet national defense requirements" such as having adequate munition war stocks on hand.

### THE BUCK STOPS HERE

The "guiding principles" for the '15 budget were to remain ready for "full spectrum" military operations, Martin said, and "when forced to cut capabilities" or "tooth," USAF will "also cut the associated support structure and overhead," or "tail." The service sought to "maximize the contribution of the Total Force," with more reliance on the Guard and Reserve, and focus "on the unique capabilities the Air Force provides the joint force" in wars against a high-end threat.

Specifically, the budget seeks to continue to provide global reach, power, and vigilance, Martin said, with well-trained, well-equipped airmen. The Air Force will strive for the capability to respond in hours, not days, and fly, fight, and win from home to anywhere on the globe, prevailing in any highly contested battlespace.

While some in Congress reacted favorably to the two-pronged budget request, saying it illustrated both appropriate spending levels and the potential damage caused

by ongoing sequester, others saw the effort as a waste of time. One of those was Rep. Howard P. “Buck” McKeon (R-Calif.), chairman of the House Armed Services Committee, who said he doesn’t see “any possibility of overturning” the sequester.

McKeon told reporters in late February that there’s a sizable faction of Congress that thinks sequester is having a beneficial effect on the federal deficit, and “until a lot of pain is felt by a lot of people” because of it, he doesn’t see a public push to end it.

“Sequestration is the law,” he said. It’s “going to happen. Why not plan on it?” he asked.

Defensewide, sequestration will lop another \$115 billion off the defense budget annually and up to \$12 billion from the Air Force’s budget every year through the remainder of the 10-year law.

## OGSI-COLORED GLASSES

The President’s budget is the best-case scenario, but the Pentagon added an even-better-case scenario in the form of a new budget device called the Opportunity, Growth, and Security Initiative. The OGSi lays out further DOD-wide spending of \$26 billion in Fiscal 2015 if Congress agrees to raise some taxes and find other federal spending offsets to fund it. The OGSi is, in effect, the unfunded priorities list usually offered by the Pentagon as a ready-made answer to members of Congress who ask what the department would do if it got more money than it asked for.

The Air Force’s share of the OGSi would be about \$7 billion, and Martin said that if it came through, the service would spend the money on readiness improvements, two additional F-35 fighters, “accelerated” buys of MQ-9s and C-130Js, upgrades for legacy platforms, and working off some of the large backlog of real-property maintenance, among other things. However, Defense Secretary Chuck Hagel, in a budget preview press conference, said the OGSi would only help “mitigate” readiness problems, not cure them.

Not all the budgetary news was grim. Up until the budget’s release, USAF leaders were hinting there would be no Combat Rescue Helicopter funding, but it was added back in at the last minute. Sikorsky will get the contract for a UH-60 variant in June if it passes a Defense Acquisition Board review and various independent cost assessments.

Other new starts include the launch of an effort to replace the E-8 Joint STARS aircraft with a smaller platform, funded for \$100 million in Fiscal 2015 and \$2.4 billion over the five-year Future Years Defense Program, or FYDP. A new weather satellite would also get \$500 million over the FYDP, and the long-deferred T-X trainer, a replacement for the 50-plus-year-old T-38, would get underway in Fiscal 2017, with \$600 million to spend by the end of Fiscal 2019.

## STEALTH BOMBER MONEY

The Air Force disclosed funding for the Long-Range Strike Bomber (LRS-B) for the first time, showing in budget documents that the program was funded at \$359 million in Fiscal 2014, but jumps to \$914 million in the new Fiscal 2015 budget. A few days before the budget rollout, Air Force Secretary Deborah Lee James revealed that a draft request for proposal on the airplane is out for comment by industry, and that a formal RFP will be issued by the end of the year. A source selection is to be made in a year.

The Air Force will buy 26 F-35s in Fiscal 2015—seven more than it bought in Fiscal 2014. It will buy a further two if it gets the OGSi funding. The service plans to achieve a buy rate of 60 aircraft a year by 2018. Early plans called for



*Retiring the A-10 is an unpopular decision.*

buying 80 to 100 F-35s per year to buy them at the swiftest, most efficient rates.

The Air Force would spend about \$2.1 billion on its top four space priorities, including the Space Expendable Launch Capability, supporting the launch of national security space vehicles. The numbers reflect lower negotiated costs on the Evolved Expendable Launch Vehicle program.

As a hedge against reduced numbers of platforms and a wait of at least 10 more years for its new penetrating bomber, USAF will up its buy of the stealthy Joint Air-to-Surface Standoff Missiles-Extended Range (JASSM-ER) weapons from 187 in Fiscal 2014 to 224 in Fiscal 2015, and similarly maintain sustaining buys of the air-to-air Sidewinder and AMRAAM AIM-120D missiles.

Martin said the Air Force “took some risk” with modifications to legacy fighters, saying the F-16 Combat Avionics Programmed Extension Suite, or CAPES, is “one program that we decided not to fund.” CAPES was to replace radars and other gear on some 300 F-16s that the Air Force will retain until they are replaced by F-35s in 10 years or so. Martin suggested these upgrades had migrated to the OGSi account—becoming an unfunded priority—but Air Force Chief of Staff Gen. Mark A. Welsh III had said just weeks before that both active electronically scanned array radars and infrared search-and-track improvements for legacy fighters were an essential part of the budget. The Air Force was not able to provide a more complete answer by press time.

The Air Force said it reversed course on the long-running debate pitting the U-2 against the Global Hawk because the numbers have changed. After negotiations with Northrop Grumman, it’s now cheaper to operate the Global Hawk than it is to operate the U-2, service leaders said. To make the Global Hawk as capable as the U-2, however, USAF will have to spend some money to integrate new sensors and give it better capability for operating in bad weather. If Congress balks and wants the U-2 instead, “we’ll make it work,” said Welsh at the Air Force Association’s Air Warfare Symposium in Orlando, Fla. However, the service can’t afford to keep both high-altitude ISR systems, he insisted.

Retiring the A-10 fleet saves \$3.7 billion in operating costs over the FYDP, and halting the planned rewinging of much of that fleet would save another \$500 million “on top of the \$3.7 [billion],” Martin said. The Air Force may have a tough time getting its way with the A-10s, though, as the Fiscal 2014 National Defense Authorization Act expressly forbids spending any money on retiring it or putting the fleet into mothball storage. Shortly after the Air Force’s formal request to retire the A-10 was submitted, dozens of “Save the A-10” petitions began circulating, as well as numerous Facebook pages and Twitter campaigns seeking to reverse USAF’s plan. ■

## Top Acquisition Post Filled

The Senate confirmed William A. LaPlante on Feb. 12 to become the next assistant secretary of the Air Force for acquisition.

LaPlante previously served as principal deputy assistant secretary of the Air Force for acquisition and fills the spot left vacant since Sue C. Payton left it in April 2009.

"I've spent over 28 years ... around defense systems, technologies, acquisition programs, touching all aspects of those programs [for] all services," LaPlante said during a Jan. 16 confirmation hearing. "This experience, along with my tenure on activities like the Defense Science Board, ... offers a firsthand impression of the state and the challenges of defense acquisition."

## Back to the Drawing Board

House Armed Services Committee Chairman Rep. Howard P. "Buck" McKeon (R-Calif.) called on the Defense Department to "rewrite and resubmit" the 2014 Quadrennial Defense Review.

McKeon said the review, released along with the President's 2015 budget request, "should be immensely valuable to planners and senior commanders," but falls short because it places too much emphasis on politics and too little emphasis on policy. "For that reason, I will require [DOD] to rewrite and resubmit a compliant report," McKeon said in a March 4 statement.

"In defiance of the [sequestration] law, this QDR provides no insight into what a moderate-to-low risk strategy would be, is clearly budget-driven, and is shortsighted," he added.

The QDR, like the Pentagon's five-year spending plan, assumes sequester will not continue beyond Fiscal 2016 without additional mitigating factors. McKeon has said that's not the case. "It allows the President to duck the consequences of the deep defense cuts he has advocated and leaves us all wondering what the true future costs of those cuts will be," he noted.

## You May Call It Pegasus

Boeing's new KC-46A tanker has been christened Pegasus. "It will be flying in June. It's a real thing now," Air Force Chief of Staff Gen. Mark A. Welsh III said, unveiling the name at the Air Force Association's Air Warfare Symposium in Orlando, Fla., Feb. 20.

The Air Force will buy 179 KC-46A Pegasus aircraft, the last of them delivered in 2028, to replace a portion of the Eisenhower-era KC-135 fleet.

USAF will continue to maintain 200-plus KC-135s, which will be 65 years old or older when the last Pegasus is delivered. As a result, the KC-Y and KC-Z follow-on efforts have to be real programs "and we've got to get on that now," Welsh emphasized.

"Air refueling is the lifeblood of US strategic mobility," he said.

## DOD Cuts Russian Cooperation

The Defense Department suspended all military cooperation with Russia in February as a result of Russia's military intervention in Ukraine. This included everything

from exercises, bilateral meetings, and port visits to planning conferences, Pentagon spokesman Rear Adm. John Kirby said March 3.

"We call on Russia to de-escalate the crisis in Ukraine and for Russian forces in Crimea to return to their bases,

## screenshot





as required under the agreements governing the Russia Black Sea Fleet,” said Kirby.

Less than seven months earlier, Defense Secretary Chuck Hagel and his Russian counterpart, Sergey Shoygu, laid out a commitment to building “a robust agenda” for military cooperation. In fact, the two militaries had previously planned a joint naval exercise for May, according to *The Wall Street Journal*.

Kirby’s announcement came on the eve of Secretary of State John F. Kerry’s arrival in Ukraine for meetings with the new Ukrainian government, and of a meeting in Brussels by the ambassadors of all 28 NATO members consulting on the situation in Ukraine at the request of NATO member Poland.

▶ Read more of *Air Force Magazine*’s coverage at [www.airforcemag.com](http://www.airforcemag.com). Search “Ukraine.”

### The Ride Begins

The prototype AC-130J Ghost rider gunship cleared the runway on its maiden post-modification test flight at Eglin AFB, Fla., in late January, Air Force Special Operations Command officials revealed. “As with any new or highly modified aircraft, the initial goal is to ensure the aircraft design or modification does not adversely affect the flying and handling qualities,” said 413th Flight Test Squadron pilot Maj. Brian Taliatferro.

Over the preceding year, technicians at Eglin modified the basic MC-130J with a precision strike package, including a 30 mm cannon, Griffin missiles, and the ability to carry the Small Diameter Bomb. New mission equipment includes all-weather synthetic aperture radar and dual electro-optical/infrared sensors.

Weaponizing the efficient J model brings “the best two C-130s together in a new weapons system,” said Todd Mc-



## 03.14.2014

*A USAF pararescueman gathers his parachute near Camp Lemmonier, Djibouti, as another braces for landing. PJs train to keep skills sharp for missions throughout the Horn of Africa.*

USAF photo by SSgt. Erik Cardenas

Ginnis, US Special Operations Command Det. 1 AC-130J modification manager.

AFSOC plans to convert 32 MC-130Js under the \$2.4 billion program to replace legacy gunships.

### Super Galaxy Hits IOC

The Air Force declared initial operational capability with the C-5M Super Galaxy on Feb. 21, according to senior service officials.

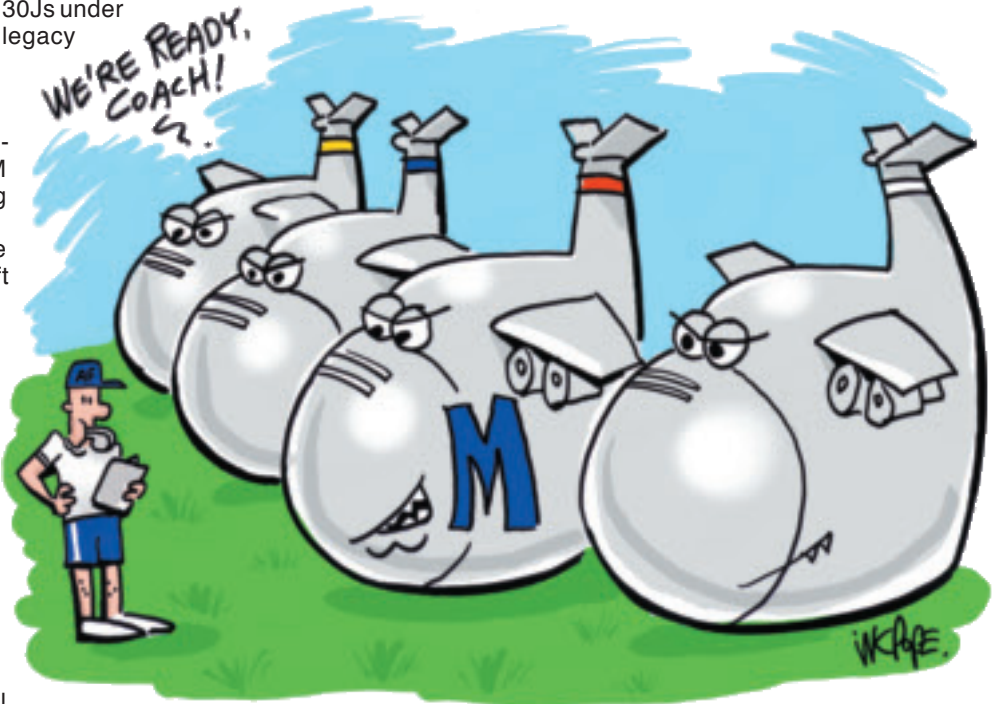
The milestone means there are now sufficient numbers of aircraft and enough training of flight and ground crews, as well as spares on hand both domestically and at forward operating areas, to allow the C-5M to go to war if needed.

The stage was set for IOC when the 16th C-5M was delivered to Dover AFB, Del., in January of this year. By the end of 2016, Air Mobility Command expects to have all 52 C-5Ms in service at three operating locations.

The upgrade of all C-5Bs, two C-5Cs, and one C-5A includes replacement of the aircraft's engines and more than 70 other structural and capability improvements.

It builds on the Avionics Modernization Program, completed in 2013. The Air Force has been using the initial C-5Ms for the past two years, and the giant airlifter has turned in on-time departure reliability rates between 88 percent and 93 percent, service officials said. By contrast, unmodified C-5s struggle to make 50 percent of departures on time.

AMC boss Gen. Paul J. Selva said the Air Force doesn't need to modify the remaining C-5As, because the C-5M fleet, as now projected, will satisfy the service's requirements.



### Neighborhood Watch On High

The Air Force will launch two previously undisclosed space-surveillance satellites into orbit sometime this year that represent a "significant improvement" in monitoring activities in near-geosynchronous orbit. This band is where the United States operates some of its most valuable space assets, said Gen. William L. Shelton, head of Air Force Space Command.

Shelton lifted the veil on the Geosynchronous Space Situational Awareness Program, or GSSAP, satellites in a speech at the Air Force Association's Air Warfare Symposium in Orlando, Fla., in February.

The satellites will carry electro-optical sensors and will function in a "neighborhood watch" role, detecting threats to US space assets such as debris or a spacecraft a potential adversary is trying to hide on orbit that could harm US satellites, said Shelton.

The two spacecraft will "drift just above and just below the GEO belt," he said. They will complement the Space Based Surveillance System satellite that has been on orbit since 2010 and US ground-based space-monitoring sensors.

### Skibirds Pick Up the Slack

A swarm of LC-130 transports airlifted researchers and supplies back from McMurdo Station, Antarctica, as the hemisphere's summer research came to an end in February.

The LC-130s provide support to the researchers every year, but normally, the end of season heavy lifting from McMurdo to Christchurch, New Zealand, is done by Air Force C-17s.

This year, warm temperatures and volcanic ash turned McMurdo's ice airstrip to mush, preventing C-17s from landing there. The New York Air National Guard's 109th Airlift Wing, operating the ski-equipped C-130s, stepped up instead.

"The unique capabilities of our aircraft have made it possible for scientists to do their work and get the most of the Antarctic summer research season," said Col. Shawn Clouthier, 109th AW commander.

The wing deployed an extra LC-130, making seven in total, to help provide the additional support.

### Lawmakers: Nyet to Treaty Violators

Republican House members pressed the Obama Administration to confront the Kremlin over Russia's alleged violation of the Intermediate-Range Nuclear Forces Treaty by testing a new type of ground-launched cruise missile, reported Global Security Newswire.

"We believe it is imperative that Russian officials not be permitted to believe they stand to gain from a material breach of this or any other treaty," wrote House Armed Services Committee Chairman Rep. Howard P. "Buck" McKeon (R-Calif.) in a Feb. 6 letter he penned with House Foreign Affairs Committee Chairman Rep. Edward R. Royce (R-Calif.) and House Intelligence Committee Chairman Rep. Mike Rogers (R-Mich.).

"Other countries around the world will be closely watching the US response to any Russian violation," they wrote.

On Jan. 30, State Department spokeswoman Jennifer Psaki confirmed that senior US officials had discussed this issue with NATO allies. However, "there's still an ongoing review, an interagency review, determining if there was a violation," she said.

The 1987 INF treaty bans ground-launched nuclear-capable missiles with ranges between 310 miles and 3,418 miles. The Russians may have begun testing this cruise missile in 2008, according to GSN.



### GPS IIF Launches

The Air Force and its industry partners launched the fifth GPS IIF navigation satellite into space from Cape Canaveral AFS, Fla., on Feb. 20. A United Launch Alliance Delta IV rocket, carrying the Boeing-built satellite into orbit, lifted off from Space Launch Complex 37 at 8:59 p.m., local time.

The satellite joined the four IIF spacecraft already operating on orbit as part of the GPS constellation of some 30 satellites.

Compared to earlier model GPS spacecraft, the IIFs offer greater navigational accuracy, a new civilian L5 signal, and an improved military signal with better resistance to jamming, according to the Air Force.

### Long-Legged Reaper

General Atomics Aeronautical Systems' MQ-9 Reaper extended-range variant took to the skies for the first time on a test flight on Feb. 12. The new configuration features two external fuel pods to increase the remotely piloted aircraft's endurance.

The Air Force awarded a contract worth up to \$117.2 million for the company to supply 38 MQ-9s with the fuel tanks by July 2016, according to a February Pentagon listing of major contracts.

Under the Accelerated Extended Range contract, the company will retrofit new-build airframes with the tanks "as they come off the production line," said company spokeswoman Kimberly Kasitz.

The company is also developing a radical new wing design to extend the Reaper's range. It will "carry all the fuel inside the wing to eliminate the need for external fuel tanks," cutting drag, she said.

The 79-foot wing is "more than just an extension," said Kasitz, noting that it's actually "bigger in all dimensions."

Construction of the first retrofit wing and tail assembly is slated for the summer, said Kasitz. The company plans to fly the wing mod in tests by the end of the year.

### Monumental Mishap

A remotely controlled QF-4 target drone launched from Holloman AFB, N.M., crashed on the grounds of the White

**Testing Silk:** A C-17 prepares to drop heavy equipment while another Globemaster III flies behind on Feb. 27 over Malemute Drop Zone on JB Elmendorf-Richardson, Alaska.

Sands National Monument about five miles west of the base, Feb. 7.

Park officials had closed the monument ahead of pre-planned Air Force tests and extended the closure to allow for "substantial cleanup" following the crash, according to Holloman officials. No one was injured in the mishap and the cause of the crash is under investigation.

### Long Shadow Over Britain

An MC-130P Combat Shadow assigned to the 67th Special

### Quick Reaction Satellite Delivered

Northrop Grumman recently delivered a revolutionary new satellite to the Air Force that is quickly configurable for missions ranging from communications and weather monitoring to surveillance, the company announced.

Dubbed Modular Space Vehicle, the satellite will allow payloads to be prepared and launched to support specific operational needs in a matter of weeks, instead of years, according to the company. "MSV provides ways for future development of rapid response space capabilities that will be timely, cost-efficient, and flexible," said Doug Young, Northrop Grumman's vice president for missile defense and advanced missions.

The satellite structure incorporates a power supply and controls that can be tailored to the specific mission needs and can be launched on a number of different boosters, including the Minotaur I and IV, Evolved Expendable Launch Vehicle-class boosters, and the Falcon 9. It also can operate from low and medium Earth orbits, as well as from geosynchronous orbit, according to the company.

Northrop Grumman delivered the first MSV to the Air Force's Operationally Responsive Space office at Kirtland AFB, N.M., on Feb. 25.



Operations Squadron flew the type's final UK-based sortie early this year. The aircraft visited several former squadron haunts on its way out. "We were able to take the airplane to

***Making Sure:*** A UH-1N deploys a security forces tactical response force in reaction to a simulated threat to a Minuteman III missile field during a recent nuclear surety inspection at Minot AFB, N.D.

### Bomber RFP Taking Shape

A draft request for proposal for the Long-Range Strike Bomber is now out for review and comment, and a final RFP should be issued in the fall, said Air Force Secretary Deborah Lee James. "There are two teams at present that are working on preproposal-type activities, preparing to take the next step in competition" for the LRS-B, James revealed at a defense symposium in Washington, D.C.

One announced competitor is the Boeing-Lockheed Martin team, and Northrop Grumman said it will bid. The competition will play out "in the fall time frame," James said, adding the bomber budget "is not classified."

"We're at a point where we're ready to begin the selection" of the bomber contractor, with a choice coming as soon as early next year, said Lt. Gen. Charles R. Davis, military deputy in the Office of the Assistant Secretary of the Air Force for Acquisition.

Air Force Vice Chief of Staff Gen. Larry O. Spencer stated at the symposium that USAF has labored to constrain "the temptation to put more stuff on this bomber" and to keep it within the allowed \$550 million unit cost, but "the folks working on this program are really working hard to get us the capabilities we need for that price. ... They're really pushing the envelope."

all the fields that the 67th SOS has been stationed at in the United Kingdom," said the final-flight pilot—and squadron assistant operations director—Lt. Col. Scott Hartman.

From RAF Mildenhall, England, the crew flew over former 67th SOS bases at RAF Sculthorpe, RAF Prestwick, RAF Woodbridge, and RAF Alconbury, refueling a CV-22 Osprey en route on Jan. 24.

Although many of the airfields are now closed, "it was a great chance to get a feel for the long history that the 67th has had here in the UK," said Hartman. Mildenhall is swapping its legacy MC-130Ps for MC-130J Commando IIs as part of Air Force Special Operations Command's overall Herc fleet upgrade.

### Busting Bad Beacons

The Air Force is replacing thousands of personnel-locating beacons after a series of reported malfunctions over the last three years.

Officials at Wright-Patterson AFB, Ohio, conducted a series of rigorous tests on the URT-44 personnel recovery beacon (PRB), intended to put the system through the most extreme scenarios possible. "They had a 100 percent failure rate," said Col. Aaron Clark, the Global Power Programs Directorate deputy director for USAF acquisitions.

The URT-44 PRB was purchased five years ago to comply with the new digital standards that make crash sites easier to find. Since then, its real world performance has decayed sharply to the point that "right now, we are see-

# The War on Terrorism

## Operation Enduring Freedom

### Casualties

By March 18, a total of 2,312 Americans had died in Operation Enduring Freedom. The total includes 2,309 troops and three Department of Defense civilians. Of these deaths, 1,814 were killed in action with the enemy, while 497 died in noncombatant incidents.

There have been 19,673 troops wounded during OEF.

### Afghanistan Contingency Planning

President Barack Obama has asked the Defense Department to “ensure that it has adequate plans in place to accomplish an orderly withdrawal” from Afghanistan by the end of the year, according to a White House press release. The President stated that it is “unlikely” Afghan President Hamid Karzai will sign a bilateral security agreement that would protect troops operating in the country after 2014.

In a telephone conversation between the two leaders, Obama told Karzai the US would “leave open the possibility of concluding a BSA” later this year, the Feb. 25 release said, though the President noted that “the longer we go without a BSA, the more challenging it will be to plan and execute any US mission.”

In a statement that same day, Defense Secretary Chuck Hagel added his “strong support” to moving ahead with additional contingency planning. “As the United States military continues to move people and equipment out of the Afghan Theater, our force posture over the next several months will provide various options for political leaders in the United States and NATO,” said Hagel.

At the same time, DOD will “continue planning for US participation in a NATO-led mission focused on training, advising, and assisting Afghan security forces, as well as a narrowly focused counterterrorism mission,” he said.

### Goodbye Manas, Hello MK

Mihail Kogalniceanu AB, Romania, is now the US military’s main air transit hub for supporting operations in Afghanistan, replacing the Transit Center at Manas, Kyrgyzstan.

The Kyrgyz government decided not to renew the US lease to Manas, forcing US officials to begin planning approximately a year ago to shift operations to Romania. MK, as the hub is known, took on this lead role at the beginning of February, according to 18th Air Force.

“By standing up MK, we are able to continue to support the movement of our troops without missing a beat,” said Chris Rosenthal, 18th Air Force transition planner. “Thanks to our partnership with the Romanian authorities, we negotiated an increase in the airport’s weight-bearing capacity that allowed us to add additional fuel,” said Lt. Col. Todd McCoy, 780th Expeditionary Airlift Squadron commander.

“Now, we save over \$20,000 each mission,” he said. The shift comes at a crucial time as US forces in Afghanistan are drawing down and massive amounts of military hardware and material are flowing out of Southwest Asia.

The Air Force completed its final KC-135 aerial refueling mission from the Transit Center at Manas on Feb. 24. The US lease there expires in July 2014.

ing an observed reliability of about 55 percent” in actual ejections, said Clark.

Because of the failed accelerated-lifecycle test results at Wright-Patterson, the Air Force will replace the first 3,900 beacons by 2015, at an estimated cost of \$15 million. USAF will then begin replacing beacons fleetwide for an additional cost of some \$40 million, according to the release. To avoid revealing downed airmen’s locations to enemy forces, the

beacons are typically used only in peacetime operations.

### Coping On Guam

This year’s exercise Cope North included a new humanitarian response scenario based on lessons drawn from Operation Damayan in the Philippines last year, officials announced.

More than 1,800 service members and 50 aircraft from the US Air Force, US Navy, Japan Air Self Defense Force,



**Taking Turns:** Maintainers work on an F-15 Eagle at Siauliai AB, Lithuania. USAF assumed command of the NATO Baltic air policing mission for a four-month rotation beginning in January, and in March, USAF sent additional F-15Cs in response to recent aggressive Russian actions in Ukraine.

USAF photo by ATC Dana J. Butler

Republic of Korea Air Force, and the Royal Australian Air Force participated in the 85th iteration of the annual exercise. It began Feb. 14.

Cope North 14 featured a full spectrum of fighter and bomber aircraft, as well as transport, command and control, and refueling assets. In addition to combat drills, the US, JASDF, and RAAF designed and practiced disaster response aimed at increasing interoperability in multinational relief operations.

“We live in a region with lots of natural disasters,” said Group Capt. Glen Beck, RAAF exercise director. “This is the largest international exercise we do and it’s definitely the largest footprint.” ■

## Senior Staff Changes

**RETIREMENT:** Maj. Gen. Margaret H. Woodward.

**NOMINATIONS: To be General:** John E. Hyten, Darren W. McDew. **To be Lieutenant General:** Thomas J. Trask, Anthony J. Rock. **To be Major General:** Jeffrey A. Rockwell. **To be Brigadier General:** Kathleen A. Cook, Robert I. Miller, William P. Robertson, Andrew J. Toth. **To be ANG Brigadier General:** Mark W. Anderson, David P. Baczewski, Jeffrey W. Burkett, Conrad C. Caldwell III, Jeffrey B. Cashman, Charles W. Chappuis, Joel A. Clark, Patrick J. Cobb, Thomas B. Cucchi, John B. Daniel, George M. Degnon, William D. DeHaes, William D. Dockery Jr., Michael E. Guillory, Andrew E. Halter, Timothy J. Harmeson, Paul G. Havel, Jill L. Hendra, Alan K. Hodgdon, Joseph M. Jabara, Wendy K. Johnson, Timothy M. Jones, Thomas J. Kennett, Kerry L. Muehlenbeck, Timothy A. Mullen, John W. Ogle III, Ryan T. Okahara, Thomas J. Owens II, Russell A. Rushe, David P. San Clemente, Diana M. Shoop, Jesse T. Simmons Jr., David A. Simon, Mark C. Snyder, John G. Sotos, Ronald C. Stamps, Randolph J. Staudenraus, Frank H. Stokes, Scott A. Studer, Michael R. Taheri, Ronald B. Turk, Steven C. Warren, Roger E. Williams Jr., Ronald W. Wilson, Bryan F. Witeof, Brett A. Wyrick, Ricky G. Yoder.

**CHANGES:** Maj. Gen. Theresa C. Carter, from AF Civil Engineer, DCS, Log., Instl., & Mission Spt., USAF, Pentagon, to Spec. Asst. to the Cmdr., AFMC, JB Andrews, Md. ... Brig. Gen. Steven D. Garland, from Cmdr., 36th Wg., PACAF, Andersen AFB, Guam, to Vice Cmdr., 14th AF, Air Forces Strat., AFSPC, Vandenberg AFB, Calif. ... Brig. Gen. Timothy S. Green, from Dir., Instl., & Mission Spt., ACC, JB Langley-Eustis, Va., to Dir., Civil Engineering, DCS, Log., Instl., & Mission Spt., USAF, Pentagon ... Maj. Gen. (sel.) Jeffrey A. Rockwell, from Cmdr., AF Legal Ops. Agency, JB Andrews, Md., to Dep. Judge Advocate General, USAF, Pentagon ... Maj. Gen. Steven M. Shepro, from Dir., Ops., DCS, Ops., Plans & Rqmts., USAF, Pentagon, to Vice Dir., Strat. Plans & Policy, Jt. Staff, Pentagon.

## Commission: Disestablish AFRC

The National Commission on the Structure of the Air Force recommended disestablishing Air Force Reserve Command and its numbered air forces in an effort to realign Air Force headquarters functions and rebalance the Total Force.

“As the Air Force progresses toward fuller integration at the unit level, the need for an [AFRC] as a ‘force providing’ headquarters declines, as does the need for its subordinate [numbered air forces],” stated the commission’s report.

Commission Chairman Dennis M. McCarthy said the report, released in January, recommends the position of Chief of the Air Force Reserve be retained, and along with the director of the Air National Guard, will still have direct access to the USAF Chief of Staff. “It’s a dual-hat position, and we recommended taking away one of the hats,” he told a group of defense reporters in Washington, D.C. AFRC’s units and functions would be taken over by USAF headquarters and the major commands, with increased representation.

McCarthy said the hope of the commission is that the Reserve will see the opportunity for fuller integration into USAF and the long-term benefits and savings for the Total Force. As the Air Force more fully integrates the Reserve into units and wings, the commission argued, the process of fielding equipment across the Air Reserve Components and the Active Duty will become easier with time.

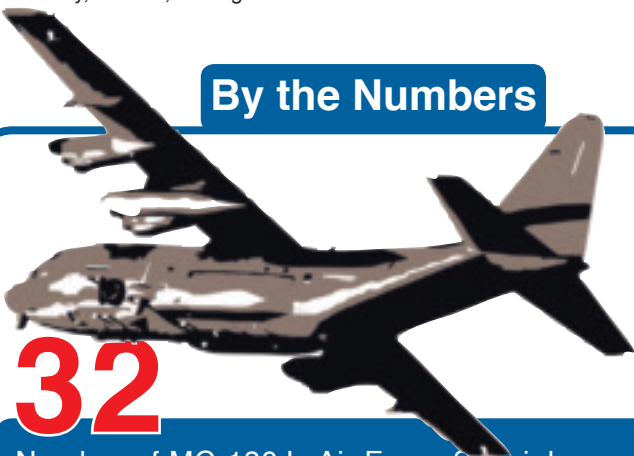
Lt. Gen. James “J. J.” Jackson, commander of Air Force Reserve Command, said merging AFRC and its organizational structure into the Active Duty portion of the Air Force should not even be on the table. He said the other 40 recommendations put forth by the congressionally mandated commission, however, are worth discussing.

“The commission did great work with the task they were given in the timeline they were given,” said Jackson. “The bottom line is, though, that there are some good pieces in [the report] that I can agree with and some I cannot.”

Jackson said there are other ways to achieve similar levels of integration and efficiency, such as expanding the number of associate units. Eliminating the command would have a devastating impact on morale in the existing Reserve force as well as negatively affect recruiting in the future, he said.

**SENIOR EXECUTIVE SERVICE CHANGES:** James J. Brooks, to Exec. Dir., ANG, Natl. Guard Bureau, Pentagon.

**COMMAND CHIEF CHANGE:** CMSgt. Matthew M. Caruso, to Command Chief, AFSOC, Hurlburt Field, Fla. ■



## By the Numbers

32

Number of MC-130Js Air Force Special Operations Command plans to convert into AC-130J Ghost Rider gunships under a \$2.4 billion deal.

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By Robert S. Dudley

## While America Sleeps

"With the proliferation of more advanced military technologies and other nations pursuing comprehensive military modernization, we are entering an era where American dominance on the seas, in the skies, and in space—not to mention cyberspace—can no longer be taken for granted."—*Secretary of Defense Chuck Hagel, statement to Senate Armed Services Committee, March 5.*

## Yo, Adrian! Surrender!

"We're hoping that Russia will not see this [conflict over Ukraine] as a sort of a continuation of the Cold War. We don't see it that way. We do not believe this should be an East-West, Russia-United States. This is not Rocky IV."—*Secretary of State John F. Kerry, in lead-up to Russian invasion of Crimea, MSNBC broadcast, Feb. 26.*

## Zero Means Zero

"Here our Secretary of State is saying this [Russia's seizure of part of Ukraine] is not the Cold War, it's 'win-win,' and it's 'not zero sum.' But for Vladimir Putin, it is zero sum. That's what we need to understand."—*Retired Air Force Gen. Michael V. Hayden, former CIA director, quoted in The Daily Beast, March 2.*

## Boots Back to Barracks

"Armies are like newspapers; they have become 21st century anachronisms. ... To judge by outcomes, the Army is not a force for decisive action. It cannot be counted on to achieve definitive results in a timely manner. In Afghanistan and Iraq, actions that momentarily appeared to be decisive served as preludes to protracted and inconclusive wars. ... What role, then, remains for the United States Army? The honorable and necessary one of defending this country. For that task, absent the emergence of a major Mexican or Canadian threat, a smaller Army should serve just fine."—*Retired Army Col. Andrew J. Bacevich, op-ed titled, "Do We Really Need a Large Army?" Washington Post, Feb. 27.*

## Rhetorical Question of the Day

"If our rockets are good enough for NASA, why aren't they good enough

for the Air Force? It makes no sense. We are ready to compete."—*Elon Musk, CEO of SpaceX, calling for more competition in Air Force launcher procurement, Senate hearing, March 5.*

## Bomber Costs, Explained

"We get a lot of questions on [unit cost of the next generation bomber]. Is it going to be \$550 million a copy? No, of course it's not going to be \$550 million a copy, once you add in everything. ... What it will be is \$550 million in design constraints. ... That limits the technology you bring in. It limits certain parameters and certain capabilities. By definition, we have used a cost-controlled approach."—*USAF Lt. Gen. Charles R. Davis, military deputy for acquisition, remarks to Aviation Week Defense Technologies and Requirements Conference, March 5.*

## Dare Call It Dereliction

"Is Afghanistan less of a threat to the United States than it was 13 years ago? Is it a better place than it was 13 years ago? Is America safer than it was on September 10th, 2001? Take a good, hard look at what's actually been happening out there, and each of those answers come back, 'Yes.' ... Even though the way that this White House has run this war has been outrageous—with White House staffers telling four-star generals their business—there has been unmistakable progress. ... What I find astounding is that the President won't acknowledge these victories. I'm astounded he won't give this speech. ... If the troops fight for the mission abroad, the President better fight for their mission here at home. Anything less is a dereliction of duty."—*Rep. Howard P. "Buck" McKeon (R-Calif.), House Armed Services Committee chairman, speech to the National Press Club, Feb. 24.*

## Rich Man, Poor Man

"The White House made clear last week that it had no interest in Social Security reform, citing budget projections showing a shrinking deficit and debt-to-GDP ratio. This week, Defense Secretary Chuck Hagel rolled out a budget that would shrink the Army to pre-World War II levels, on the excuse

that the Pentagon needs to recognize 'the reality of the magnitude of our fiscal challenges.' So we're rolling in dough when it comes to entitlements. ... Yet we're out of cash for defense. This is the policy combination that has made much of Europe bankrupt and defenseless at the same time."—*House editorial, Wall Street Journal, Feb. 28.*

## Uhhhhhhh ... Why?

"US PUSHING ISRAEL TO STOP ASSASSINATING IRANIAN NUCLEAR SCIENTISTS."—*Actual headline seen at CBSNews.com, March 1.*

## Let's Keep Negotiating!

"I can tell you that Iran's nuclear program will remain intact. We will not close any program."—*Iranian Foreign Minister Mohammad Javad Zarif, on proposals to halt Iran's nuclear effort, to reporters in New Delhi, Feb. 27.*

## Well, It's Settled, Then

"The men don't want to lower the standards [for women to qualify for the combat arms], because they see that as a ... risk to their team. The women don't want to lower the standards, because they want the men to know they're just as able as they are to do the same task."—*David Brinkley, Army Training and Doctrine Command, Associated Press dispatch, Feb. 25.*

## Catastrophe Takes a Holiday

"Shrinking the future military contains real risks, as a smaller force, no matter how ready or technologically advanced, can go to fewer places and do fewer things, especially when confronted by multiple contingencies or a scenario in which mass is required. However, attempting to retain a larger force in the face of potential sequester level cuts would create, in effect, a decade-long modernization holiday on top of the program cancellations and delays already made. And while the odds of a major conflict against another technologically advanced military power are relatively low, the consequences of being unprepared for such a contingency could be catastrophic."—*Christine H. Fox, acting deputy secretary of defense, remarks at American Enterprise Institute forum, Feb. 26.*

# Smaller, But Still the Best

By Marc V. Schanz, Senior Editor



**At AFA's Orlando Air Warfare Symposium, the top Air Force leaders said we're going back to the basics.**



**T**he Air Force is shedding aircraft and personnel in an attempt to preserve its potency and readiness as a global force. At the Air Force Association's Air Warfare Symposium in Orlando, Fla., in February, USAF leadership laid the groundwork for what this will mean and cautioned that the service must undergo deep changes to adapt to a new postwar footing.

Air Force Secretary Deborah Lee James used the opportunity to preview what she and Chief of Staff Gen. Mark A. Welsh III would present to Congress. "There are going to be some things that you like, and there are going to be some things that you don't like," she told the audience in Orlando about the forthcom-

ing budget choices. James made clear that so-called "vertical cuts" of entire fleets of aircraft (with the A-10 and U-2 among the proposed victims) were now necessary evils.

James also noted that over a decade of war USAF delayed some difficult choices in its investments, end strength, and capabilities. These decisions can't be put off anymore. Secretary of Defense Chuck Hagel has directed the services to begin balancing hardware, personnel, and long-range strategy, James said.

Alongside force structure reductions, USAF will soon be carrying out end strength reductions of up to 25,000 personnel across the force by Fiscal 2019. Much of the personnel reductions are set to come up front and then normalize

(along with the force structure) in future years, CMSAF James A. Cody said. The goal is to have most of the reduction programs in process by the beginning of next year, as USAF does not want to take five years to make the cuts.

There will be adjustments and refinements along the way. You have to prepare the force, Cody said, and give people the opportunity to consider the voluntary programs.

"I can tell you that although it might sound counterintuitive, it's actually better if you can ... get things done more quickly rather than more slowly," James elaborated. "It's easier on people that way because people will know what to expect. They can know about their choices."

The end strength reduction is just part of the major effort to retool the Air Force to survive sequestration—and beyond. "Let's go back to basics and rethink why we are doing it? Is it necessary? Can we stop?" James asked rhetorically.

### Get Ready

This philosophy is what is also behind USAF headquarters reductions and staff reorganizations, tied to the Fiscal 2015 budget. "I'm telling you all of this now to get you prepared and ask for your help in helping us tell the total story of how we need to achieve these savings, sometimes in very unpopular ways," James said in her speech. Her message was echoed by Welsh and other senior leaders who emphasized repeatedly that USAF's plan would require a good deal of pain, but reductions would be reinvested into core service capabilities needed for the future—intelligence-surveillance-reconnaissance, space, cyber, strike, and mobility modernization, among others.

Cutbacks will not be restricted to the enlisted force and will go as high as the general officer corps. Welsh confirmed the Air Staff is examining the reduction of three- and four-star general officer positions across the force. During a panel with the heads of the major commands, Welsh said USAF is about to hire the first of a new generation of majcom vice commanders who will be two stars rather than three-star generals.

While Congress recently granted some relief to readiness accounts, the fundamental problem for the service's solvency remain. Last year's Bipartisan Budget Act, though giving USAF a reprieve from sequestration, does not fix the problem. Funds can only go to activities in the next two fiscal years; thus almost all of it must go to readi-



*An F-15E taxis to the runway before a training mission during Red Flag 14-1 at Nellis AFB, Nev.*

USAF photo by SrA. Brett Clashman

*Clockwise: 111 SSgt. Jerome Duhan inserts a hard drive into a server at the 97th Air Mobility Wing's network control center. 121 An A-10 peels away after taking on fuel from a KC-135 over Afghanistan. Secretary of the Air Force Deborah Lee James said that due to budget cuts, eliminating entire fleets of aircraft—including the A-10—is a necessary evil. 131 USAF SrA. Frederick Riggans-Huguley (r) and Royal Australian Air Force Flight Sgt. Sean Bedford analyze missile defense systems data during Red Flag 14-1. Over the next few decades, USAF will be looking closely at the ratio between air, space, and cyberspace in its core missions.*

ness activities—flying hours, training, weapons school classes.

And by 2017, the Air Force is back to the full burden of sequestration. The reduction plan now underway is based on the assumption that the cuts remain, as sequestration is indeed the law of the land and USAF must still train and maintain a capable force.

“How big can that force be and still remain trained?” Welsh asked. “That’s why we target these first couple of years to make the reductions, so that we can kind of balance our ability with our size by 2017 if nothing else changes in the budget.”

The changes by necessity are not limited to the Active Duty force, and in

the coming years the service aims to integrate its Air Reserve Components with its daily operations in an unprecedented manner. USAF just now is emerging from a long reexamination of its relationship with both the Air National Guard and Air Force Reserve Command, prompted by the sharp disagreements that arose from the Fiscal 2013 budget proposal.

This led to the stand-up of the Total Force Task Force (TF2), bringing general officers from Active Duty, the Air Guard, and AFRC together at the Air Staff level to hammer out a consensus. The work of TF2 directly influenced the long-term trades and priorities established in the 2015 budget, Welsh and others pointed out.



USAF photo by SrA. Franklin R. Ramos

Discord between the components emerged in the first months, but by the fourth month those inside TF2 had a good understanding of the positions of the others on long-term force structure choices facing the Air Force, officials said.

The task force was able to run through a deep analysis of platforms and specialty codes and how much capabilities cost in each of the components. About half the service's force structure was examined by the time the 2015 budget was finalized. By USAF estimates, the in-depth analysis on the remainder will be completed for the 2016 submission.

Air National Guard Director Lt. Gen. Stanley E. Clarke III told Orlando

attendees the TF2 was a new way of approaching an old problem: how to integrate the Guard and Reserve into the Total Air Force. Clarke said that during a previous assignment of his at the Pentagon, most of the decision-making on Total Force integration was done at the major command level. "Now, we have a place to focus our efforts at the Air Staff level. There's more process, more insight," he said.

"Arguably some of the things we did in the past weren't done as well as they could have been," he said. Now, with TF2 institutionalized at the headquarters level as the "Total Force Continuum" with three one-stars to rotate in and out, TF2 will serve as

a permanent resource for Total Force issues at the Pentagon.

## Cautions

Meanwhile, the National Commission on the Structure of the Air Force released its final report in January. While it came too late to advise the 2015 budget, USAF leadership largely had praise for the commission's work, noting many of its recommendations reflected similar issues tackled by the TF2.

However, both Welsh and Lt. Gen. James "J. J." Jackson, commander of Air Force Reserve Command, sounded a caution on specific recommendations: setting a percentage figure for force structure in the Active Duty and reorganizing AFRC command structures. While Jackson supported many of the commission's findings, he disagreed with their recommendation to disestablish AFRC and its numbered air forces.

Jackson noted the organizations were built up based on key lessons learned during both the Korean War and in the aftermath of Operation Desert Storm. "I don't think we should go backward in time," he said.

James said there were recommendations in the NCSAF report "we don't fully understand" but added that USAF leadership would wait to get briefed on the methodology used before making final decisions.

The NCSAF report came back with a floor for Active Duty force structure, to boot: USAF should aim to put no less than 58 percent of the force structure in the Active Duty. "I'm not arguing that their numbers are wrong," Welsh said. He said the Air Staff wanted to engage in talks with the commission to see how they arrived at their conclusions. He said the Air Force began the TF2 process from the other end of the problem: trying to put as much force structure into the Air Guard and Reserve and not lose responsiveness.

Air Force leaders want to improve the mobility of personnel between components, but warn that this will not be easy. While it will be difficult in some regard, due to the part-time nature of the ARC, USAF needs to start thinking about how to develop senior leaders over time who have a good understanding of how the Total Force operates, Welsh emphasized.

The Air Force is now also reexamining how it plans, budgets, fulfills, and prosecutes its missions. In the long term, the Air Force must reconfigure how it adapts and adjusts its core missions to the national military strategy. Over the



USAF photo by MSgt. William Greer



USAF photo by S/A. Brett Clashman

years USAF has had a lot of guiding concepts, Welsh said, from strategic bombardment in World War II to nuclear deterrence after the Korean War, to Air-Land Battle in the 1980s all the way up to the counterinsurgency (COIN) wars of the last 12 years.

The Air Force must now ask itself what it needs to deliver more of to fulfill the national military strategy. “We’ve got to figure this out and we’ve got to figure it out quick,” Welsh said.

The 2015 budget set the Air Force on a path with various resource options. For example, USAF has worked out a classified resource strategy, Air Force 2023. Welsh was quick to say the effort was not a USAF strategy per se, but rather a resourcing guide, designed to get the service to the end of sequestration. A new USAF strategy is now in the works, Welsh stated, and will be released in June.

This strategy document will help the Air Force more closely track its capabilities, spending, and long-term goals and has three components.

First, a “30-year” plan element will examine threats, strategic priorities, and how USAF operates (in air, space, and

cyberspace). It must be updated every four years.

Second, a master plan will look at the service’s next two decades and take core function plans—from air superiority to mobility to space operations—and bring them together in one place. By examining all these in one place, leaders will be able to trade capabilities across portfolios and missions and build off-ramps to recognize programs or technologies that succeed or get out of ones that don’t.

### Organizational Changes

The third element will institutionalize a 10-year resource-driven look, much like AF 2023, to make sure the service is keeping “reality in our funding streams ... down the road.”

To guide and plan for the service’s long-term health, leadership forecast organizational changes to headquarters staff in 2015 and beyond. Welsh confirmed that as part of headquarters reorganization and reductions efforts, the Air Staff’s A3/5 office (operations and plans) will be split up again, with A3 now left solely to focus on operations, while a new A5/8 office will be in charge of both strategic plans and programs and long-range resource

planning. Other organizational changes are in the works, too.

Even as USAF experiences great upheaval in its force structure (with some additional 300-some aircraft proposed for retirement in Fiscal 2015), leadership believes a close relationship between budgeting and planning will help the service articulate what it will become 10 and 20 years in the future.

The cyber mission, a growth area for the service, is a prime example. Air Force Space Command’s Gen. William L. Shelton said seven of USAF’s cyber capabilities have been declared official “weapons systems”—much like any aircraft—and include cyber defense programs, the “vulnerability assessment system,” and unnamed “offensive cyber capabilities.”

The Air Force will add thousands of airmen in the coming three years to focus on cyber defense, combat support, and other activities through US Cyber Command. “We have tremendous opportunity ahead, but it will require us to rethink how we do business in cyberspace,” Shelton said.

Welsh said it is important for all airmen to understand the cyber domain, rather than a mission, is a vehicle for USAF’s five



Lockheed Martin photo

core missions: air and space superiority, ISR, global mobility, global strike, and command and control. “I believe very firmly that if we look at the missions, ... we will see corollaries that we can do in both space and cyber,” he said, noting USAF already does ISR through space, and someday it may even perform strike from space. “Someday, ... we’ll be doing armed escort of information in the cyber domain,” he said. “This isn’t that cosmic if you understand the roles we play to a joint commander and to the nation.” Over the next 20 to 30 years, the Air Force will be looking closely at the ratio between air, space, and cyber in all its core missions and at how to create the best effect overall.

Change is already taking place in many mission sets. The end of F-22 production meant the F-35 is now being adapted to perform air superiority missions, and this involves improving weapons and sensors.

Two of the Air Force’s greatest mission successes are undergoing change: ISR and global mobility. Air Mobility Command’s Gen. Paul J. Selva stated that the collective global mobility capability of USAF is largely built on studies and projections performed in 2012. “We’ve advocated [that] we ought to take a look at emerging [operations plans] from our combatant commanders and look forward to the early 2020s,” he said, to get some sense for what the needs of a future force will be, as they will likely not reflect the capability now fielded.

The same can be said of ISR. In the Gulf War, “nobody knew what ISR was,” Welsh said, and today, at the NCO level, USAF has experts on a range of ISR operations. “The game has changed,” he said. “It has changed principally because the Air Force has built the system, and we ... can move this kind of data all over the world at the speed of light. ... It is a stunningly effective example of American military power,” he said.

### No More Soda Straws

As the service adapts from an architecture set up to support a large footprint COIN campaign to aid future fights, the question needing an answer is how USAF integrates all the ISR tools it has built up across domains, from signals intelligence to audio and imagery. The era of a fleet of soda straw-limited views on Predators and Reapers pulling up volumes of full-motion video has to give way to a better method to collect, manage, and disseminate information around the world for combatant commanders, Welsh said.

As adversary capabilities increase,

challenges will emerge for both targeting and command and control—as coordinating operations at a theater level, among allies, will get harder in an environment where an enemy is actively trying to deny goals. Some tools that will become more important in this domain include self-healing networks and better situational awareness, including, in space and cyberspace.

With the change rippling across the force, some are sanguine about the risks being shouldered by the reductions. “We will still be the best, most capable air force in the world,” said Heidi H. Grant, deputy undersecretary of the Air Force for international affairs. USAF’s partners around the world understand, however, that the US is taking “potential risk” in capacity. In the future, the US may not be able to have the depth to accomplish a full range of operations like it did in March 2011, Grant said, when the Libya campaign kicked off, Operation Tomodachi in Japan commenced, and wars still needed support in Iraq and Afghanistan.

“In the future, the question is, will we be able to? And that’s where our partners come in,” Grant said. Allies will be increasingly important to organize and respond and must build up

complementary capabilities in areas such as ISR and airlift for when USAF will not be available.

Col. Anton Den Drijver, Royal Netherlands Air Force’s air attaché at the Dutch Embassy in Washington, said the Netherlands realized after the 2011 Libya campaign that many allies needed to wean themselves from reliance on key US capabilities. “That’s a big challenge with [the] US and Europe. There are a lot of countries facing this,” Drijver said. The Netherlands has moved to increase procurement of joint programs, such as the F-35 and MQ-9, and to reach out to allies to help build consortiums.

“At the end of the day, it’s nice to have the same pallet configurations in the back of a C-17, ... the same weapons that load up and talk on the same 1760 [data] bus,” said Assistant Vice Chief of Staff Lt. Gen. Stephen L. Hoog, on a panel of air attachés. “All of this interoperability we sometimes take for granted is absolutely essential to the effective integration of airpower, ... and it can go away.”

On one point the leadership was clear, however: “Our ability to respond is going to diminish,” Welsh said, “but when we respond, we’ll still be the best in the world when we arrive.” ■



**Left:** The U-2 fleet is one of the proposed victims of “vertical cuts” that US Air Force leaders say are necessary to meet budget limits. **Above:** Gen. Mark Welsh, USAF Chief of Staff, and James acknowledged the harsh budget realities that will lead to a smaller force, but they are confident the US Air Force will remain the best in the world.



Declining Air Force budgets mean the service must consciously trade capacity for capability.

# Low Budgets, High Technology

By John A. Tirpak, Executive Editor

*In this Boeing illustration, a KC-46 prepares to refuel an F-15 as another Eagle waits for its turn at the boom. Air Force Secretary Deborah Lee James says the KC-46 remains one of USAF's top priorities.*

**U**nder even the best-case financial scenario, the Air Force in the coming years will continue to shrink and be able to do less. Consequently, service leaders have made a deliberate decision to trade capacity for capability: preserving the service's technological edge over world competitors but giving up the ability to operate in as many places at once.

To keep that edge—according to top officials at the Air Force Association's Air Warfare Symposium, held in February in Orlando, Fla.—USAF will not only stick to its recapitalization efforts, it will expand them. There will be a formal program to go beyond the KC-X tanker program with more aircraft, and "serious" work will begin on a successor to the F-22. The Air Force will move aggressively toward hypersonic systems; improve its weapons, to include directed-energy systems; launch a major new engine program; and work more closely with industry to avoid redundant research and development efforts.

Industry speakers at the conference forecast potentially profound changes in manufacturing technologies that could sharply lower costs and shorten the timetable for introducing new weapons. Nevertheless, many speakers noted that USAF's long-held technological lead has greatly narrowed—perhaps permanently—and the service will require diligent, thoughtful investment to stay ahead.

### **Putting Two and Two Together**

Air Force Secretary Deborah Lee James, addressing the symposium, explained, "We have to always keep in mind both the strategy of what it is we may be asked to do when the nation calls, but also the ... budget that we are likely to have in the future."

If USAF doesn't "put those two things together, then in my opinion, our plans, no matter how good they [are] ... simply won't be realistic," she said.

Speakers gave attendees a preview of the Fiscal 2015 budget and five-year plan that would be released shortly. The Air Force's budget, like that of the overall Defense Department, proposes spending at one of two levels: an optimistic one that assumes Congress will repeal the Budget Control Act and end the sequester and a second one that assumes the sequester remains in force.

At either level, James said, "we will be a smaller Air Force overall, but it is our charge to make sure that we are an Air Force that remains on the cutting edge of technology and able to provide that important capability when the nation calls."

She said she'll work toward "balancing today's readiness with tomorrow's readiness." That means maintaining sufficient forces able to fight tonight while investing adequately in future game-changing technologies to ensure USAF stays ahead of rising competitors. Some existing platforms will be selectively modernized or replaced "to ensure that we stay ahead of the threats and remain able to control the skies, project power, and extend global reach for years to come," James said.

As they have been for the past few years, USAF's top priorities remain the F-35 fighter, the KC-46 tanker, and the Long-Range Strike Bomber. Other programs, readiness, force structure, and compensation will all be considered legitimate trade-offs to preserve these three keystone projects.

**Bottom (l-r): A1C Nathan White, SrA. Vincent Miller, and SSgt. Irma Hinton transport an inert GBU-32 JDAM to load onto an F-22 at Holloman AFB, N.M., during a load crew competition. USAF Chief of Staff Gen. Mark Welsh III says the F-35 is having the sort of maintenance problems that the F-22 once experienced—and those have been solved.**

James promised to work toward “better communications and relations with industry,” because USAF depends so heavily on its “direct contribution ... to military capability.”

Chief of Staff Gen. Mark A. Welsh III said USAF has been working on a “30-year look” to the future that he characterized as “not an Air Force strategy” but “a resource strategy” to align service investment plans with the funding expected. It will be done by June, he said.

“This is a call to the future,” he said, to “make sure we don’t get our feet stuck in today” and not have a coherent view of where the Air Force needs to be, relative to its core missions and the future threat.

“It has to include our strategic priorities and the different lines of operation from S&T [science and technology] to many others that keep us moving in a direction that allows us to stay on the leading edge of technology, that keep us engaged with industry the way you need us to be engaged with you.” This strategy will be “reviewed every two years, and it will be completely updated every four years,” Welsh said. It will include a “violent threat assessment,” he said.

In parallel, USAF will create a 20-year strategy that will coalesce the various

portfolio roadmaps, Welsh said, into “a single Air Force master plan.”

### Teething Problems

Despite the contractions, USAF’s core missions will not change, he said, but the service will have to find innovative ways to do them all. The core missions are air and space superiority; intelligence, surveillance, and reconnaissance; rapid global mobility; global strike; and command and control. Perhaps as an add-on, or maybe as an element of all those, USAF will also have to conduct cyber defense, he said. All core missions will be performed through the employment of cyber, and he said USAF people must think of it not as a tool but as a domain in which the service operates.

“We’re already doing ISR in and through the space domain, just like we did through the air domain. Someday we will do strike from space,” Welsh predicted, but “it may be cyber strike.”

As an example of a system that will have to adapt to a new mission, he cited the F-35.

“The F-22 buy was truncated,” Welsh said. “Good or bad, it doesn’t matter at this point,” but “we don’t have enough F-22s to provide air superiority for a theater’s worth of conflict.” Therefore,

the F-35 will have to fulfill some of the air superiority mission “before it goes and does the things it was supposed to be designed to do. It’s just the way it is.”

James told reporters in a press conference later that she and Welsh have high confidence the F-35 will deliver the expected capability, and Welsh said he fully expects it will achieve the planned initial operational capability date in 2016.

The F-35 has had teething problems, but these are typical of “leap-ahead” technologies, which the F-35 represents, James said. “A certain amount of this is to be expected,” she observed, but she reiterated program executive officer Lt. Gen. Christopher C. Bogdan’s mantra that “there’s no more time, there’s no more money” to get the F-35 up to snuff, and the aircraft will have to be “produced on time.”

Welsh said he trusts the opinions of hard-nosed test pilots and those in the initial training cadres who’ve said of the designers: “They got the airplane right.” The “way it flies, the way it handles. ... They like [it]. ... Every guy I’ve talked to who’s flown the airplane will tell you the same thing.”

He told reporters that the concerns on the F-35—particularly on the maintenance side—are “the same kinds” the service had with the F-22, F-16, and



USAF photo by SrA. Kasey Close



**Below: A Global Hawk remotely piloted aircraft completes 2,000 missions and 30,000 flying hours in 2009. USAF, which had planned on retiring the Global Hawk in favor of continuing to fly the U-2, has reversed positions and now plans on upgrading the RPA with U-2 sensors.**

A-10, and those all were resolved. The key now is to bring an operations mentality to flying operations, rather than a test-flight mentality, “which is very, very different.”

“You’ve got to be able to have predictable turn rates”—the time it takes to service and ready the aircraft to fly again. “You’ve got to be able to fix airplanes within a certain time limit.” F-35 operations at Eglin AFB, Fla., are now tracked this way, he said.

Though service leaders have vacillated about whether they can afford to upgrade legacy fighters like the F-15 and F-16 with new gear and still buy new F-35s, Welsh said in his speech that there’s a plan to do both.

“Anything that’s a nice-to-have upgrade on a platform over the next 10 years is out,” Welsh warned. However, certain core upgrades must go forward, such as active electronically scanned array radars to replace analog systems; infrared search-and-track gear; and new data links. “We can’t opt out of those things or we will put our people at risk,” he said, nor can new missile or weapon upgrades be deferred. They’ve “got to happen” to ensure USAF’s combat viability in 10 years.

He added, “And folks, it’s time to start working on a sixth [generation]

fighter. Nobody wants to hear that, but it’s time. ... We’ve got to think and talk about it right now.”

Welsh later told reporters that the data links are a key investment and his goal is “to make sure everything we can connect into is easily ‘connectable-to,’ if that makes sense.” It will be critical for all USAF systems to be able to talk to each other—and connect with the other services. AirSea Battle, he said, is “about extending ranges” and thus being able to take advantage of data from forward deployed Navy sensors on ships, aircraft, and submarines, and vice versa.

Welsh announced to conference attendees that the official name of the KC-46 aircraft is Pegasus, and “it’s a real thing, now.” Boeing and USAF have “a great team” effort on the program, but it only calls for 179 aircraft. When the last one is delivered in 2028, “we’ll still have 200-plus KC-135s that are 65 years old or older. So KC-Y and KC-Z also have to become programs, and we’ve got to get on that now,” he said.

The Air Force is “standing strong” on the absolute need to start recapitalizing its aging bomber fleet with the Long-Range Strike Bomber, he said. “We have to have that capability. We need to deliver it in the mid-2020s.” Welsh later told reporters that he is the only

person authorized to alter the LRS-B’s requirements.

“There’s nothing happening by accident in the bomber program,” he said in the press conference. Requirements changes have traditionally been the culprit when aircraft costs go up, and he said USAF is exercising tight discipline on that front. Secrecy is being maintained for the moment because “we want the program to keep moving and not have the distractions that many other programs have as they get closer to fielding.”

At a different symposium, a week later, James said a draft request for proposal for the bomber is now “out for comment,” and a final RFP will be issued by the end of the year. Lt. Gen. Charles R. Davis, USAF’s top acquisition official, told *Air Force Magazine* the bomber source selection will be completed by early 2015.

Welsh also said USAF has “got to get serious about recapitalizing” nuclear weapons and facilities.

James and Welsh explained that they have reversed course on the issue of the U-2 versus the RQ-4 Global Hawk. In the last couple of years, USAF leaders planned to retire the Block 30 Global Hawk and continue flying the U-2, because operating costs pointed toward that solution as the most cost-effective



USAF photo by Bobbi Zapka



Photo by Richard VanderMeulen



Illustration by Erik Simonsen

one. However, since then, Congress has balked at retiring the Block 30s—many of them quite new—and Welsh said that due to “negotiations” with Northrop Grumman, operating costs on the Global Hawk have come down significantly. USAF is also figuring out how to put the U-2’s unique sensors on the Global Hawk and make the RQ-4 capable of operating in weather.

However, “the driving reasons” for choosing one platform over another are not just about cost, but “sensor quality,” Welsh told the press. Even so, “either one of them could work,” he said. “We clearly think one is the right answer over the other, but if the decision is to go a different direction, we’ll make it work.”

With regard to research, development, science, and technology accounts, James and Welsh provided assurances that neither will be slashed in the coming budget.

“S&T funding is absolutely essential to a service that prides itself on being fueled by innovation. It was born of technology and must stay ahead of the technological curve,” Welsh said in the

press conference. “So we have got to pay a lot of attention to S&T.”

The challenge, he said, is “prioritizing it properly over time and making sure we’re taking a long-enough-range look.” It’s necessary to have that discussion with industry partners “so we’re not duplicating S&T funding on something that’s already being done.” He said the Air Force is looking for ways to save money on S&T through collaboration with the other services.

### Swarm Operations

James added that while “everything is coming down” in terms of spending, “I think you’re going to find there was an effort to protect these accounts vis-à-vis some of the others, precisely because it is so important to the future.”

Some of the old bugaboos of introducing new weapons—namely, higher costs and longer development timetables with each generation—may be turned on their heads in the coming years because of emerging technologies.

Speaking during a panel discussing the “Revolution in Modern Weapons,” Chris-

topher J. Bowie, director of Northrop Grumman’s Analysis Center, said “additive” manufacturing—better known as “3-D printing”—could “completely disrupt and enhance the manufacturing economy.” He noted that Boeing is already using 3-D printing of parts and is flying some 200 of them on 11 types of aircraft. Northrop Grumman is doing 3-D printing of parts using titanium—not just plastic.

The use of 3-D printing could obviate the need for expensive tooling in many cases, Bowie said. Moreover, it could truly speed up the process and lower the cost of aircraft particularly. Imagine, he said, how much touch-labor and inspection could be eliminated if, instead of laboriously threading wiring bundles through an endless series of aircraft bulkheads, “you could theoretically print the wiring loads into the structure.”

Other “printable” items could include “apertures, radar, and so forth”—again, potentially reducing aircraft costs substantially.

In fact, “a whole new force posture” could result because “if a 3-D printer can

**Above left: A KC-135R under maintenance in Meridian, Miss. Even after the last KC-46 is delivered in 2028, USAF will have some 200 KC-135s, many more than 65 years old. Above right: In an artist’s concept, a future bomber muscles into position under a tanker.**



USAF photo by Samuel King Jr.

print an airplane, it can print itself,” with profound ramifications for the speed of manufacturing.

Bowie said that unmanned aircraft will see greater use, and they will cost “one-third to one-half” as much as manned platforms because they won’t need to provide life support or an escape mechanism for an aircrew. At the same time, they would not be constrained by the limits of human endurance and be able to pull many more than nine Gs and fly far more than the 11 hours that seem to be the upper limits for a human pilot.

There will soon be a new science of “swarm” operations involving large numbers of unmanned aircraft having some degree of autonomy and automatically working together, he said.

Retired Maj. Gen. Curtis M. Bedke said weapons and manufacturing technology is moving so fast in competitor nations that for some time to come—perhaps from now on—“sometimes we’ll be ahead, sometimes even, and sometimes behind” competitors, and often “we won’t know ... for sure” where we stand.

However, Bedke issued a stern warning that technology is no longer an impermeable shield guaranteeing safety for the US.

Competitors “will be able to strike the United States homeland, even if they don’t reach our level” of technological prowess, Bedke said, and the US has done relatively little to build air defenses for itself. Enemies will use their newfound technological options “in their own ways,” and the US is well-advised not to assume that competitors “will fight the way we do.” The US military “is living on borrowed time,” he cautioned.

Former USAF Chief Scientist Mark J. Lewis urged continued robust investment in S&T, because many technologies simply don’t follow a prescribed timetable for maturity. Lasers were invented in 1960, he said, and at first were a “solution in search of a problem.” Today, nearly 60 years later, and after tremendous investments in research, lasers and other directed energy weapons are on the cusp of providing real operational capability as weapons themselves, not merely as weapon enablers. The Navy has fielded its first attack laser at sea, with a select-

able amount of damage, at just a dollar per shot, Lewis said.

He noted that hypersonics research is well along in India, Russia, and China, and that China recently tested a hypersonic glide weapon not unlike USAF’s own Common Aerospace Vehicle. These developments are coming “in parallel” with efforts in the US, and he stated that foreign competitors “are more familiar with ... our literature than we are” in the subject area.

Asked what the US can do to prevent high technology from being stolen, particularly by computer hacking, Bedke said it’s “foolish” to attempt a perfect defense.

“We can’t keep everybody out,” he said, and pointed to the hubris of the *Titanic*, the Maginot Line, and the Great Wall of China as barriers that were easily compromised. “We have to expect that although you do all you can” to safeguard information, “you won’t be completely successful. We ought to take that into account” in deciding whether to field technologies incrementally instead of in huge, one-fell-swoop deployments, he said. ■

**Above: TSgt. Russ Fontaine maneuvers a bomb into position to be loaded onto an F-35 in August 2013. It was the first time airmen loaded weapons onto a Lightning II. That the F-35 will perform some air superiority duties is “just the way it is,” said Welsh.**



# Are RPA Pilots the New Normal?

By Aaron M. U. Church, Associate Editor

The remotely piloted aircraft career field, which cut its teeth controlling Predators and Reapers in the skies over Iraq and Afghanistan, is finally settling into normal operations.

**R**emotely piloted aircraft have spawned a new breed of professional aviator that the Air Force says is here to stay. The next challenge is to cement a viable career path for the young pilots who cut their teeth guiding these vehicles over Afghanistan.

When airplanes were still strange new weapons in World War I, a group of pilots came back from Europe who “understood airplanes,” said Col. William M. Tart, RPA Capabilities Division director on the Air Staff. “Those are the people who started the airlines; those are the people who started the Air Corps Tactical School.”

Airmen coming back from Afghanistan, Iraq, and Libya are a new generation “with great ideas” and experience “that will propel the future of RPA” given the right opportunities, said Tart.

Building a new career field—and in many ways a new weapon—in constant combat hasn’t been easy. Airmen who had never flown before trained from scratch to fly RPAs in the Air Force’s new training pipeline, alone a major success.

They have been flying missions “delivering combat effects right out of the gate,” said Col. James Jinnette, Combat Air Forces Division chief at the Pentagon.

Combatant commanders have been exceedingly pleased.



USAF photo by 2nd Lt. Logan Clark



USAF photo by SrA. Jack Sanders

In Afghanistan, the RPA aviators are “proving their value and they’re proving the quality of the training that they’re getting,” said Jinnette.

Like all new ventures, there are issues to address, notably manpower shortages and advancement and promotion opportunities in a career field still arguably under construction. “We’ve identified shortcomings and challenges to work on and we’re getting after them. That’s the bottom line up front,” said Jinnette.

The job of flying remotely piloted aircraft came of age amidst two wars with a voracious appetite for RPA eyes on the battlefield. When war began over Afghanistan, RPA pilot was not a formalized career, and no standardized pipeline existed to train pilots.

“When this RPA enterprise began, it was a novelty. It was something different and

**Left: An 18X student with the 6th Reconnaissance Squadron at Holloman AFB, N.M., trains on an MQ-1 Predator simulator. USAF guidance frequently prohibits the release of RPA pilots’ and sensor operators’ names due to operational security. Above: SSgt. Tyler Groff, a crew chief with the 451st Expeditionary Aircraft Maintenance Squadron, checks the propeller of an MQ-9 Reaper before a flight at Kandahar Airfield, Afghanistan.**

not understood, because it didn’t really exist yet,” said Jinnette. “In the decade of war we’ve had since then, it has become more recognized as a platform that has immense value and capability in combat operations.”

So much so, it has grown up in constant surge mode while undermanned and in the thick of combat. Demand grew so quickly that the Air Force initially pulled pilots and combat systems officers from the cockpits of fighters and tankers alike

to man a joystick. With a mandate to mount 65 combat air patrols—that many simultaneous orbits flying around-the-clock—by 2013, the old feeder system proved insufficient.

Even today, “at the most, we end up filling 66 percent of all combatant commanders’ [intelligence, surveillance, and reconnaissance] requirements,” said Tart.

To give Air Education and Training Command breathing room to stand up an RPA pilot training program, the Air



USAF photo

Force took officers straight from undergraduate pilot training to temporarily fly RPAs before continuing to their assigned conventional aircraft. “Since 2009, we’ve gone from 12 squadrons to 22 squadrons. No other community is doing that kind of growth,” said Tart.

When it became clear RPAs weren’t a fad, officials knew they needed a more efficient and permanent way to source pilots. The brand-new 18X Air Force specialty code was born and AETC set to work building a pipeline to train operators from zero. “It’s more expensive to send someone through UPT and then over to the RPAs,” explained RPA Specialty Manager Lt. Col. Theodore J. Shultz. “It’s much faster and cheaper to create straight-up RPA pilots.”

This is exactly what the Air Force is now doing. With the undergraduate RPA training pipeline, and now the MQ-1 Predator/MQ-9 Reaper formal training unit up and running at Holloman AFB, N.M., “we’ve put out about 168 brand-new 18X [personnel] per year” not only to backfill those departing but also to begin alleviating the burden on airmen, said Shultz.

By the time the first class of pilots trained from scratch in the new pipeline graduated from Holloman as qualified Predator and Reaper pilots in 2012, the Air Force had snatched 245 UPT-direct pilots to fill the void. The service has already offered roughly two-thirds of

them their promised opportunity for a manned cockpit, backfilled by 18X airmen graduating from the schoolhouse at Holloman.

“There is a lot of still priming-the-pump, if you will, to grow the career field and play catch-up from the many years of surge,” however, said Shultz. The goal, after more than a decade of operations, is to finally “normalize” the career field with the dedicated structures, personnel, and training of a normal Air Force mission. “Understand that we never got to a full crew complement across the enterprise,” said Tart. Despite the war winding down in Afghanistan, “there’s no lessening in the demand.” Right now, “we’re not even up to the full 65 CAPs’ complement of guys” yet, he said.

### Normalizing

The Air Force is working several manpower studies to evaluate the long-term need, but to fully man the current CAP mandate takes 1,600 Active Duty RPA pilots, according to Shultz. “A lot of that growth is in the staff, ... normalizing the [USAF] Weapons School and FTUs and some of the other non-direct operational units,” he said.

The pool stands at 1,300 pilots, about 30 percent of them organically trained 18X. The rest are reclassified or cross-trained pilots or aircrew. “There is still growth to be done to reach that final enterprise size,” said Shultz, noting that

it will probably take seven to eight years to reach. Even without enough bodies, the Air Force expects to finally hit 65 CAPs in May, according to Tart.

With today’s manpower, “the people who are flying those continue to operate in what is effectively a surge mode,” said Jinnette. What surge mode means is that the Air Force cannot spare RPA pilots for the kind of training and professional development “we would like them to take if they were in another career field or on another aircraft,” said Jinnette. In most cases, RPA pilots can’t take normal leave to recharge. “It takes more [manpower] than we have available per CAP to get the mission done. ... What’s going to give is personnel development and leave,” he explained.

Officers need more than just flying to be competitive for promotion and command slots, and more than combat hours to remain proficient aviators. “That’s stunted right now because of the surge mode that we’re still in,” said Jinnette. As quickly as demand wanes in Afghanistan, combatant commanders are jostling to snap up CAPs. “People want these things in the [Mediterranean], they want them in the Pacific, they want them in the Persian Gulf,” and pretty much everywhere US forces are engaged.

Paradoxically, the surge that complicates attaining equilibrium is “part of what’s driving our normalization,” said Jinnette. “We’ve now accepted that the



Left: An MQ-1 Predator flies over Creech AFB, Nev., in 2011. Below: Airmen move a Reaper at Kandahar in preparation for an Operation Enduring Freedom mission in 2013. The Predator/Reaper training unit at Holloman is putting out some 168 new 18X personnel per year.

demand is not going to go away just because of any change in Afghanistan.” This is solidifying the importance of RPAs and guaranteeing a long-term place for them in the Air Force.

One of the first actions taken to “normalize” the RPA enterprise was to recode flying and staff billets as 18X, effectively preventing non-RPA pilots with conventional flying experience from filling the RPA slots. This includes flying slots in operational units clear up to the division chief level on the Air Staff. “Those billets are now hard-coded to be RPA-expertise

required,” said Shultz. This aimed not only at professionalizing the enterprise but also opening suitable advancement opportunities for RPA operators.

### Building Viable Careers

Congress and academics alike have criticized the inadequate opportunities and low promotion rates within the RPA force. Both are areas the Air Force is working to improve.

Lawmakers inserted language into the Fiscal 2013 defense authorization legislation tasking the Air Force to study and report on the cause for RPA officers’ “persistently lower average” career development and promotion rates.

Lt. Col. Lawrence Spinetta, then an Air University fellow, penned an equally critical assessment in a 2013 *Air & Space Power Journal* article, citing a slew of factors inhibiting RPA officers’ progression and command opportunities.

Neither is a simple problem, but “if I were to say it properly, the career path is in definition,” said Tart. “All the leadership understands that RPAs are a major aspect of the future” and are working within manpower and budgetary constraints to resolve these issues. “We see it as a normalized career field that needs to be more normalized. ... It’s not there yet, but we’re working that way,” said Jinnette.

By the time the Air Force reported to Congress in summer 2013, promotion

rates were already beginning to pick up, according to Shultz.

New RPA tracks at the Weapons School at Nellis AFB, Nev., and the USAF Test Pilot School (TPS) at Edwards AFB, Calif.—combined with other normalizing efforts—have helped.

Pilots who’ve graduated from the Weapons School or TPS are “looked at differently” by promotion boards, compared to those who haven’t, said Tart. Before RPA tracks existed at these schools “you never had that check mark on your block.” Now that there’s a formal training unit at Holloman, pilots can up their competitiveness by instructing, too. Until recently, “you didn’t have all the benefits of a normalized career field from which to have an officer who looks good on paper,” said Jinnette. It’s getting to the point where “now it’s a system” to advance and promote within the RPA career track, which is already pushing up officers’ promotion rates to major and beyond.

### A Chance To Command

Manning and operations tempos still make it difficult to send pilots away for activities such as Squadron Officer School, needed to move up the chain. Even when fully manned, though, Tart pointed out that the Air Force isn’t about “having a lot of fat so that people can résumé-build.” Pursuing an advanced degree on top of a day job isn’t easy for any officer, RPA pilot or not, he said.



USAF photo by SrA. Jack Sanders



*An MQ-1 Predator armed with Hellfire missiles flies a combat mission over southern Afghanistan*

The upside is that RPA operators on the whole are young. The bulk fall in rank between second lieutenant and captain; this gives leaders a chance to build the pathway out ahead of them as they progress.

“I’m the only colonel 18X, and then the next 18X is a major,” stated Tart.

The enterprise is new enough that last summer it produced its first RPA-qualified wing commander: Col. James Cluff, a former fighter pilot-cum RPA operator. He commanded an RPA squadron at Creech AFB, Nev., and now heads the 432nd Wing there.

“Those are the successes” that build momentum and pave the way for young officers coming up behind them, Tart said.

RPAs are quickly becoming one of the Air Force’s largest flying communities. As Spinetta, now 69th Reconnaissance Group commander at Grand Forks AFB, N.D., noted, a single wing manages the bulk of regular Air Force RPA forces. The remaining operational and training squadrons are nestled under non-RPA wings dominated by fighters, bombers, or special operations. The result is a career bottleneck at the wing command level, severely limiting RPA pilots’ chances to lead a major command, joint-service combatant command, or even the Air Force later down the road.

“Every Chief of Staff during the last 50 years commanded a wing” as part of his career development, wrote Spinetta.

While the Air Force is concerned about the issue, it’s not unique to RPAs, said Jinnette. “If you look at some of our big-wing ISR, you’ll see very limited wings associated with a lot of people,”

he said. “It’s not like this is a special boutique problem.”

The Air Force is at least looking at all options, up to and including force structure changes, to breach barriers. With billions of dollars cut from the defense budget, Jinnette said the real problem is money. “The idea of growing the number of units to allow command opportunities is something that has to be carefully considered. ... There’s an overhead cost,” he said. “It might make more sense to support the warfighter and have more units in different places. ... I don’t want it to sound at all like we’re moving out that way, but we’re not ignoring it.”

Getting back to RPA officers’ average age, though, creating staff and squadron level billets is more pressing—and arguably easier at present. “We’ve got to work on the squadron commander piece and the ops group piece ... before we can really get there,” said Tart.

Most RPA pilots right now are looking at what it takes to make captain or major, to command a squadron, or serve on a major command staff. All this will prepare them for higher level command when leaders are able to create billets down the road, said Tart. “Finding guys who can fit that mold to be a squadron commander” and helping them along is the task at hand, he said. Whether 18X, or officers who chose to permanently cross over, Shultz said, “we’ll continue to proactively return and look for opportunities” to make certain that billets exist “once they do reach those ranks.”

Jinnette said the Air Force has made great strides normalizing the RPA career field. “If you think about 20 different

lines of effort that we’re getting at, one is staff, one is command opportunities: ... There’s a whole list of things we all have to dial up,” he said.

### Happy Ending

Clearly, airmen do see a rewarding future in the RPA business. Of the 245 pilots pulled directly from flight school, 37 percent turned down a guaranteed fighter, bomber, or airlifter slot to continue flying RPAs, noted Shultz. Tart highlighted a young UPT-direct pilot he’d known during his time as operations group commander at Creech as an example.

“She was the No. 1 lieutenant out of 200 pilots” at UPT, he said. After her three-year assignment was up, she said, “Absolutely, I want to stay here and do this,” recalled Tart. “She went on to Weapons School,” became an RPA instructor, and will be “a future leader in RPA for sure,” he said. “The current ops group commander at Holloman was a squadron commander at Creech,” he added.

“I would not say that it’s all solved and it’s all good, but we know what we’re getting after and we’re starting to develop lines of effort as a service to resolve those,” said Jinnette.

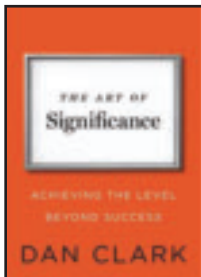
He noted that the RPA community has had to answer critics before, such as when it set up a schoolhouse to quickly train operators without sending them through traditional flight training. The Air Force views this as a monumental success that many initially doubted was possible. ■



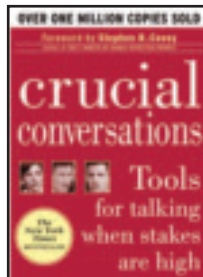
# Books Special: CSAF Reading List 2014

Compiled by Chequita Wood, Media Research Editor

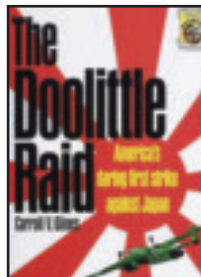
Air Force Chief of Staff Gen. Mark A. Welsh III released his 2014 reading list in February. Twelve books form the centerpiece of the list, but it also includes films, photographs, and art. In introducing the list, Welsh said, "I hope they inspire you to tell your Air Force story."



**The Art of Significance: Achieving the Level Beyond Success.** Dan Clark. Penguin Group, New York (212-366-2000). 256 pages. \$12.99.



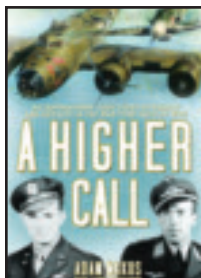
**Crucial Conversations: Tools for Talking When Stakes Are High.** Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler. McGraw-Hill, Blacklick, OH (877-833-5524). 256 pages. \$18.00.



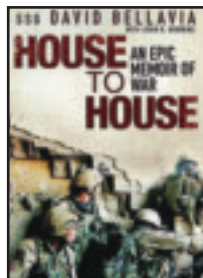
**The Doolittle Raid: America's Daring First Strike Against Japan.** Carroll V. Glines. Schiffer Publishing, Atglen, PA (610-593-1777). 272 pages. \$29.99.



**Fearless: The Undaunted Courage and Ultimate Sacrifice of Navy SEAL Team SIX Operator Adam Brown.** Eric Blehm. Waterbrook Press, Colorado Springs, CO (800-603-7051). 290 pages. \$14.99.



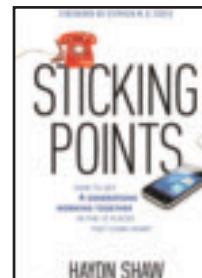
**A Higher Call: An Incredible True Story of Combat and Chivalry in the War-Torn Skies of World War II.** Adam Makos with Larry Alexander. Penguin Group, New York (212-366-2000). 400 pages. \$26.95.



**House to House: An Epic Memoir of War.** David Bellavia with John R. Bruning. Simon & Schuster, New York (800-223-2336). 336 pages. \$7.99.



**On Combat: The Psychology and Physiology of Deadly Conflict in War and in Peace.** Lt. Col. Dave Grossman, USA (Ret.), and Loren W. Christensen. Warrior Science Publications, Milstadt, IL (618-476-3200). 403 pages. \$16.45.



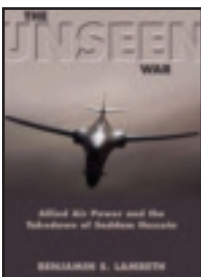
**Sticking Points: How To Get 4 Generations Working Together in the 12 Places They Come Apart.** Haydn Shaw and Stephen M. R. Covey. Tynedale House Publishers, Carol Stream, IL (800-323-9400). 285 pages. \$17.99.



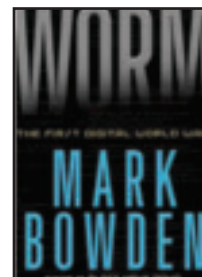
**Switch: How To Change Things When Change Is Hard.** Chip Heath and Dan Heath. Random House, New York (800-726-0600). 320 pages. \$26.00.



**Undaunted: The Real Story of America's Servicewomen in Today's Military.** Tanya Biank. NAL Caliber, New York (212-366-2000). 369 pages. \$16.00.



**The Unseen War: Allied Air Power and the Takedown of Saddam Hussein.** Benjamin S. Lambeth. Naval Institute Press, Annapolis, MD (800-233-8764). 480 pages. \$59.95.



**Worm: The First Digital World War.** Mark Bowden. Atlantic Monthly Press, Jackson, TN (800-343-4499). 288 pages. \$15.00.

**T**HE Air Force is working to ensure its nuclear forces maintain their high state of readiness.

Perhaps no Air Force mission has received more scrutiny in the past six years than the operation and maintenance of the nation's nuclear-capable bombers and intercontinental ballistic missiles.

Big changes began in June 2008 when the Air Force Chief of Staff and Secretary were fired by then-Defense Secretary Robert M. Gates for high-profile nuclear security lapses.

The Air Force placed considerable new attention on its nuclear mission. This included activating Air Force Global Strike Command to oversee the service's B-2A and B-52H bombers and its Minuteman III ICBMs. The Air Force also established an office on the Air Staff for overseeing nuclear matters, the A10.

The challenges did not end there, however. Late in 2013 came a series of reports on new mishaps and morale problems within the ICBM force, which is being reduced (as is the nuclear-capable bomber fleet) to meet the ceilings imposed by the New START agreement with Russia.

In light of all this, Air Force and DOD leaders are working to improve the service's nuclear force. Defense Secretary Chuck Hagel said the nuclear triad of land-, air-, and sea-based delivery systems will be preserved, and the mission will not be neglected. DOD

will "make important investments to preserve a safe, secure, reliable, and effective nuclear force," Hagel said in a February briefing to preview the 2015 defense budget request.

On the Air Force's side, upholding its nuclear standards will mean the service is paying close attention to airmen's professional development and investments in equipment—to ensure nuclear readiness rates do not suffer.

### Define Readiness

This effort comes at a time when the Air Force's nuclear deterrence operations, or NDO, are undergoing a transition. Maj. Gen. Garrett Harencak, who oversees the A10 said USAF is working to protect its nuclear readiness accounts from the effects of budget volatility.

"Everybody took some cuts. ... There was some underfunding, some underinvestments," he said in a January interview. The concern is "these bills are going to come back due again."

The Pentagon's guidance to the services on readiness reflects this view. "Readiness of an individual unit is the result of a series of time-intensive programs that train qualified people and prepare working equipment to be deployed, operated, and ultimately recovered," states a 2013 fact sheet on readiness impacts. For example, it takes three to six months for a given unit to regain lapsed proficiency qualifications in a flying mission, according to the fact sheet.

Nuclear readiness has some similarities to the flying mission, but is unique and entails practicing for the mission without being employed in combat. "In NDO, we are pretty clear as to how we do that: If you are a unit, you are evaluated for traditional readiness, ... with [operational readiness inspections], ... then compliance with nuclear surety inspections," Harencak said.

A nuclear operational readiness inspection, or NORI, provides the metrics to measure performance and is the standard the Air Force should hold its nuclear units to, Harencak believes. "Fundamentally, that's how I would define readiness," he said. "Can you do your wartime mission now, right now? How we determine [that] is through inspections."

One hard-to-balance issue is the nuclear mission's need for expertise and specialization versus the need to expose NDO airmen to the wider Air Force. The missile and bomber units are located at just a few bases, and both internal Defense Department studies and RAND reports indicate that career advancement is a concern of airmen in the nuclear mission.

Since standing up AFGSC, the Air Force has placed a "laser focus" on nuclear operations. "That meant that there are parts of the Air Force that don't have exposure to the nuclear enterprise," said Harencak. "When you just centralize into a few places, that has an advantage. But one of the disadvantages



# NUCLEAR

is that the pride and professionalism [of the NDO community] is not always exposed to the general population of the Air Force and the DOD.”

This balance is one the Air Force is working on, together with its partners in the Navy’s nuclear community, as it seeks to retain a skilled and specialized workforce but also give it exposure and opportunity for advancement across the US military.

The dual-capable bomber force also provides conventional capabilities, and the Air Force routinely rotates heavy bombers to Guam as part of the continuous bomber presence in the Asia-Pacific region to provide stability there. In 2012, AFGSC moved to six-month rotations instead of four-month rotations for its B-52 deployments to Guam. This change cut logistical costs and added greater mission stability, while allowing crews to practice tasks related to both conventional and nuclear deterrence operations.

The Air Force is now well-versed in how to manage pilots, weapon systems officers, and other aircrew members, said Harencak, and in how to oversee the “seeds and weeds” tasks that airmen must accomplish before the service can declare a unit combat-ready. “Many of the skill sets are reasonably transferable,” he said. But “one of the things we have to juggle is how do we measure readiness to do both those missions simultaneously?”

For nuclear units, the answer is

twofold: first evaluating for traditional readiness via NORIs, then measuring compliance via nuclear surety inspections, or NSIs. Every 36 months, each ICBM and nuclear-capable bomber unit undergoes a NORI, with inspectors scrutinizing operations from top to bottom. They grade a unit in four areas: force generation, employment, reconstitution, and surety. They rate a unit as being outstanding, excellent, satisfactory, marginal, or unsatisfactory.

### The Toughest Inspection

The Air Force has conducted nine NORIs since 2010, resulting in two outstanding ratings, four excellent scores, and three satisfactory marks, according to Harencak. This set of results is historically higher than the average operational readiness inspection rate, he said. But they go the extra step with NDO; they also evaluate the unit’s ability to comply.

This involves a separate inspection, the NSI, carried out by inspectors every 14 months. The inspections cover safety, security, and storage issues pertaining to how a unit handles its portion of the nuclear deterrence mission.

The NSI is an exhaustive inspection and there are only two results possible: pass or fail. Last summer, the 341st Missile Wing at Malmstrom AFB, Mont., garnered attention for failing an NSI. Inspectors later retested the unit. It redeemed itself by earning a

passing score the second time around.

Harencak said the setup with NORIs and NSIs is, by and large, working. “I have not met anyone who has ever had to experience an NSI [who] does not believe it is the toughest inspection the US military gives to itself,” he said. “It is very intrusive, it is very detail-oriented, and it uncovers every rock and opens every door.”

While there are different metrics for missile wings than for bomber units, the underlying principles are the same.

Missile operations are “fundamentally different” from flying operations, and so the Air Force maintains a set of metrics to measure performance in the NORIs and NSIs. Most are classified, and commanders rarely discuss specifics of NSI failures. But failure is part of the system, said Harencak.

It is the human capital aspect of readiness that attracts as much time and attention as sorties and missile tests. “Our people will make mistakes,” said Harencak. “We don’t make excuses for it.”

“If everyone were passing all the time, there would be something to worry about,” he said. “Some people will fall short.”

The Air Force has made progress in the last 10 years in managing the human capital side of the nuclear enterprise, but work remains. Reports emerged detailing morale problems inside the ICBM cadre, along with a perceived lack of career advancement

**Despite the recent distractions, USAF’s nuclear bomber and ICBM forces must keep focused.**

READINESS

By Marc V. Schanz, Senior Editor



USAF photos by SSgt. Jonathan Snyder



USAF photo by SSgt. Jonathan Snyder

*Left: USAF personnel transport a re-entry system to be installed at an ICBM facility near Malmstrom AFB, Mont. Above: Capt. Arthur Jones (l) and Capt. Jared Bishop during missile launch procedures training at Vandenberg AFB, Calif.*

opportunities, staffing shortages, and burnout, according to a preliminary RAND study briefed to AFGSC leadership in 2013.

How we educate and motivate warriors “matters as much today, and probably matters more, simply because we are smaller than we once were,” said Harencak. The nuclear mission comprises five percent of the Air Force’s force structure and takes up less than one percent of the budget for operations.

As a result, USAF is tweaking professional military education within nuclear deterrence operations to give airmen the training and tools to perform the mission. This includes classes ranging from Nuclear 100 to Nuclear 400 to placing funding priority on what are deemed “key nuclear billets.”

The Air Force develops key personnel who have nuclear expertise and now fills the billets to 100 percent in a given unit before others. “That [billet] becomes a force multiplier,” said Harencak.

The Air Force’s nuclear readiness has a much tighter relationship with modernization and sustainment than some other missions. USAF really can’t write any sustainment and modernization off, said Harencak of investment cutbacks in O&M accounts. “We are supposed to fly a certain number of sorties and do a certain number of continuous training events.”

Equipment investments, from B-52 upgrades to missile alert facilities, are intertwined with how the Air Force measures its nuclear readiness.

A 2013 RAND study on nuclear sustainment reflects Harencak’s perspective. “Foremost among these unique aspects [of NDO] is the nature of the mission itself: deterrence and extended deterrence, which are as much about political effects as military effects,” states the report. “These objectives are relevant to sustainment because sustainment is ultimately the long-term maintenance of a capability, and the degree to which that effort is successful depends on whether these mission objectives are met.”

### Honest Debate

The mission, the report notes, is only as effective as its credibility. Testing ICBMs at Vandenberg AFB, Calif., is an example of highly visible sustainment efforts that could also be classified as a mission-readiness activity.

The reverse is true as well. “If an entire fleet of dual-capable aircraft were grounded, ... it would be a visible indication of a lack of a credible deterrent in one portion of the nuclear triad,” states RAND. This is why sustainment and readiness factor into resource decisions together in a manner “that differs from most conventional capabilities.”

The Air Force and DOD will have to make some “tough choices” about nuclear force structure in the coming years, said Harencak. “DOD and our Air Force [are] going to have to come to grips with the fact we are living in 2014, not 1974,” he said. “How we operate may need to change: how we acquire, how we train, how we procure.”

In November, USAF Chief of Staff Gen. Mark A. Welsh III said nuclear deterrence strategy is something “we should be thinking and talking about all the time.” The daily cost of operating the ICBM fleet, for example, “is not that significant compared to the cost of running other things; in fact, it’s actually fairly small.”

The possible modernization bill, however, is not small and will get close examination. This will lead to “a very honest debate about where we can afford to invest, where we must invest, and how does that relate to a strategy going forward for the nation,” said Welsh. “I think it’s a fair debate and the Air Force needs to be in the middle of it.”

Harencak, for his part, believes discussions about the mission’s future should be separated from cost debates. “The numbers are not what matter. What matters is what we can control, is the mission at hand,” he said. “Doing things the right way, and doing that thing right, that is what we should focus on,” he said. ■

AIR FORCE ASSOCIATION'S

# AIR & SPACE CONFERENCE AND TECHNOLOGY EXPOSITION

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**SEPTEMBER 15-17, 2014**  
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**R**EMOTELY piloted aircraft such as the MQ-9 Reaper and RQ-4 Global Hawk are manned by squadrons of pilots and sensor operators on the ground. Five or 10 years from now, however, that may no longer be the case, as full autonomy for air vehicles is well within the Air Force's technical reach.

According to USAF officials, artificial intelligence and other technology advances will enable unmanned systems to make and execute complex decisions required for full autonomy sometime in the decade after 2015.

Advances in information management, vehicles, and weapons have opened the door to highly complex applications of autonomy with far less human intervention in the mission timeline. Threat is a driver, too: Technical advances in autonomy can improve reaction time and chances for mission success in contested or denied airspace.

The Pentagon says full speed ahead. In November 2012, then-Deputy Secretary of Defense Ashton B. Carter issued new guidelines on autonomous weapons development. The guidelines authorized combatant commanders to incorporate more weapon systems with autonomy into operational missions.

The intent was to pursue operational advantages and "allow commanders and operators to exercise appropriate levels of human judgment in the use of force," according to the policy directive.

Two more thumbs up came from the undersecretary of defense for acquisition, technology, and logistics, Frank Kendall III, and the vice chairman of the Joint Chiefs of Staff, Adm. James A. Winnefeld Jr., when they released an updated unmanned systems roadmap in 2013.

"Autonomy in unmanned systems will be critical to future conflicts that will be fought and won with technology," the roadmap noted.

Autonomy refers to what a machine can do by itself. The concept started out as a way to reduce the workload of human operators by transferring partial operations to a machine process—e.g., an airplane's autopilot mode.

### Dark and Light

Autonomy technologies stand to make a major difference in the contested battlespace—but they will be contested in public debate, too. Increasing levels of autonomy stir controversy when they touch on deep-seated fears and values surrounding the use of force. At issue is whether repositioning the elements

of human control alters the concept of legitimate action.

Discomfort persists. "Drones are a technological step that further isolates the American people from military action," law professor Mary L. Dudziak said, according to *The New Yorker* in a 2009 article. The release of the November 2012 guidelines stirred calls for an executive order stating that lethal and nonlethal attack with fully autonomous weapons violates the law of war.

Intriguingly, there is a vocal group on the other side, too. These scientists see autonomy as a means to reduce error and enhance the legitimacy of the use of force. While some decry the growth of autonomy, others have pointed out it can subtract human weaknesses from combat. Full-scale robots "would be unaffected by the emotions, adrenaline, and stress that cause soldiers to overreact or deliberately overstep the rules of engagement," hypothesized a California Polytechnic State

University team sponsored by the Office of Naval Research. These robots could even "act as objective, unblinking observers on the battlefield, reporting any unethical behavior back to command," they said in the report "Autonomous Military Robotics: Risk, Ethics, and Design."

Taken to the extreme, autonomy theoretically enhances legitimacy. "Future generations may come to regard tactical warfare as properly the business of machines and not appropriate for people at all," noted Thomas K. Adams in a 2001 article for the US Army War College's journal *Parameters*, reprinted in 2011.

A consensus on the proper roles for autonomy is lagging behind the technical possibilities. For example, most in the debate agree that weapon autonomy is more acceptable for self-defense of a fixed air base or a platform such as an aircraft carrier at sea. Automated close-in defensive fires systems like the Phalanx 20 mm gun were designed to search, track,

# THE AUTONOMO QUESTIO

**Where should humans step aside  
and let the machines take over?**

and engage automatically. Land-based Phalanx systems deployed extensively at forward operating bases in Iraq recorded more than 100 intercepts by 2010. Current DOD policy explicitly approves supervised semiautomatic weapons like Phalanx when they are used to thwart time-critical or saturation attacks on manned installations. In other words, automated self-defense systems to protect human life are considered well within bounds.

Problems arise when those distinctions blur. Does pre-emptive attack against a missile launch site by an autonomous system fit the criteria? Would having human commanders set the mission parameters skate under the barrier, or does the input have to take place within a specified period of time? The point is that sanctioning autonomy only as a defensive weapon will soon be too small a fig leaf. Questions about offensive employment of autonomous weapons cannot be avoided.

One way ahead could be to subject autonomous systems to blue-suit evaluation and discipline. Writing in 2002, an Air Force Research Laboratory team took on the challenge of setting up autonomy metrics. "The great insight was this: We are designing algorithms, agents if you will, to replace pilot decision functions. Machines replace humans—so why not look at the human effectiveness community for metrics?" The AFRL team pointed to the OODA (observe, orient, decide, and act) Loop as an obvious choice for the Air Force. But the team's insight is broader. Autonomous operations will remain within a larger framework of the human joint force commander's mission and intent. There's every chance to keep ethics and efficiency in the loop.

Expect the Air Force to be closely engaged with both the operational and policy issues surrounding autonomy technologies. As with many technologies before it, autonomy puts USAF again at

the leading edge of major changes in the art of warfare.

Thus, humans remain in control. As the Air Force's "Unmanned Aircraft Systems Flight Plan 2009-2047" put it: "Humans will retain the ability to change the level of autonomy as appropriate for the type or phase of mission."

Researchers have long understood that machines may be more skillful than humans at many tasks. An early guideline on autonomy was proposed by psychology professor Paul M. Fitts in 1951. It addressed the distinction between man and machine head-on. Fitts was studying air traffic control when he developed his list as "a general answer to the problem of dividing responsibility between men and machines."

Fitts grouped six tasks under the heading "Men Are Better At" and five more as "Machines Are Better At." Based on the technology of the early 1950s, Fitts gave humans the edge in storing data for long periods of time and in perception of dim light and faint sounds. Both categories would probably be awarded to machines today. However, Fitts also gave humans the advantage in improvisation, inductive reasoning, and judgment—as most would again today.

Military operations with higher levels of autonomy developed quite recently. Autonomous aircraft were flown prior to and during the Vietnam War, but it was the mid-1990's advances in software and the wide availability of precision satellite guidance that made systems such as the MQ-1 Predator reliable enough for routine operations.

The real dilemma is not the current level of autonomous systems. For all their notoriety, the Predator/Reaper family can be seen as just a waypoint on the road to fully autonomous systems. The next applications of autonomy could greatly decrease the human crew intervention in the mission timeline.

In summer 2012, the Defense Science Board completed a study of autonomy commissioned by the deputy secretary of defense. The starting point was that autonomy is here to stay. "Unmanned vehicle technologies, even with limited autonomous capabilities, have proven their value to DOD operations," stated the report, "The Role of Autonomy in DOD Systems."

The study then raised the issue of finding the appropriate cognitive level

***Phalanx systems autonomously track and destroy incoming threats. Here, a Phalanx's 20 mm gun is test-fired from USS Monterey.***



USN photo by Mass Communications Spec. 3rd Class William Weinert

# MY N

By Rebecca Grant

for handoffs between human control and software autonomy. The DSB report also acknowledged that “allocations may vary by mission phase as well as echelon.”

Notably, all current DOD unmanned systems are remotely operated; they can default to true automation only briefly and “in extreme circumstances, such as a lost link condition,” as DOD puts it. Making the distinction “is important because our community vernacular often uses the term ‘autonomy’ to incorrectly describe automated operations,” the report chided.

The debate on autonomy is likely to heat up. The near future holds both technological advances and mission requirements that will keep the spotlight on this development.

Just what does increased performance of autonomous flight technology portend for the Air Force? Autonomy could spread in several ways and USAF is poised to be at the center of it.

The first application will be greater autonomy for individual vehicles. More than a decade ago, researchers at AFRL led by Bruce T. Clough defined a fully autonomous system this way: “The UAV [unmanned aerial vehicle] receives goals from the humans and translates that into tasks, which it does without human intervention. The UAV has authority to make all decisions.”

Systems are close to employing dynamic tasking where the vehicle itself can select its next move. The most advanced vehicles like Global Hawk already have programmed in subroutines that can cover significant portions of their missions. General Atomics Aeronautical Systems notes the Predator B can be flown as remotely piloted or “fully autonomous.”

Recognizing this, the Air Force laid out goals for full mission autonomy for air vehicles in the 2009 UAS flight plan. Milestones such as autonomous flight, automatic target engagement, and command of autonomy were anticipated for the 2015 to 2025 time period.

Dynamic tasking would permit automatic selection of flight and mission profiles by the aircraft itself. Crucial steps in the autonomy chain include avoiding collision, detecting other air vehicles, in-flight diagnostics, and mission replanning. While the choice could be monitored, the decision inputs would be carried out onboard the aircraft. Doing more onboard

would make it possible to filter out human control through most or all mission segments.

Why push for more autonomy? It may be essential to completing missions in a contested environment.

Reapers over Afghanistan operated in a relatively permissive environment under full control of human operators using satellite links. Full autonomy in various types of air vehicles may be needed if satellite links between unmanned aircraft and their remote operator crews are hacked or disrupted. Remote operators can maintain near-constant contact with unmanned systems in a permissive environment. However, rapid, autonomous execution of part of a mission could be invaluable against anti-access systems.

In the case of an unmanned aircraft switching to autonomous mode in denied airspace, independent operation might also permit the aircraft to make onboard decisions about its sensor operations based on weather, mission priorities, etc. The fusion of intelligence and surveillance information has made this a near-term prospect.

Under this concept, speed improves as autonomous systems detect, process, and act on the information. Additional autonomy would be an advantage. A contested, denied access environment could require more autonomy just to complete the kill chain.

It’s possible that unmanned aircraft may be tasked to acquire targets and release weapons. The Pentagon’s 2012 policy left the door open for autonomous targeting

but added restrictions against targeting humans. The guidelines also built in a safeguard by mandating that autonomous systems “complete engagements in a time frame consistent with commander and operator intentions, and if unable to do so, terminate engagements or seek additional human operator input before continuing the engagement.”

Programming in the commander’s intent could extend a long leash to autonomous missions. Under broad interpretation of this concept, human input sets parameters but hands off final task execution decisions to autonomous systems.

That may seem a bold step. But growing threats could urge it along.

The US is not the only nation pursuing autonomy. According to the DSB, it is also time for the US to plan explicitly for adversary use of autonomous systems. Likewise, the 2012 directive on autonomy stipulates that systems “function as anticipated in realistic operational environments against adaptive adversaries.”

### Forming Up

Another step in autonomy goes beyond what one single aircraft can do. In the near future, autonomous systems could also engage in collaboration. Passive, line-of-sight links have been explored by researchers as a means to control unmanned formations either from a manned “lead” aircraft or from another unmanned vehicle. The goal is for followers to maintain relative range while the leader maneuvers. Software in the loop determines the guidance inputs.

**Airmen move an MQ-9 Reaper at Kandahar Airfield, Afghanistan, in preparation for a mission in 2013. Autonomous flight and automatic target engagement may be coming.**





Success in automated air refueling is a harbinger of more autonomy. However, the trick in recent tests has been for software to grasp and react correctly to the many minute inputs generated by two vehicles in close flight. The next step is formation flight of two, four, or more air vehicles.

All of this is within reach. The Air Force's 2009 unmanned aircraft systems flight plan summed up specific projections for progress on technologies such as "see and avoid."

"The same technologies that keep UAS from any airborne collision will also enable UAS formation flight," the report said.

Teams of multiple vehicles coordinating movements without the constant intervention from human controllers is an alluring concept of operations. Research laboratories have already tested autonomous formation flight of small, unmanned vehicles, for example.

Of course, a group of autonomous vehicles has to stay in sync—one of the most difficult technical hurdles. The system as a whole will have to verify that the vehicles are receiving a single set of commands and executing them correctly.

Tactical mastery might come first as a partnership between manned and unmanned systems. The first application for fully autonomous vehicles could be within the manned-unmanned interface often abbreviated as MUM. The interface is already part of plans for next generation systems.

For example, "we're talking about how manned and unmanned systems might work together" on an Air Force

and Navy future air dominance project, said Defense Advanced Research Projects Agency Director Arati Prabhakar in April at the Pentagon.

Similarly, the Obama Administration's concept for a new long-range strike family of systems includes teaming between a manned or optionally manned bomber and an unmanned strike or electronic warfare platform. As the manned-unmanned interface moves into the mainstream, MUM raises second-order issues. Long segments of flight in collaborative formation with profile changes would practically constitute an autonomous mission fleet.

So far, the autonomy discussion has centered on vehicles. However, operating a platform with no crew on board is not the only mode for autonomy. It also holds possibilities further up the command and control chain—specifically, in autonomous adaptive planning. Sensor and intelligence data processing may need to increase reliance on autonomy routines to perform operations at a faster pace.

The capability for such an application isn't in doubt. Machines have long since demonstrated their prowess as logic tools. The computer Deep Blue beat champion Garry Kasparov at chess way back in 1997. It would not be far-fetched to assign to a machine the flow of forces, logistics, initial shaping operations, and even decisive operations in the campaign plan. (Computers already handle primary joint logistics processes.) The reason for doing so could be speed of planning, eliminating fatigue, or even just spitting out dozens of campaign plans for possible comparison.

Dealing with data faster has obvious military advantages. The Air Force has been hinting at this revolution for quite some time.

Former Chief of Staff Gen. John P. Jumper spoke often of the need for a self-forming, self-healing network to maximize command of data. In 2004, he described the value of data as seen in Operation Iraqi Freedom in March 2003. "Now, that networking was crude," said Jumper. "It was machine-to-machine interfaces, but it was crude." Airmen did it "on the chat networks at the speed of typing, not the speed of light."

Part of the answer, of course, is more autonomy. The requirement for autonomy in information stems first from the sheer mass of data—which, coincidentally, was generated in large part by the plethora of unmanned systems.

Rapidly making sense of this data requires more automated processing. Referring back to the Fitts criteria, there is little question that the machine can perform data matches more quickly than human analysts. Then there is the unstructured information generated as text, video, social media, and more. The key is to add automated layers of data processing that conform to mission needs and present actionable information as quickly as possible.

This could be the second source of demand for more autonomy. In the 2000s, faster data processing enabled counterterrorism operations—but they unfolded over long periods of time in permissive airspace and uncluttered electronic environments.

To be sure, there are still many technical hurdles to clear as autonomy advances. Certain key enablers must be available in order to realize the full benefits of autonomy, according to DOD. The list includes mission planning that is easy to change, guaranteed precision navigation, and timing; better cross-cueing by sensors both on an offboard; and the major issue of how and when to disseminate data from autonomous systems to others engaged in a battle. Efficient use of bandwidth for data transmission is another major concern.

Add in contested environments, false targets, and an information-savvy foe and the need for autonomous information processing could grow by leaps and bounds. ■

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*Rebecca Grant is president of IRIS Independent Research. Her most recent article for Air Force Magazine was "How Many Aircrew?" in the January issue.*



USAF photo

The California Air National Guard's 129th Rescue Wing has saved more than a thousand service members and civilians at sea, over land, and in Afghanistan.

A photograph showing four rescue workers in flight gear carrying a stretcher with an orange life raft on an airfield. In the background, a helicopter is visible. The scene is set on a paved airfield under a clear sky.

# One Thousand (and Three)

# RESCUES

By June L. Kim, Associate Editor

*Pararescuemen—“Guardian Angels”—from the 129th Rescue Wing carry an injured fisherman away from an HH-60G Pave Hawk helicopter in March 2012. The crew rescued two fishermen burned by a fire aboard a Chinese fishing vessel hundreds of miles off Mexico’s Pacific coast.*



ANG photo by A1C John D. Pharr III

**T**he pararescue jumpers knew they were up against Mother Nature and time as they jumped out of a Coast Guard C-130 and parachuted into the dark stormy waters of the Pacific on April 1, 2010. The California Air National Guard's 129th Rescue Wing, based at Moffett Field, and the US Coast Guard were responding to a call about a severely injured civilian on the sailboat *Wind Child* some 1,400 miles off the coast of Mexico.

Just before dawn, a gust of wind sent the sailboat's boom across the boat, entangling Michael Kalahar in the heavy lines of the mainsheet. Kalahar, from Port Angeles, Wash., fell backward and struck his head on a winch, biting his tongue in the process. Crew members rushed to his aid but the injuries to his head and neck called for a more sophisticated plan.

The Coast Guard called the pararescue jumpers (PJs) to help with the rescue. After parachuting down, the PJs found their way onto their Zodiac boat and motored toward *Wind Child*. "Everything was pushed to

the limit" on this rescue, recalled Capt. Tristan Grell, a combat rescue officer on the mission. "A lot of things [were] out of our control."

The waves were swelling at 12-to-14-feet and within an hour, the PJs were seasick. The medics kept having to go below deck, "do [the] treatment, come back up, throw up over the side, and go do treatment again," Grell said. Still, the rescuers performed flawlessly, he said, and the rescue mission was ultimately successful.

The PJs set up Kalahar with an IV to keep him hydrated and bandaged him, but after they'd been on *Wind Child* for nearly 12 hours, the sailboat lost power when a line got caught in the rudder.

By that time, though, a Liberian cargo ship had come to their rescue and the PJs were able to transfer the patient aboard and bring him closer to shore. The team spent three days on the cargo ship until HH-60 Pave Hawks could fly out and pick them up, transporting Kalahar to a hospital in San Diego where he recovered.

### From the Beginning

The men who saved his life come from a unit with a federal mission to provide personnel recovery in military operations, as well as crisis response—like this—at the state and national level.

This elite group of airmen come from all walks of life with the same desire to rescue those in need. In the close-knit USAF rescue community, the PJs are known as "Guardian Angels."

PJs go through nearly two years of training, starting with a 10-week indoctrination selection course at JBSA-Lackland in Texas, where the dropout rate is 90 percent. Capt. Darren Pon, a combat rescue officer with the 129th RQW, graduated in the early 2000s. "I think we started with 86 to 90 guys and then graduated [with] 14," he said.

After indoctrination, PJs spend four to six weeks at the Air Force Combat Dive Course in Panama City, Fla. Next, they spend three weeks at the US Army's Airborne School at Fort Benning, Ga., and five weeks at the Military Free Fall



Photo courtesy of SSgt. Andrew Gibson



School at both Fort Bragg, N.C., and Yuma Proving Grounds, Ariz. Though this is the primary military free fall school, some PJs attend the Navy's school in San Diego.

PJs then spend three weeks at the Air Force Survival School at Fairchild AFB, Wash., approximately six months in a paramedic course at Kirtland AFB, N.M., and another six months in a para-rescue recovery specialist course, also at Kirtland.

Even after a PJ completes the pararescue pipeline, he continues training for the rest of his career. They train "quite a bit" offsite, said TSgt. Christopher Klaftenegger, a PJ since 2005. "Just to stay current, we've got 70 days of training" a year, he said, but "to be proficient is a whole 'nother animal, so we're constantly looking for ways to stay sharp."

PJs have to keep up with all kinds of training because they never know what scenario they'll be in next. "Whether it be alpine, swift water, earthquakes, combat search and rescue, open ocean rescue, [or any] major hurricane, we've been on standby for that," said Capt. Lejon Boudreaux, a 129th RQW combat rescue officer.

The wing of 900 airmen comprises three rescue squadrons: the 129th, the 130th, and the 131st. The 129th RQS is made up of HH-60 Pave Hawk crew and maintainers;

the 130th RQS has the MC-130 Combat Shadow crew and maintainers; and the 131st RQS holds the PJs.

The wing's rescue mission dates to 1975 when it was designated the 129th Aerospace Rescue and Recovery Group. In March 1977, the group saw its first rescue when it picked up a downed A-10 pilot who crashed during a Red Flag exercise.

The wing now uses MC-130P Combat Shadow aircraft and HH-60G Pave Hawks. The two aircraft work in concert; the C-130s drop off PJs where Pave Hawks can't fly, and the Pave Hawks come in to pick them up. Sometimes, if the rescue site is close enough, the Pave Hawks will fly in for a drop off. "Helicopters can refuel, ... but they can only fly [for] so long," explained Pon, the 129th combat rescue officer.

For example, in water rescues, "there's an imaginary line that we draw in the ocean that between that line and closer [to the coast], we'll go out and do a helicopter

pickup. Anything beyond that line, we'll [fly out in a C-130], parachute in, and we'll steer whatever boat we happen to be on toward that imaginary line, and then the helicopter can come pick us up."

### Help at Sea

In August 2012, the 129th RQW received a call that two Ecuadorian fishermen on the fishing boat *Mirelur*, 1,600 miles off the coast of Cabo San Lucas, Mexico, were in need of emergency care. One man had gastrointes-

***A combat rescue officer assigned to the 26th Expeditionary Rescue Squadron from the 129th Rescue Wing runs through a preflight inspection on a Pave Hawk in 2013 at Camp Bastion, Afghanistan. Air National Guardsmen recorded the wing's 1,000th save May 18, when members of the unit rescued an Afghan national wounded by gunfire in southern Afghanistan.***

USAF photo by Sra. Scott Saldukas





ANG photo by A1C John D. Pharr III

**Far left: An HH-60 Pave Hawk from California's 129th Rescue Wing maneuvers toward a container ship during an offshore rescue mission in 2010. Left: Guardian Angels from the 129th transfer a patient to land-based medical facilities after a long-range overwater rescue mission 1,400 miles off the coast of Acapulco, Mexico. They saved the lives of two Ecuadorians.**

tinal problems and the other had been hit by a 400-pound tuna and hurt his back. The wing dispatched PJs to help.

*Mirelur* was too far for a helicopter pickup so Capt. Bevan Hart, MSgt. Seth Zweben, TSgt. Mark Finney, and Klaftenegger flew in and parachuted down. They reached *Mirelur* and began assessing the situation. The captain spoke a little English but the rest of the crew didn't, Finney said, so the rescue team got by with high school Spanish and basic sign language.



The patient with the stomach problems, Francisco Daniel Bravo Medranda, was treated by Klaftenegger. "His belly was super rigid and tight and he was in a lot of pain," he said. Medranda was "big-sick," as Klaftenegger put it.

"We took care of [the patients] for three days," Klaftenegger said, both on *Mirelur* and then on a Coast Guard cutter, which picked them up and traveled quicker than the fishing boat. Once they got within range for Pave Hawks to fly out and pick them up, the PJs hoisted them up and transferred the patients to a hospital in San José del Cabo in Mexico.

Medranda was diagnosed with gangrenous appendicitis, according to *El Mercurio*, an Ecuadorian newspaper that

printed his account of the harrowing rescue. Medranda went into surgery the following day, recalled Finney, who had taken care of the patient with the back pain.

If the boat had taken the normal time to get back, Medranda "definitely would have died on the way. He was kind of a ticking time bomb," Klaftenegger said.

About a week after the rescue, Medranda's wife wrote to the 129th RQW a heartfelt email thanking the crew members and praising them for playing a crucial part in saving her husband.

**Oceans and Deserts**

As of early March, the 129th RQW is credited with a remarkable total of 1,003 cumulative saves. Of those saves, 414 are combat-related and 589 are civilian-related. Since 2001, the wing has deployed nine times to Kuwait, Turkey, Iraq, and Afghanistan. The last deployment was in January 2013, to Afghanistan. More than 200 airmen from the 129th RQW deployed to Camp Bastion for operations there and in the Horn of Africa. Once in Afghanistan, the 129th flew as the 26th Expeditionary Rescue Squadron.

On one notable mission last May, a small Marine Corps unit was on an early morning ground patrol in Helmand province when the rear patrolman, Pfc. Duncan S. Mathis, slid down an embankment and fell into a 60-foot-deep dry well.

The marine landed on his feet, crushing his legs, said SSgt. Nick Plummer, a PJ who participated in the rescue. Mathis suffered an open fracture to his left tibia and fibula, which went straight "through his boot," said Plummer. Mathis also had

**Lost in Line of Duty**

During its 40-year history with more than a thousand successful saves, the 129th Rescue Wing lost seven of its PJs in mission-related situations. They are:

- Sgt. Lawrence Zimmerman, who died in a 1977 parachute accident during a training jump.
- Lt. Col. Les Spencer, Maj. Terry Nelson, SSgt. Steven Courtney, and SSgt. Steven Carlyle, who perished in a 1988 HH-3E helicopter accident.
- SSgt. Kevin McKenna died from natural causes while deployed in 1993.
- MSgt. John Horton died in a 2002 training accident.



**An HH-60G hoists a patient from a Chinese fishing vessel in 2012. The rescue saved the lives of two fishermen.**

a compound fracture on his left femur and a dislocated right shoulder. “He was pretty messed up,” said Boudreaux, the team commander on the mission. Mathis was able to make a loose tourniquet for his leg but couldn’t do much else but wait until rescue arrived.

The area where Mathis had fallen was a previously contested area, so when PJs reached the scene, the marines on-site remained alert and watchful, making the PJs more aware of their situation. Plummer helped construct an anchor nearby that would be used to take SSgt. Nathan Schmidt, another PJ, down the well to reach Mathis. Once Schmidt reached the bottom of the well, there was no space for him to move around.

“The well was probably the size for someone more like five feet tall,” Plummer said, and both Schmidt and Mathis were taller than six feet. Schmidt “had to straddle the patient” since there was no leg room. Basically “we [had] two of the biggest people” down this well, said Plummer. Mathis couldn’t move without pain. Schmidt gave the patient 50 milligrams of ketamine and “he was still screaming,” said Boudreaux.

“I’ll never forget the sounds that he was making as we were raising him, because there [was] really no good way around bringing him up out of the well. So he was screaming at the top of his lungs. My guys on the surface were telling him, ‘This is going to be probably the worst minute or two minutes of your life right here. You just gotta be tough and push through it,’” recalled Boudreaux.

When Mathis reached the top of the well, Plummer noted his femur looked

like a purple watermelon. Despite his injuries, “he was a great patient,” said Plummer. When he wasn’t being moved, “he was laughing and joking the whole time. ... I’ll remember that kid for the rest of my life.”

The PJs loaded Mathis into a special litter called a Skedco, and Plummer and another PJ, SSgt. Jacob Garel, placed him in a Pave Hawk and medevaced him to a hospital. By the time Mathis arrived at the hospital, the entire mission had taken 30 minutes. “That was honestly one of the few times where I was like, ‘Man, I really feel like my training paid off’ and I wasn’t just a flying ambulance [or] taxi service,” said Plummer.

“The civilian mission is obviously very important and very gratifying; however, being out with your troops in the military, supplying them with personnel recovery and [combat search and rescue] is a great privilege and something to be proud of,” said Capt. Kyl Wells, a CRO with the wing. “It just ties in more to our jobs as pararescue and combat rescue officers.”

### The Thousandth Save

In the days leading up to the wing’s 1,000th mission, someone had set up a big placard with the number of rescues made so far, Boudreaux said. It sat in the alert facility in Afghanistan where they had their morning briefings. The unit operated as two shifts, a morning shift and a “p.m.” shift. “It would be like 996 that day, and then the next shift would get two rescues and then it would be 998,” he said. There was a “kind of competition” to see who would make the

1,000th save because the PJs knew one of the shifts was going to get it.

The call came in midday, toward the end of Boudreaux’s shift on May 18, 2013.

Near Lashkar Gah, an Afghan National Army individual had suffered life-threatening injuries to his lower extremities from a gunshot wound. He was considered a Category A patient—in danger of losing his life, limb, or eyesight and immediate response was needed, explained Boudreaux.

“We did a minimal brief time inside the alert facility, got all the pertinent information,” and then within five minutes, the Guardian Angels spun up and flew to a forward operating base in southern Afghanistan to pick up the patient, he said.

When they landed at the FOB, there were a couple of small little one-story buildings surrounded by barrier walls with an Afghan flag, said Plummer. Because the patient was an Afghan national, the PJs took him to an Afghan-run airfield inside Lashkar Gah, where the local hospital staff could easily communicate with him. On the helo ride to Lashkar Gah, the PJs dressed his wound, gave him an IV to keep him hydrated, and administered painkillers, Boudreaux said.

On their return to Camp Bastion, the PJs threw a mini celebration in honor of their 1,000th mission, he said.

Seven months later, in January 2014, the 26th ERQS inactivated and returned to Moffett Field. ■



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**The Air Force sprang into action to support the storm-ravaged Philippines after the devastating Typhoon Haiyan.**

# OPERATION DAMIAYAN

By Carlo Muñoz

**A**IRFORCE units based in the Asia-Pacific region played an integral but overlooked role spearheading initial rescue and relief missions into the Philippines, mere days after the worst typhoon in the country's history crashed onto its shores.

Less than 24 hours after Typhoon Haiyan ravaged large swaths of Visayas province in the central Philippines last November, washing away entire coastal villages and cities, aircraft and command and control units from USAF's Pacific Air Forces were in the skies and on the ground in the hardest hit areas.

While airmen assessed which airfields and landing zones would be best suited to handle the influx of C-17 Globemaster III and C-130 Hercules transports heading into the disaster zone, long-range, remotely piloted aircraft based at Andersen Air Force Base on Guam flew reconnaissance missions over Tacloban City, Leyte island, Roxas City, and other locales, surveying the damage and searching for survivors.

Once the joint disaster relief mission, dubbed Operation Damayan, reached full swing, USAF cargo aircraft were among the first US air assets to get wheels down in Manila and elsewhere in the Philippines, to begin ferrying tons of food, water, and supplies into the vast areas devastated by the typhoon.

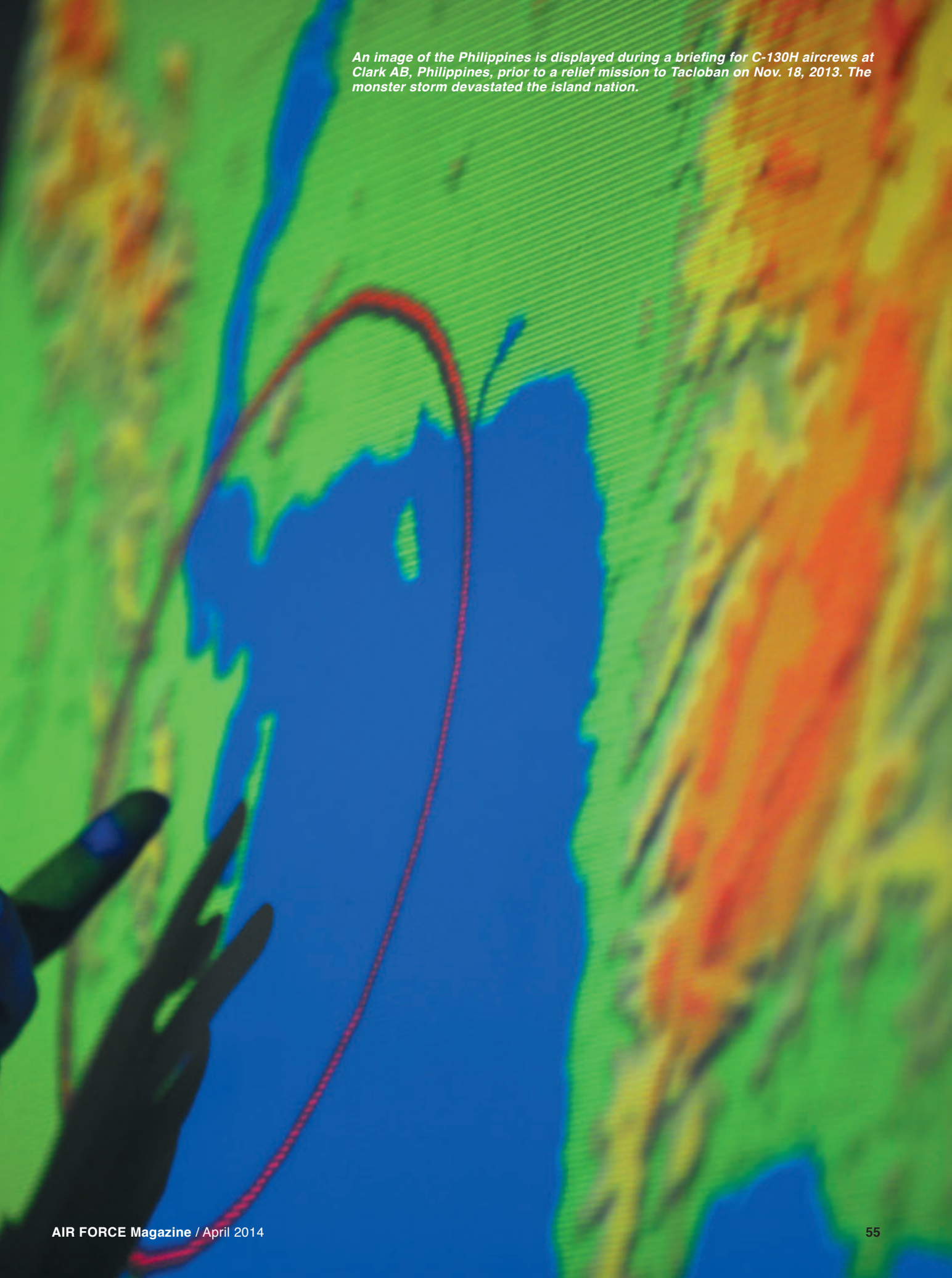
While the humanitarian mission exemplified the rapid response capabilities of the Air Force and US military, Operation Damayan also stoked debate in Washington, D.C., and Manila on whether American air assets should return to the Philippines on a permanent basis.

Regionally, no US military assets have been based at the former Clark Air Base or at Subic Bay Naval Base since Washington handed over both installations to Philippine control in the early 1990s. But

USAF photo by 2nd Lt. Jake Bailey



*An image of the Philippines is displayed during a briefing for C-130H aircrews at Clark AB, Philippines, prior to a relief mission to Tacloban on Nov. 18, 2013. The monster storm devastated the island nation.*



**Some 670 refugees from Tacloban pack a C-17 during evacuation to Manila. The aircraft and its crew deployed from JB Pearl Harbor-Hickam, Hawaii, for Operation Damayan.**

Damayan's success has come at a time when US-Philippine military cooperation is increasing, and the likelihood of the country hosting larger deployments of rotational forces in the near future is growing as the US continues to press engagement with allies and emerging partners in Southeast Asia.

### Rapid Response

Before Typhoon Haiyan cut its path across the Philippines, top Air Force commanders at PACAF knew the killer storm would be a big one—possibly the biggest ever to make landfall in the island nation.

Tracking the storm from various PACAF outposts scattered throughout the region, US officials began drafting plans on Nov. 7 for the massive disaster relief mission that was sure to come, according to a command spokesman.

Haiyan would hit the Visayas Islands the next day.

PACAF began spinning up its airlift and command and control systems in anticipation of a huge logistical challenge. The command's first move was to put on ready alert elements of 3rd Wing from JB Elmendorf-Richardson, Alaska, 15th Wing from JB Pearl Harbor-Hickam, Hawaii, and the 374th Airlift Wing from Yokota AB, Japan.

As Damayan kicked off, three additional C-130 airlifters attached to the joint US-Bangladesh military exercise Cope South were redeployed to the Philippines, joining the growing Air Force presence in the country.

On the personnel side, Air Force command and control units from the 109th Air Operations Group and contingency operations specialists from the 36th Contingency Response Group were on the ground in Manila 24 hours after Haiyan passed through the country.

The main job for those units was to conduct damage assessments on the various landing strips and airfields closest to the hardest hit areas in the Visayas, determine which ones could handle the heavy air traffic, and set up the critical logistics chain to ensure supplies and aid got to the areas most in need.

"This is a 24-hour-a-day operation and our guys are motivated," said Col. Thomas Livingston, 36th CRG commander, according to a news release. "As we assist the Philippine forces in getting



USAF photo by SSgt. Ramon Brockington



**Capt. Dominique Haig briefs C-130 aircrews at Clark before a nighttime airlift mission in support of Damayan.**



people on the planes, you can really see the partnership building between forces to alleviate further human suffering.”

Aside from spearheading the airlift portion of the crisis response mission, the airmen on the ground were responsible for finding a way to get the thousands of survivors scattered throughout Haiyan’s path to safe ground. An integral part of the mission was PACAF’s unmanned intelligence, surveillance, and reconnaissance ability. Several RQ-4 Global Hawks based at Andersen took to the skies above the Visayas.

The aircraft’s electro-optic and infrared sensor packages, traditionally

used to collect battlefield intelligence on potential targets in places such as Iraq and Afghanistan, were now being used to find, fix, and track victims of the typhoon. Airborne imagery was used to assess damaged infrastructure and locate potentially suitable helicopter landing zones. These rotary wing aircraft picked up survivors and delivered supplies into the most isolated regions of the islands.

With the air logistics chain and evacuation strategy in place, and with Air Force fixed wing aircraft inbound, PACAF elements were folded into Joint Task Force 505, the US military force assigned to carry out Damayan.

Under the command of Marine Corps Lt. Gen. John E. Wissler, PACAF units and assets joined the Marine Corps and Navy units already ordered into the Philippines. More than 1,000 marines from 31st Marine Expeditionary Unit, backed by the USS *George Washington* carrier strike group on station in Philippine waters, linked up with Air Force units on the ground in Tacloban less than two weeks after Haiyan made landfall.

Over the approximately three-week span of Operation Damayan, which ended in early December, nearly 300 PACAF airmen logged more than 2,000 flight hours, conducting a total of 239 airlift missions and ferrying more than 2,000 tons of food, water, and medical supplies into the Visayas, according to a PACAF after-action review of the operation.

The US and allied militaries involved in the mission deemed it a great success and a template for handling military-to-military humanitarian operations in the future.

Despite its success, some observers claimed the US response might have been faster and possibly more effective if American forces had maintained a sizable military footprint in the Philippines.



USAF photo by SrA. Marianne Santos

**A C-130 transporting airmen and equipment takes off from Andersen AFB, Guam, headed toward the Philippines to join the disaster relief efforts. Mobility aircraft were quickly on the scene.**

**MSgt. Derontae Spencer examines release paperwork that will allow a mobility aircraft to deploy from Andersen to Tacloban, one of the hardest hit cities in the Philippines.**

### The Clark Question

In 1991, the last permanently stationed Air Force assets left Clark Air Base in the Philippines, shuttering USAF's largest base in Southeast Asia.

The Navy followed suit a year later, handing over Subic Bay Naval Base to the Philippine government. The closure of the two facilities ended a large US military presence in the Asia-Pacific.

While Washington and Manila have continued to maintain strong military-to-military ties, engaging in numerous joint exercises and operations throughout the region, American forces have yet to re-establish a significant profile in the Philippines.

Currently, the only active US military in the Philippines have been a special operations task force supporting the Armed Forces of the Philippines in a campaign against the Abu Sayyaf Group and affiliated extremists in the southern part of the country.

Even a counterterrorism role creates controversy.

A group protesting the US counterterrorism mission, Patriotiko Mindanao, has been a vocal critic of the US-Philippine military engagement in the southern areas of Palawan and Mindanao. But that public outcry did not stop Washington and Manila from initially reaching a deal in 2012 to open up both Clark and Subic Bay to American air and naval forces rotating through the country, according to Philippine Undersecretary for Defense Affairs Honorio S. Azcueta.

The agreement would not allow permanent basing in the Philippines, but would grant US warships and military aircraft access to those facilities, as part of increased temporary deployments.

If forces had been stationed at Clark or nearby facilities during Damayan, USAF, in theory, could have saved valuable time and fuel costs getting assets to the Philippines from Hawaii, Alaska, and Japan. DOD leaders sought to downplay the relationship between the operation and basing discussions, however.

At the height of Damayan, DOD dismissed any notion the disaster relief mission would open the door to the Air



USAF photo by SRA, Marianne Santos

Force's return to Clark. "I'm not sure I would draw a direct linkage between our [increased] presence in the region and our ability to respond to these kinds of crises," George Little, then the Pentagon press secretary, said last November.

DOD already has "thousands of forward deployed American service members" scattered across the Asia-Pacific region, Little told reporters shortly after the first American units arrived in the Philippines. "I would not draw a direct causal connection between" the US-led disaster relief mission and bolstering American troop numbers there, he added.

The Pentagon and Manila have slowly explored the possibility of increasing the Air Force's presence in the country.

In recent years, US military planners have eyed deployment options in the Philippines and elsewhere in the region as part of the White House's plan to shift the military's focus from the wars in Iraq



**Airmen from Yokota AB, Japan, offload equipment from a C-130 at Clark. PACAF officials across the region began tracking Haiyan early in November, in anticipation of the massive relief effort that would be required.**

and Afghanistan to increased attention to the Asia-Pacific.

In December, US Secretary of State John F. Kerry announced \$40 million in military funding to the Philippines. The island nation received \$30 million in foreign military funding from the United States in 2012, according to news reports, and \$11.9 million in 2011.

Not all accounts are growing, however.

As the Air Force continues to cope with smaller budgets and massive force structure cuts under sequestration, service leaders have been forced to rebalance in the Pacific region while doing more with less.

The Air Force has had to sacrifice operations and readiness accounts, the coffers that finance missions like USAF's contribution to Damayan.

As a result, Air Force and Pentagon leaders are embracing a supporting and enabling role in emerging conflicts and crises, allowing partner nation forces to take the lead—whether it be disaster relief or combat support missions. In the Philippines, the US gradually handed off operations to its Philippine Air Force counterparts as Damayan wound down.

Closer cooperation with allies in these scenarios is all but assured in the long term. "Future joint forces will routinely employ more such combinations than ever before, with [international] partners as well as within ... to achieve efficiencies and synergies not previously feasible," stated the 2012 "Capstone Concept for Joint Operations: Joint Force 2020," by Chairman of the Joint Chiefs of Staff Army Gen. Martin E. Dempsey.

The success of Damayan sprang from cooperation at the highest levels of the American and Philippine militaries. Indeed, on Oct. 16—more than three weeks before Haiyan made landfall in the Philip-

## Quick Contingency Reaction

Weeks after Pacific Air Forces wrapped up its air operations in the Philippines, a similar portfolio of American airpower deployed to Africa, this time to help French and African Union forces quell violence in the Central African Republic.

As in the Philippines, the familiar force package of Air Force airlifters and intelligence, surveillance, and reconnaissance assets stepped up for another support operation. The Pentagon deployed a pair of Air Force C-17 cargo airplanes, accompanied by small teams of airmen, into the strife-torn African nation late last year. Aside from the aircraft, an Air Force team was deployed to neighboring Burundi, tasked with coordinating logistics and transportation for roughly 800 Burundian troops headed to the Central African Republic.

A second Air Force team went into the CAR to assist French and African Union forces in their efforts to secure the main airfield in the country's capitol of Bangui.

Those American and Burundian troops joined the nearly 1,000 French troops on the ground, as part of the international peacekeeping force sent to the African country. The US officially ended military support for operations in the CAR on Dec. 30, 2013, but continued logistical support through January.

While the mission in CAR was not in response to a natural disaster as in Operation Damayan, the Air Force's expeditionary approach to the scenario was similar—a small footprint tasked with aerial supply, logistics, and intelligence.



**SrA. Dylan Porras, a loadmaster with the 535th Airlift Squadron, guides SrA. Christopher Follett, an air transportation specialist, as he loads equipment into a C-17 on the flight line at Andersen.**

ines—Lt. Gen. Lauro Catalino G. Dela Cruz, commander of the Philippine Air Force, visited Joint Base Pearl Harbor-Hickam for a meeting with PACAF's commander, Gen. Herbert J. "Hawk" Carlisle, and discussed bilateral and regional military cooperation issues.

The two leaders conferred about future engagements between the two air services, with Carlisle noting USAF and PAF have a well-developed working relationship. The ties and cooperation were in no small part critical to the success of Damayan.

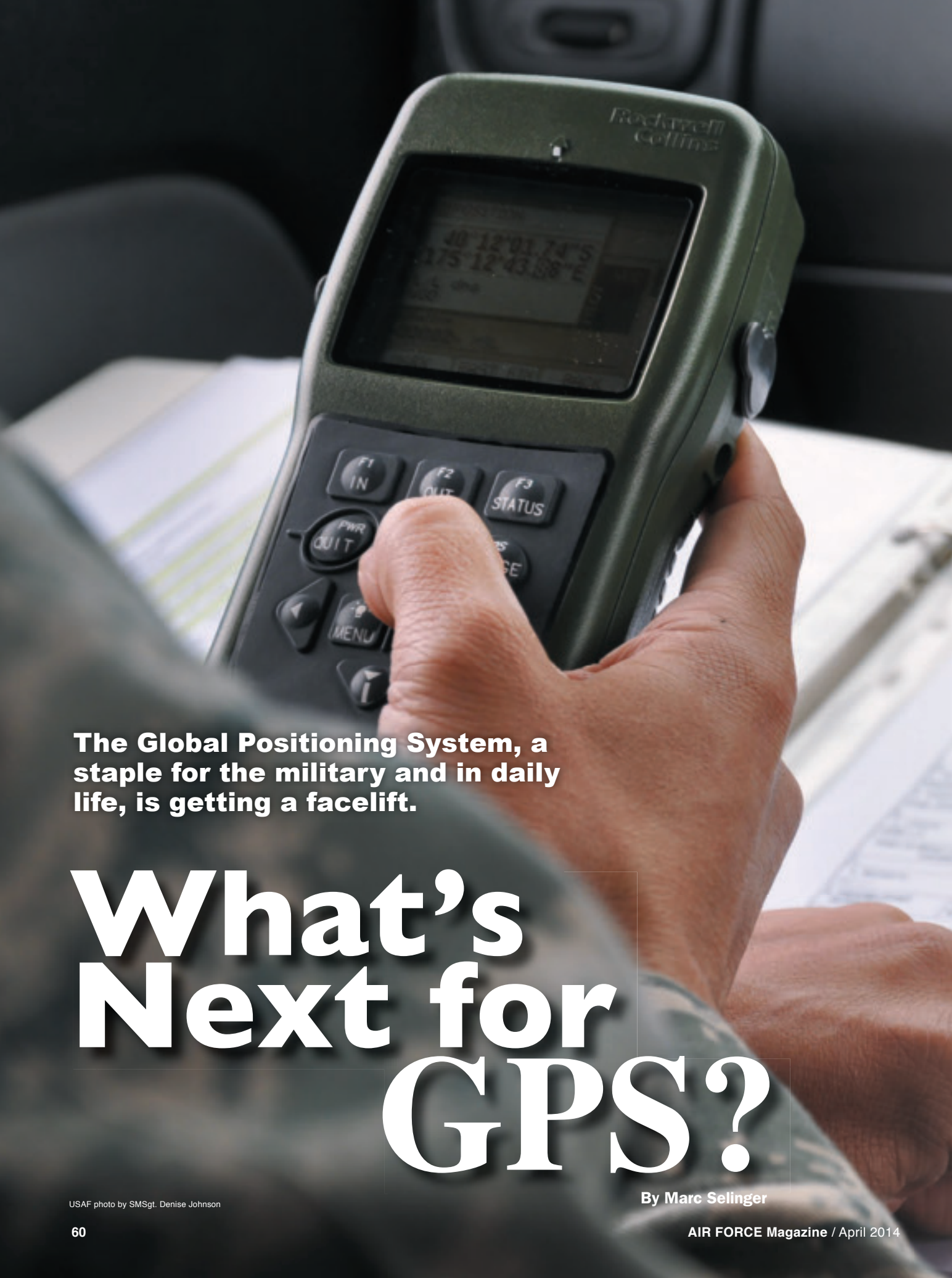
Regional alliances, such as those with the Philippines, have helped enable

DOD's Asia-Pacific shift, and fostering these relationships is a priority for both PACAF and the Air Force as a whole. Negotiations continue between the Philippine government and State Department representatives about possible bilateral deployments and exercises. Leaders on both sides have indicated the relationship between the US and the Philippines has only grown closer in the aftermath of the storm. ■



USAF photo by Capt. Raymond Geoffroy

*Carlo Muñoz is a defense and national security correspondent for BuzzFeed.com in Washington, D.C. He has covered US military operations in Afghanistan, South America, Cuba, and the Asia-Pacific. His most recent article for Air Force Magazine, "The JTAC Imperative," appeared in November 2013.*



**The Global Positioning System, a staple for the military and in daily life, is getting a facelift.**

# What's Next for GPS?

By Marc Selinger

**F**orty years after the US government awarded a contract to build the first Global Positioning System navigation satellite, GPS is the Department of Defense's largest satellite constellation and is as integral to modern warfare as aircraft or ships. The heavy responsibility for keeping the system up-to-date rests with the Air Force.

This is no easy task. The ongoing modernization effort will run to billions of dollars and includes potentially dozens of new satellites, an updated ground control system, and new GPS receivers.

The large-scale, long-term modernization initiative has "a lot of moving parts," said Air Force Col. William T. "Bill" Cooley, the government's GPS program director. And there are "lots of challenges with making certain that ... all of those segments are going to work together."

Key tests this spring will help determine whether GPS modernization is on the right track. But failure is not optional. GPS is vital to national security today and to the conduct of the global economy.

GPS is best known for sending out signals that help people and machines determine their location on Earth. The system was created to serve military purposes, from guiding troop movements to directing precision guided munitions. Today, the civil and commercial sector is dependent on this free service, from tracking trains to providing directions to car drivers.

Equipped with precise atomic clocks, GPS satellites also play an important "timing" role. Their signals include time data that allow communication, financial, and electric-power systems to synchronize their operations. "We're providing a global capability that not just the Air Force, not just the other services, but the entire world depends on, and it's intricately linked to the way our society functions, quite frankly," Cooley said.

The first GPS satellite, part of the Block I series built by Rockwell International, was launched in 1978. Block I was followed by five series of Block II satellites that expanded, replenished, and updated the constellation. More than 60 GPS satellites have been placed in orbit in all.

As of mid-January, a total of 36 functioning GPS satellites were in orbit about 12,500 miles above the Earth. Of those 36 spacecraft, 31 actively contribute to the constellation and the other five serve as backups. Although the minimum requirement for coverage stands at 24 satellites distributed around the Earth, the Air Force prefers to have more satellites available to provide better coverage. The larger the constellation, the more likely a GPS receiver on the ground will have a clear view of satellites.

In an April 2013 Government Accountability Office report to Congress on potential cost-saving options for GPS, the Air Force assumed a future constellation of 30 satellites.

The Air Force has exceeded its 24-satellite requirement thanks in part to spacecraft lasting much longer than planned. For example, the 19 GPS Block IIAs, developed by Rockwell and launched from 1990 to 1997, were designed to last 7.5 years and should have timed out of service by now. But as of November 2013, eight were still part of the active constellation, with the eldest now exceeding 23 years of service.

"The good news is that GPS is a robust and healthy constellation because the IIAs have lived much longer than anyone had originally projected," said Cooley, who runs the program from the Air Force's Space and Missile Systems Center at Los Angeles AFB, Calif.

Estimating how long satellites will be operational is clearly not an exact science. While designed to survive the harsh environment of medium Earth orbit, GPS satellites sometimes face

unpredictable conditions, such as solar flares that can degrade electronics. But based on computer modeling and a pipeline full of new satellites, the Air Force projects it will have enough spacecraft for the foreseeable future, Cooley said.

Boeing is finishing the last of 12 new Block IIF satellites at its factory in El Segundo, Calif. On Feb. 20, the Air Force launched the fifth IIF satellite from Cape Canaveral AFS, Fla., aboard a United Launch Alliance Delta IV booster.

Assembly of the initial batch of Block IIIs is underway at a Lockheed Martin plant in Denver.

## Looking Forward

Both new satellite series have had their share of glitches. The first Block IIF satellite launched in 2010, four and a half years late, due to development problems—what GAO attributed to the use of "immature technologies."

Another setback occurred when the second IIF satellite, launched in 2011, experienced a failure of its Cesium clock, one of three atomic clocks that ensure the accuracy of the spacecraft through redundancy.

The Air Force concluded the chamber surrounding the Cesium clock did not release air quickly enough once the satellite was placed in space, causing an electrical short. Satellites three through seven had the same problem, so a hole was drilled in the chamber to allow more gas to escape. The Air Force believes the issue is resolved.

"That's behind us," Cooley said.

The Block III series, which Lockheed Martin is developing under a \$1.5 billion contract awarded in 2008, is supposed to deliver signals that are several times more accurate and resistant to jamming than existing GPS spacecraft. Block III satellites are also designed to last 15 years, or 25 percent longer than Block IIFs, and they will be the first GPS spacecraft with a new L1C civil signal to make them interoperable with comparable foreign systems, such as Europe's Galileo.

To help avoid the kinds of problems that plagued Block IIF, the GPS III program built the GPS III Non-Flight Satellite Testbed (GNST), a full-sized, flight-equivalent prototype of a Block III satellite, and put it through a series of exercises in the summer and fall of 2013. For a dress rehearsal, GNST was physically handled like an actual satellite, from the way it was loaded onto a C-17 aircraft in Denver to the way it was unloaded at Cape Canaveral for testing.

At the Cape, the test bed communicated successfully with the GPS program's new ground-control system and with flight-like hardware simulators for the IIR, IIR-M and IIF satellites, which make up most of the current GPS constellation. Testing also demonstrated the receiver's ability to track navigation signals transmitted by the GNST. "The efforts that we put here early on the program are going to pay off in large dividends on the production contract going forward," said Mark Stewart, Lockheed Martin's vice president of navigation systems, who earlier helped the aerospace firm build IIR and IIR-M satellites.

But in 2013 a major problem emerged in the first Block III satellite, designated Space Vehicle 01 (SV-01). In the spring and summer, the navigation payload (developed by Lockheed Martin subcontractor Exelis) experienced "signal crosstalk," or interference between signals within the payload. The problem was caused by "insufficient isolation" between signals of different frequencies and power levels and arose in the payload's mission data unit, a 167-pound box that processes signals on the payload, Stewart said.

Lockheed Martin and Exelis both expressed confidence the payload will be fixed and ready for delivery to Lockheed Martin's



Denver facility this spring. Stewart said such hiccups are to be expected in a development phase, and the program has “a very detailed plan on hand” to resolve the matter.

Exelis spokeswoman Jane Khodos said that “significant testing with flight-like engineering units and the first GPS III satellite’s flight hardware indicates that the known technical issues are being resolved, and GPS III will meet all mission and quality requirements.”

While Cooley agreed that progress is being made, he won’t be convinced the problem is fixed until the payload successfully completes thermal vacuum chamber testing this spring, to simulate the low and high temperatures the payload will experience on orbit.

“I applaud the optimism, but I’m not going to declare that we’re out of the woods,” Cooley said. SV-01 is scheduled to arrive at Cape Canaveral in 2014 for a May 2015 launch, though there were indications in March that the launch date might slip.

Exactly how many Block III satellites the Air Force will acquire is unclear. The Air Force has indicated it could buy more than 30 Block IIIs. But as of late March, it had committed funds to procure only the first six, plus long-lead items for the seventh and eighth.

“We assess the health of the constellation and the resources in the department and the needs of those things on a recurring basis to decide what makes sense,” Cooley said. “So that’s a decision that has yet to be made in terms of exactly how many GPS III satellites we’re going to buy.”

### Control Issues

The GPS control segment consists of a global network of ground facilities that monitor and command GPS satellites. The Air Force and Raytheon are developing the Next Generation Operational Control System (OCX) “because the existing



USAF photo by Todd Berenger

*Top: The GPS IIF-5 satellite atop a United Launch Alliance Delta IV rocket launches from Space Launch Complex-37 at Cape Canaveral AFS, Fla., on Feb. 20. Above: Col. William Cooley, GPS program director, says the full buy of GPS III satellites is still up in the air.*





Lockheed Martin photo

ground control software is not compatible” with the Block III satellites, according to the GAO.

Since Raytheon was awarded the OCX contract in early 2010, the system has made “significant progress” in meeting milestones, conducting exercises, and writing software, said Matthew Gilligan, Raytheon’s OCX program manager. But Cooley said a major uncertainty for OCX is not yet knowing how the system will perform until it undergoes operational-like testing scheduled for spring. “We’re not going to know precisely where we are until we get through some of that testing,” he said.

A major requirement for OCX is meeting Department of Defense information assurance standards. Preventing hackers from compromising the system is part of this process. The system also must be able to verify authorized operators and that they do not accidentally or deliberately cause harm.

For example, Cooley explained, “we want to make sure that there’s not ... a potential issue of a user clicking on the wrong button and resetting a clock on orbit.” Gilligan said the OCX program has developed 1,800 individual information assurance requirements to ensure security is “baked in” throughout the system.

Yet another responsibility for Cooley’s office is overseeing the development of new user equipment for DOD. GPS receivers are widely used across all services, and it falls on the Air Force to design and test chips and algorithms that receiver manufacturers can integrate into their systems.

New features include the military signal M-code, to help improve defenses against jamming. To use M-code, receivers need a new chip to process the signal. The Air Force hired three vendors—L-3, Raytheon, and Rockwell Collins—to develop M-code chips, and this effort “has gone very, very well,” Cooley said.

The Air Force plans to further refine the chips and then integrate and test them on a lead platform for each military service to confirm the chips work as planned. The services will then be able to buy user equipment from the receiver manufacturer they prefer. The lead platforms chosen are the Navy Arleigh Burke-class guided-missile destroyer, the Army Raven unmanned aircraft, the Air Force’s F-15E fighter, and a Marine Corps ground vehicle.

***A GPS III satellite prototype arrives at Cape Canaveral from Buckley AFB, Colo., aboard a C-17. The navigational satellite is scheduled for a 2015 launch.***

In a June 2013 test flight at Holloman Air Force Base in New Mexico, an RQ-11B Raven became the first aircraft to use M-code for navigation, according to Rockwell Collins.

The Air Force hopes to make M-code available for operations as early as 2017.

### **Not Immune**

Like the rest of the military, the GPS program office is grappling with how to execute its mission amid belt-tightening in Washington, D.C. With defense budgets constrained and GPS III satellites projected to cost \$23 billion from Fiscal 2013 through Fiscal 2030, the program could be an attractive target for budget cutters.

Several possibilities are under exploration to lower the program’s price. For instance, the Air Force originally planned to buy the last 26 GPS III satellites in two increments, but it now plans to streamline this buy into one large increment to take advantage of economies of scale.

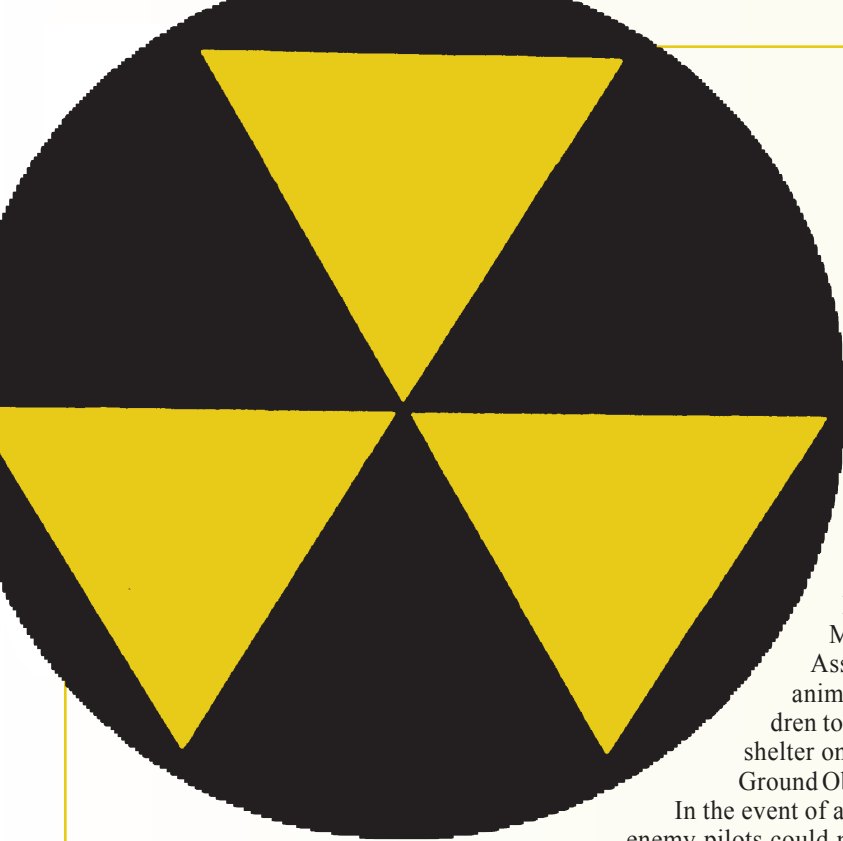
Some potential changes involve hardware. In addition to their navigation payloads, Block III satellites carry a system to detect nuclear detonations on Earth. Therefore, one option might be to leave the nuclear detection payload off some of the new satellites.

The Air Force had also been studying whether a “dual-launch capability,” or launching two satellites on a single rocket, would save money.

Sorting through such intricacies does not appear to deter Cooley, who holds a doctorate in engineering physics from the Air Force Institute of Technology. Instead he welcomes the challenges ahead.

“It’s an exciting time for GPS,” he said. “That’s what makes this job exhilarating.” ■

*Marc Selinger is a freelance journalist based in the Washington, D.C., area. This is his first article for Air Force Magazine.*



**Hoping to survive an atomic attack, families built underground shelters in the backyard. In farm country, there were even shelters for cows.**

**T**here was a civil defense program of sorts in the United States during World War II. It included air raid wardens, first aid training, and blackout curtains to foil enemy bombers. There was no real danger, though, and it was a minor aspect of life in wartime. The program was abolished altogether in June 1945.

Interest in civil defense came roaring back when the Soviet Union exploded an atomic bomb in 1949. The young Rep. John F. Kennedy (D) of Massachusetts fired off a letter to President Truman warning that the nation left itself open to “an atomic Pearl Harbor” by its indifference to civil defense planning. The National Security Resources Board called for the building of public shelters in “target areas” and private basement shelters for families and neighborhood groups.

In December 1950, Truman created the Federal Civil Defense Administration with headquarters in Battle Creek, Mich. The FCDA, in cooperation with the National Education Association, produced a film, “Duck and Cover,” in 1951. An animated turtle named Bert urged some New York schoolchildren to follow his example. “Bert ducks and covers, but he has his shelter on his back,” the film said. “You must learn to find shelter.” Ground Observer Corps volunteers scanned the sky for hostile aircraft.

In the event of an attack, regular radio stations would stop broadcasting so enemy pilots could not use their signals for navigation. Small triangles at 630 and 1230 on the dials of AM radios marked the frequencies for CONELRAD—Control of Electromagnetic Radiation—to which listeners were to tune for civil defense information.

Initially, the structures in which citizens were to take refuge were called “bomb shelters.” The danger from fallout—radioactive particles drifting back to earth—increased significantly in the 1950s with the development of hydrogen bombs, which produced much greater levels of contamination. Once the hazards were fully understood, the bomb shelters became known as “fallout shelters.”

The defense strategy that ultimately got the United States through the Cold War was deterrence: maintaining sufficient countervailing military power to forestall any temptation for the Soviet Union to attack. However, politicians and others continued to search for a civil defense solution, their efforts reaching peak intensity in the late 1950s and early 1960s.



# Fear of Fallout

By John T. Correll

## Beyond Duck and Cover

The program got off to a poor start when Truman’s civil defense administrator, Millard F. Caldwell, spoke carelessly about providing shelters for every person in the country. The cost of that was clearly impossible and it never got beyond the planning stage. As future planners came to realize, individual citizens would not have fallout shelters unless they built them for themselves.

Between 1951 and 1953, Congress funded civil defense at a meager 10 percent of the level Truman requested. The program concentrated on converting public buildings and underground facilities to dual use as shelters, establishing



an attack warning system, stockpiling supplies, and conducting a civic education campaign.

As with the “Duck and Cover” film, the messages generally predicted survivability for those who took proper steps.

One of the most bizarre items to appear was a 1953 comic book entitled “Picture Parade,” put out by Gilberton, the well-known publisher of “Classics Illustrated.” The cover shows a boy hugging his dog while a mushroom cloud rises in the distance. Incredibly, the story inside, “Andy’s Atomic Adventure,” was soothing and upbeat, geared to fourth grade reading level. Teachers passed out copies to their pupils.

Expectations would become considerably darker in 1955 when the Atomic Energy Commission announced that after an H-bomb attack, the radioactive fallout might kill everyone within a 140-mile radius of the detonation.

Val Peterson, the new FCDA chief in the Eisenhower Administration, proposed scaling back or eliminating the shelter program in favor of evacuating the cities on warning of attack. In 1955, Peterson

said that residents in most cities had only one choice: “Stay and die, or move out and survive.”

Unfortunately, the strategy had several critical failings. Even if the public had time to evacuate and a place to go, the road and bridge infrastructure could not handle the multitude of refugees. Peterson was soon back to urging citizens to build some sort of fallout shelter and stock it with food and water to last for five or six days. Under an “evacuation to shelter” approach, individuals were to move from target areas to shelters elsewhere. Peterson suggested digging ditches along the roads for those who could not get to the shelters in time. The National Shelter Policy for 1958 put priority on home shelters instead of evacuation.

### Doom Towns in the Desert

Between 1954 and 1961, the government conducted “Operation Alert” civil defense exercises annually in dozens of major cities. Public education was one of the main objectives, and newspapers, recruited to help, published reports of the fictitious attacks. The headline in the

Operation Alert edition of the *Buffalo Evening News* in July 1956 announced “125,000 Known Dead; Downtown in Ruins.” There was an illustration of City Hall crumbling. The *Grand Rapids Herald* headline said, “16,200 Die as H-Bomb Levels Grand Rapids,” but the message was in the drop headline: “Evacuation Saves 136,000.”

Today’s readers may recall a scene from the 2008 movie, “Indiana Jones and the Kingdom of the Crystal Skull,” in which Indiana is chased into a mocked-up desert town where the clock is ticking down toward a nuclear explosion test. Indy escapes by closing himself in a lead-lined refrigerator.

Such “doom town” tests were actually conducted in the Nevada desert in 1953 and 1955. The tests were filmed and shown on television to encourage the public to invest in fallout shelters. To add “realism,” families of mannequins were placed in the

***This family is calm and composed, but then, the picture is posed. How their composure would have held up after two weeks in such close quarters might have been an altogether different matter.***

Photo via Library of Congress





**Left:** This model of a fallout shelter cost \$1,000, well below the average price, but there was not much room to move around. **Above:** Schoolchildren were urged to follow the example of Bert the Turtle and “duck and cover.”



targeted structures, dressed in clothing donated by J. C. Penney with furniture and household items all around them. Mannequins in shelters survived. The others did not.

Boy Scouts and Girl Scouts distributed millions of copies of a civil defense handbook put out by the government with instruction on first aid, air raid warnings, fallout protection, and how to build home shelters.

In January 1959, the civil defense chief for New York state predicted that within five years most Americans would be living in fallout shelters and “would see sunshine only by taking a calculated risk.” The Joint Congressional Committee on Atomic Energy estimated that 50 million Americans would die in an atomic attack, with another 20 million seriously injured, but that civil defense could cut radiation casualties from 25 percent to three percent.

If the public needed any further scaring, *On the Beach*—a best-selling novel by Neville Shute in 1957, made into an even more successful movie in 1959—did the job. World War III, us-

ing enhanced nuclear weapons, destroys life in the northern hemisphere. The last survivors on Earth wait helplessly in Australia as the fallout drifts southward toward them.

The bureaucrats were always more enthusiastic about civil defense than the citizens were. Officials often depicted the public as ignorant and reckless, but in some respects, the public may have had a better assessment of reality than the bureaucrats did.

### JFK Inspires a Boom

The fallout shelter campaign got a huge boost from a July 25, 1961, speech by President John F. Kennedy, generated by the latest Berlin crisis and the prospect of nuclear war with Soviet Union.

It was essential, Kennedy said, for the public to know “what they should do and where they should go if bombs begin to fall.” New public fallout shelters would be identified and stocked, but that would not be enough. “The lives of those families which are not hit in a nuclear blast and fire can still be saved—if they can be warned to take shelter and if that shelter is available,” he said. “In the coming months, I hope to let every citizen know what steps he can take without delay to protect his family in case of attack. I know that you will want to do no less.”

It was the first time a President had ever spoken to the nation about the need for shelters. His immediate goal was to provide fallout shelters in existing buildings for a fourth of the nation’s population. Within a few months, he set a goal of “fallout protection for every American as rapidly as possible.” Administration officials said that those who could not afford commercial shelters could dig a hole in the backyard, roof it with planks and sandbags, and store emergency water and canned goods.

The news media were fully aboard. A *Life* magazine cover in September 1961 touted “How You Can Survive Fallout.” The contents included a message from President Kennedy. Another *Life* cover in January 1962 focused on “The Drive for Mass Shelters.”

There was no bigger advocate of fallout shelters than Nelson



Photos via Library of Congress

A. Rockefeller, governor of New York. Since 1959, Rockefeller had been pushing for a law to make it mandatory for every homeowner to build a private shelter, but had withdrawn the proposal in 1960 under an avalanche of criticism. After Kennedy's announcement, Rockefeller returned to his original position, proclaiming that a fallout shelter in every home was "essential to national defense and individual survival."

There was money to be made from this, and a civil defense industry sprang up almost overnight. Forty different manufacturers sold fallout shelters, made of reinforced concrete, corrugated metal, aluminum, and other constructions. Some of them cost more than \$4,000, which was the median US income in 1960.

Cheaper (and smaller) shelters were available, with tiered bunks and low ceilings. The Pentagon furnished civil defense offices plans for eight kinds of inexpensive shelters, including a sand-filled lean-to that could be set up against a basement wall.

Vendors offered packaged food and water, generators, lanterns, exercise bicycles, and other items. General Mills developed a granulated protein mix called "Multipurpose Food." It came in a gallon can labeled "MPF" and three scoops of it, hot or cold, wet or dry, met an individual's daily requirements. Radiation-shielding windows from Corning Glass promised to relieve claustrophobia during an extended stay in the shelter. One company took over an abandoned iron mine and rented space in it for firms to store copies of their vital business records.

In February 1962, Stuart L. Pittman, assistant secretary of defense for civil defense, predicted that the Administra-

tion's fallout shelter program would give protection for substantially all Americans within five years.

### A Hideaway in the Hills

Fallout shelters were not just for the big cities. Small towns were caught up in the frenzy, too. Catawba County in the foothills of North Carolina, far from any nuclear war target, had its own civil defense director who made speeches to civic clubs promoting fallout shelters. Catawba Dairy packaged water in milk cartons marked with the distinctive Civil Defense triangle.

In 1962, the US Department of Agriculture published *Your Livestock Can Survive Fallout From Nuclear Attack*. "For animals as well as humans, shelter is the best protection against fallout," the guide read. Another Agriculture Department booklet in 1964 said that such shelters "could be modified for use by sheep, hogs, or poultry."

Roberts Dairy in Elkhorn, Neb., achieved a certain amount of notoriety with its underground concrete shelter for 200 Golden Guernsey cows and a couple of bulls. In addition to the storage space for cattle feed, there was a 10,000-gallon water tank beneath five feet of dirt. A fan carried away offensive odors. The dairy conducted a two-week test with 35 cows and two cowhands. The cows were not bothered by the experience but the cowhands said they did not want to look at another cow for a while.

Only five state governors had their own fallout shelters, and only one member of the Kennedy cabinet, postmaster general J. Edward Day, had a home fallout shelter. However, the Army Engineers built a fallout shelter for Kennedy at his summer home in Hyannis Port, Mass., on Cape Cod, and the Navy Seabees built another one for him at Peanut Island off the Florida coast, five minutes by helicopter from his winter home at Palm Beach. It had 15 metal bunks and room for 30 people.

Nothing, though, ever came close to comparing with the secret bomb shelter built for Congress in a hillside adjacent to the Greenbrier resort hotel in White Sulphur Springs, W.Va. Construction began in 1959 and was finished in the spring of 1962, but its existence was not widely known until *The Washington Post* revealed it in 1992.

The big exhibit halls in the hotel's West Virginia Wing were designed to double as legislative chambers. In emergency, disguised blast doors would close to seal off the wing. A nearby corridor led

to the underground shelter, which included a dormitory with hundreds of metal beds. According to *Post* reporter Ted Gup, there was also a television studio "from which the legislators would be able to address what was left of the nation." The facility was never used, although it was put on high alert during the Cuban missile crisis.

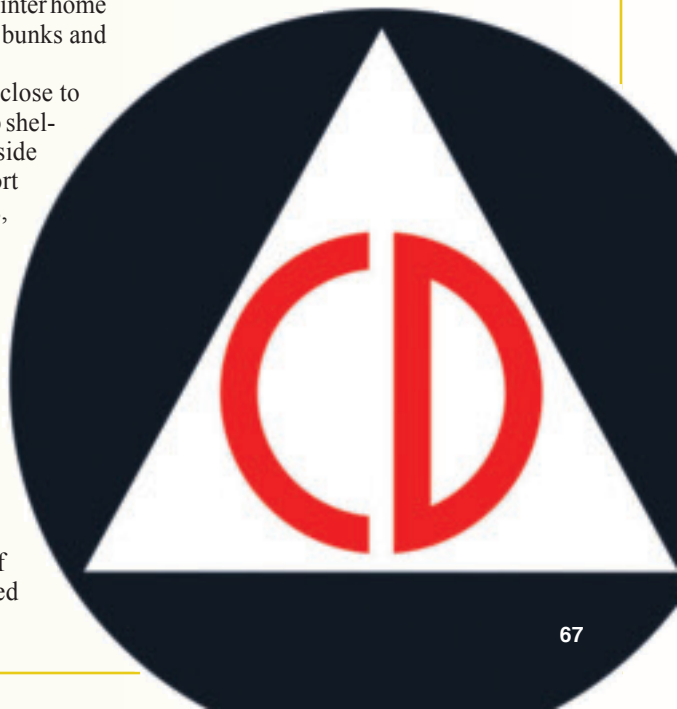
Most members of Congress did not know about the secret shelter in the mountains and mobilizing them for the 250-mile trip would have been a problem. They would not have been allowed to bring their spouses and children, and after the existence of the shelter was disclosed, some said they would not have left their families to go there.

### Gun Thy Neighbor

In the posed publicity pictures for the backyard shelters, the families were always neatly dressed, calm, and seemingly content with their books and knitting projects. How well their composure would have held up for two weeks in close quarters remained to be determined. In those days, many people smoked and incredibly, some smokers apparently expected to continue indulging their habit while underground.

Whether a family would be together in their shelter depended on the timing of the attack. Except at night, family members were likely to be dispersed to work, school, or elsewhere when the critical moment arrived.

Conversely, Rep. Martha W. Griffiths (D-Mich.) pointed out to the *Los Angeles Times* that most of the public shelters were in downtown urban areas so "if the bombs fell at night, you would save nobody but skid row characters, drunks, a few people in hospitals, and maybe the night shift on the local newspapers."

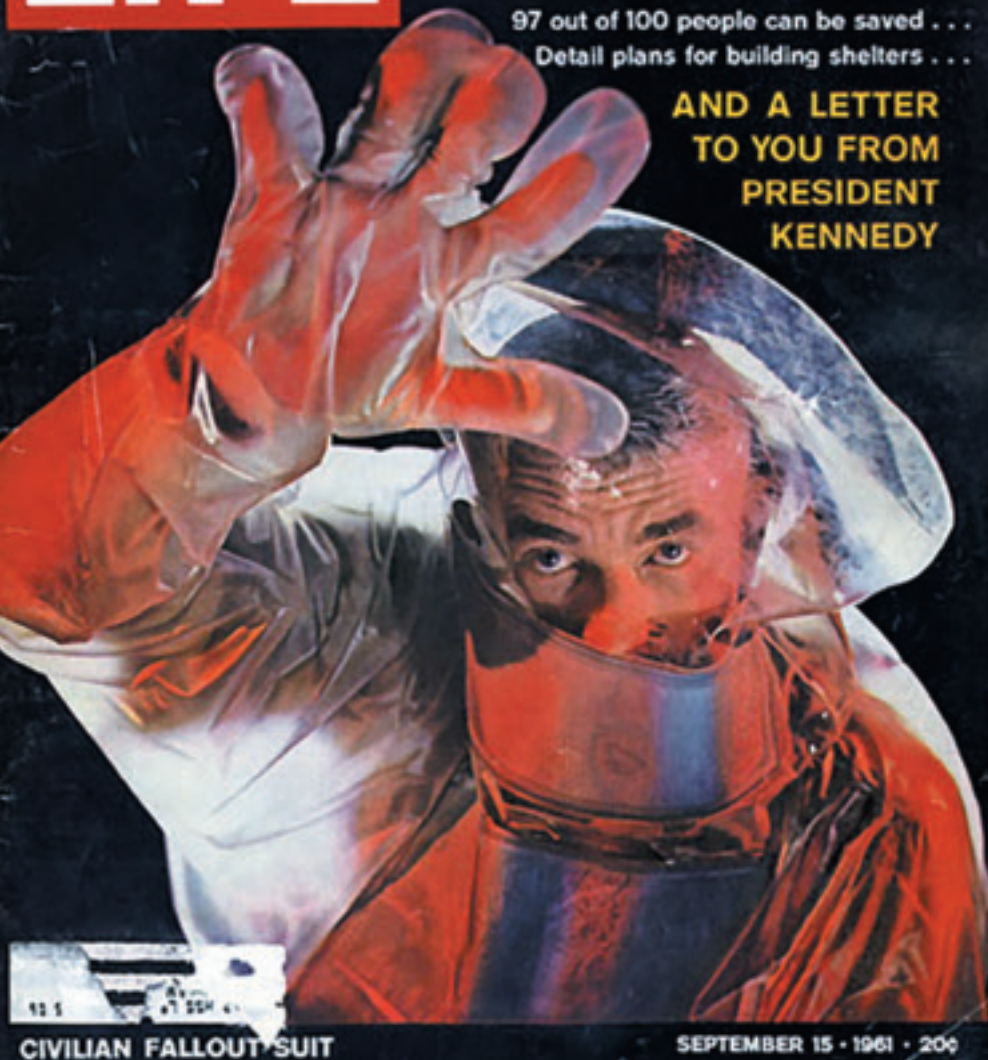


# LIFE

## HOW YOU CAN SURVIVE FALLOUT

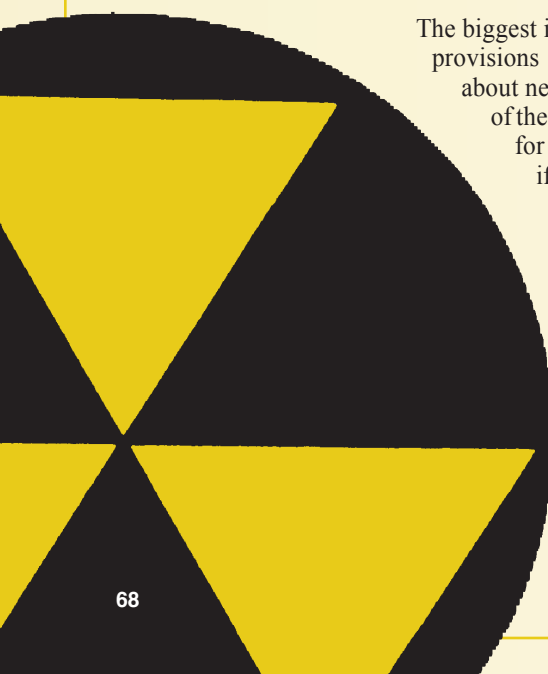
97 out of 100 people can be saved . . .  
Detail plans for building shelters . . .

AND A LETTER  
TO YOU FROM  
PRESIDENT  
KENNEDY



CIVILIAN FALLOUT SUIT

SEPTEMBER 15 • 1961 • 200



The biggest issue was a moral one. With only space and provisions enough for one's own family, what to do about neighbors who wanted admission and a share of the food when the balloon went up? The answer for many was to repel them, with lethal force if necessary.

In a *Time* magazine article titled, "Gun Thy Neighbor," a Chicago suburbanite said, "When I get my shelter finished, I'm going to mount a machine gun at the hatch to keep the neighbors out if the bomb falls." One observer, cited by Kenneth Rose in *One Nation Underground*, speculated that a shelterless neighbor might retaliate by slipping a plastic bag over the air intake.

Evangelist Billy Graham told *The New York Times*, "I feel a primary responsibility for my family but I don't

believe I myself could stay in a shelter while my neighbor had no protection." The civil defense director for Jefferson County, Colo., near Denver, felt no such hesitation. He equipped his personal shelter with weapons to keep out intruders.

Kennedy was taken aback by the rancor. "He remarked ruefully that he wished he had never said the things which had stirred the matter up and wanted to diminish the excitement as expeditiously as possible," said Arthur M. Schlesinger Jr., the Administration's court historian.

### With Enough Shovels

The shelter boom was over. Civil defense was a low priority for the Johnson Administration, which took office in 1963. "The topic began to fall slowly off



Photos via National Archives



**Far left: Life magazine for Sept. 15, 1961, included an upbeat message from President Kennedy. The promise on the cover that 97 percent could survive fallout severely strained credulity. Above: People were advised to stock enough food and water—and, apparently, soda pop—to sustain their families for two weeks. Left: In “tests” in the desert, staged for publicity purposes, mannequin “families” were subject to nuclear attack. Mannequins who took shelter survived. The others didn’t.**

the public radar, and President Lyndon B. Johnson allowed it to slip further by not pressuring Congress to pass the Shelter Incentive Program bill, which proposed to give every nonprofit institution financial compensation for each shelter it built,” says the official history of the Civil Defense program.

The total number of fallout shelters built is unknown. Many of them were installed in secrecy, hoping to escape the notice of neighbors. By one estimate, there were about 200,000 shelters in 1965, but as Kenneth Rose notes in *One Nation Underground*, that was a tiny fraction of American households—with only one out of every 266 having a shelter.

The demise of the shelter movement was partly attributable to the emergence

of arms control agreements and the unwillingness of the government to fund the shelter programs. The main factor, though, was lack of public interest.

Nevertheless, Civil Defense managed to hang on. After several name changes and organizational realignments, the program was assigned to the Defense Preparedness Agency in 1972 and a few pages were allocated to it each year in the Pentagon’s annual report to Congress.

Civil defense made the headlines again in 1982 when deputy undersecretary of defense T. K. Jones declared that nuclear war would not be as devastating as the nation had been led to believe. “If there are enough shovels to go around, everybody’s going to make it,” he said. The shovels were for digging holes, to be covered with a couple of doors and three feet of dirt on top. “It’s the dirt that does it,” Jones said.

The absurdity of doomsday planning was not yet over. In his *Washington Post* article revealing the congressio-

nal shelter at Greenbrier, Ted Gup also reported that as recently as June 1990, “the nation’s defense planners still designated Greenbrier County as the place to which some 45,400 residents of Fairfax County would be evacuated in the event of a nuclear war, under a master plan to relocate civilian populations living in key East Coast target areas.”

Citizens were supposed to drive five hours to a place where there would be nothing to help them once they got there. “The sudden influx of people would more than double the county’s population,” Gup said. “Not only is there no vast and well-stocked bunker waiting to take them in, there is no food or shelter set aside for them at all. Instead, they would be expected to show up with recreational vehicles or tents and to bring their own food, medicine, and supplies.”

The Civil Defense program became part of the Federal Emergency Management Agency when it was created in 1979. In 2003, FEMA was absorbed by the new Department of Homeland Security and the program currently resides there.

In 2006, the traditional civil defense insignia—a red “CD” inside a white triangle on a blue disk—was dropped after 67 years. The announcement came from the National Emergency Management Association, a group representing state emergency managers. The new symbol—depicting “what our profession is all about”—was developed by a marketing firm and is built around the letters “EM,” which focused attention on the association.

In 2010, a plan developed by a federal interagency committee called for educating citizens to take cover and “shelter in place” in the event of attack by a terrorist atomic bomb. One program official said that such an attack would be “more survivable than most people think.” A 130-page planning guide advised citizens to get inside a building or hunker down in a basement. Radiation dosage could be reduced by piling up anything, such as books and furniture, overhead.

“That advice,” said Glenn Harland Reynolds, writing in the *Atlantic*, “sounds a lot like what they were saying in my grandfather’s day: Duck and cover.” ■

*John T. Correll was editor in chief of Air Force Magazine for 18 years and is now a contributor. His most recent article, “Weinberger Doctrine,” appeared in the March issue.*



# THE HEART OF THE NORTH

By Jack Broughton

**Thud missions into North Vietnam were scenic, memorable, and deadly.**

**D**uring the Vietnam War, if a “Thud Driver” took off from either Takhli or Korat Royal Thai Air Base (the two US Air Force F-105 bases in central Thailand), a 400-mile straight line course to the northeast would put them in the midst of downtown Hanoi’s surface-to-air missiles, MiGs, and anti-aircraft gun defenses. Haiphong and the Gulf of Tonkin were 130 miles farther east, and the Chinese border 140 miles farther north.

Despite this, it was seldom that pilots could fly in a straight line between any two points in Vietnam due to aerial refueling, weather conditions, restricted and prohibited locations, and the temperament of defenses.

Those of us who traveled the area on regular combat missions had perhaps the most amazing travel opportunity available anywhere in the world. However, given the Thud loss rate during Operation Rolling

*An F-105 attacks a bridge in North Vietnam in 1966. Supply routes and bridges were popular targets for Thud Drivers during the war. Right: A map shows bases and refueling “anchors”—areas where tankers would loiter, waiting to refuel fighter and reconnaissance aircraft on their way to or from targets in North Vietnam.*





Thunder, there was an ever-present anxiety you might not be able to return to relate what you saw. But from the moment 60,000 pounds of Thud, fuel, and munitions banged into afterburner, and you gazed down that long runway toward the Thai rice paddies ahead, there was a lot to see.

Once F-105 flights were joined up, the immediate concern was the KC-135 refueling tankers. Tankers were deployed in cells, designated by color codes, and orbited about 200 miles north of the fighter bases. Thud flights were assigned to specific tanker orbits, and you could count on five elliptical orbits across Laos, and two orbits over the South China Sea. While refueling from the tankers over Laos, you could view the most gigantic, persistent, and severe thunderstorms in the world, whose tops were still boiling upward above 50,000 feet. You could appreciate their menace just trying to navigate around them, and the darker it was, the more awesome their constant lightning became. Excitement



USAF map and photo



USAF photos

**Here: A Wild Weasel takes off from Korat RTAB, Thailand, in 1971, loaded with SAM-killing missiles and a droppable fuel tank. Right: An RC-135 takes off. Reconnaissance aircraft gathered important intelligence on North Vietnamese air defense systems so pilots would know the “hot spots” to avoid.**

bordered on terror and demanded utmost skill when the pulse of war forced pilots to find a tanker inside one of those storms, then hang on for desperately needed fuel.

### Zero Visibility

If you were assigned to an overwater tanker cell, you could anticipate the possibility of crowded US Air Force, Navy, and commercial air traffic over the ocean. An unattractive aspect of those tanker cells was the tendency for Air Force single-engine fighters to develop rough running engines when they crossed the coastline outbound, seemingly without fail.

Once off the tankers, if weather was acceptable, the endless green jungles and rugged peaks along the mountains running the length of Laos were spectacular to view. One could look down and easily imagine seeing giant white elephants trooping below.

Precise navigation was of paramount importance, since everything was geared to arriving over a specific spot in hostile territory at your appointed target time. Flying at 500 mph, there was little room for error.

The Thud’s navigation gear included a navigation receiver with an omnidirectional needle and distance to station readout allowing pilots to monitor position in relation to a transmitting station. Aircrew also had a sophisticated onboard Doppler navigation system that allowed them to input their exact position when they taxied onto the end of the runway, then steer to any selected pinpoint target. The Doppler system was quite allergic to jungle heat and humidity, however, abhorred lots of high maneuvering,

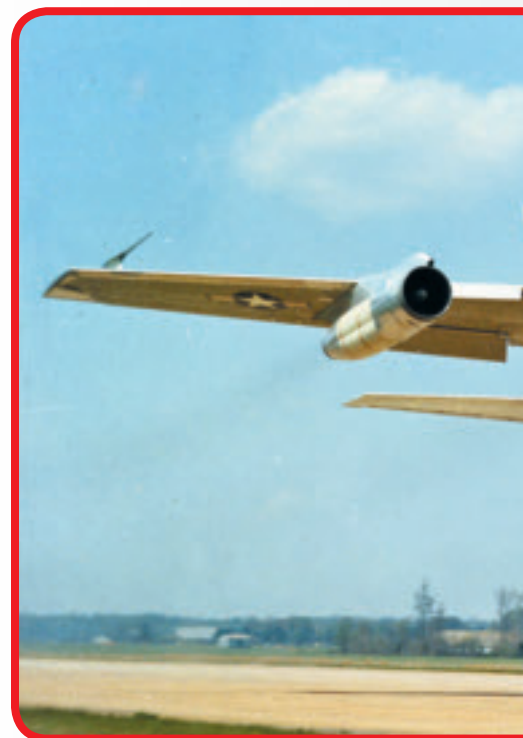
and had trouble keeping up with fast maintenance turnarounds. It was a good bet that if you could get it working at all, you could depend on it going belly up shortly after you left the tankers but before you got to the target. Flight leaders were usually forced into basic time, distance, and eyeball navigation.

The weather varied between monsoon season and almost monsoon season, and see-for-miles days were not common. Rice farmers burned all crop waste, and a day without a breeze could quickly produce absolutely zero visibility. Thus, the few good landmarks in an empire of rice paddies were very important.

Our Wild Weasels entered target areas to hunt for and kill surface-to-air missile sites, and their radio transmissions were a preamble to the action just ahead. But all the noise sort of bounced off our flight leaders, whose sole task was to get themselves and their wingmen to the pop-up point and kill the target.

Landmarks became increasingly important as you got closer to targets, and the worse the weather the more important they were. Our working area stretched from the Laotian border on the west to the Gulf of Tonkin on the east. We usually approached from the west, to avoid the more intense defenses; thus our first good landmarks were the bends and twists of the Black and Red rivers, feeding the rice lands of the Red River Valley.

Regardless of our target, we drew courses to steer clear of Yen Bai, located on the Red River, 120 miles west of Hanoi. You could immediately tell if you were off course and were too close to the place if the skies lit up with all sizes of flak



coming straight up. There wasn’t much to the town, but it was rumored to be the hometown of Ho Chi Minh. They sprayed the skies at any excuse, with nothing resembling tracking.

The prime marker in North Vietnam was the long bony “finger” that ran from northwest to southeast and pointed directly at the heart of Hanoi. It was known as “Thud Ridge” since it identified the unintended end destination of so many of our Thuds and their pilots. Its highest peaks were about 5,000 feet, and its heavy green foliage stood out against the surrounding flatlands.

If we could see Thud Ridge, despite the weather, we knew we could thunder along its sides, be protected from radar from the east, and be zeroed in on downtown

Hanoi. That put the pilots in the heart of the North—the box bounded by Haiphong and the Gulf of Tonkin on the east, the junction of the Red and Black rivers on the west, Thai Nguyen on the north, and Hoa Binh on the south. That's where the US Thud drivers fought against some of the fiercest defenses in the history of aerial warfare.

As we continued to descend inbound to our target, our altitude dropped to 200 to 300 feet, and our speed increased to about 620 mph. Turbulence became intense, so a landmark had to be big and easy to see to be of value. MiGs sent up to pursue Thuds increased the urgency of the sortie, as well as SAMs whistling about and ugly blankets of white, black, and red flak greeting us.



All of our missions were complicated by our maps of North Vietnam, full of seemingly endless little squares and circles representing US self-imposed forbidden areas. The largest no-no was an irregular, 30-mile wide swath across the entire Vietnam-China border where our leaders decided we must not venture.

I will quickly admit when you are lead man for 72 F-105s, each carrying eight tons of bombs and fuel, nibbling on Mach 1, bouncing wildly at 200 feet in the midst of a flak storm, it is very difficult to see and obey those imaginary lines on the ground.

The earphones inside our helmets were a constant, piercing source of reminders that we were involved in a complex, noisy, and violent endeavor.

As we approached downtown, the noise tempo was ever increasing.

One of the most bothersome noise sources was our big four-engine headquarters command and communications relay aircraft, orbiting high and far out over the South China Sea. Their radio transmitters and onboard radar monitors were powerful, and they had an amazing capability to block all truly crucial chatter at the wrong moment in combat. As flights were desperately trying to exchange life-or-death warnings, the C2 aircraft could be counted on to transmit an eardrum-shattering MiG warning code of the day such as “Orphan Annie-Orphan Annie,” then a set of map coordinates that meant nothing at the instant, then, “MiGs heading 265 degrees, angles 20 (altitude in thousands of feet),

Orphan Annie -Orphan Annie.” They also had code words to warn those of us who might be approaching a restricted area. As we entered the hot areas, we always turned off the IFF radio transponders that transmitted our identification code, so our headquarters monitors could not tell which one of us to turn in for disciplinary action.

Imagine the frustration if the C2 aircraft blocked the airways in the middle of a furball, with your element leader trying to warn you that you had a MiG closing on your tail.

On our normal attacks against sensitive downtown Hanoi area targets we powered along between the green crests of Thud Ridge and the busy MiG airfield of Phuc Yen, located abreast of the southern tip of Thud Ridge. It was utterly frustrating

to see the MiGs, sitting ducks in takeoff position on the end of their runway, and not be allowed to splash them. As we passed them heading south, they would take off to the north and turn onto our tails.

## A Fiery Trap

The lead pilot on any strike had the responsibility to make the go or no-go call for all flights on that strike sortie. You never wanted to call off a strike just miles from the target, but you also didn't want to drag your force over an unbelievably fierce storm of enemy gunfire, if weather would prevent them from a good attack pattern ensuring bombs on target. Sometimes you couldn't make that decision until you were within visual range of the target. Thus, if it was a last second call, and if the target was downtown, passing Phuc Yen was a gut-check moment. You were 25 miles north of downtown, and at 620 mph that gave you 60 seconds to decide: Either attack or break away.

If your target was Thai Nguyen, just north and west of the Ridge, the flak, SAMs, and MiGs were always there to point it out for you. If you could afford a glance at the massive facility you could see a huge railroad complex, with an absurd choke point diminishing four rail lines into one, a steel mill, multiple power generating facilities, a barge factory, a chemical facility, and more. It was perhaps the most heavily defended spot in the history of air warfare. It was easy to see why the commander of Pacific forces had it high on the on the list of 94 targets he wanted destroyed.

The Air Force almost certainly could have done that swiftly at the start of the war, since the North had no MiGs, no SAMs, and limited AAA. But the US decided to wait until it became a fiery trap. Pilots were only allowed to hit it on restricted, stop-and-go strikes.

We had multiple targets in the Viet Tri-Phu Tho area. If the weather was anywhere near decent when we were approaching Viet Tri from the west, it was an easy target to find, since that's where the Red and Black rivers came together to identify a major thermal power plant.

If you were coming from the east, you could follow the railroad and take your choice of the railroad staging area or proceed a bit farther into the center of town. The town was built around a large, square, four-story gray building, with rows of windows on all floors, known to us as “the hospital.” Previously it was a chemical production facility, but now had huge white circles painted on the walls, with equally large red crosses



Photo via Jack Broughton

**Vietnamese farm workers toil in the flats of the Red River Delta. To the right is Thud Ridge, to the left is Viet Tri, a target-rich area for Thud Drivers.**

centered in the circles, to preserve it from attack.

If your course took you near the hospital, the circle and cross were immediately highlighted for you by solid walls of relatively small-arms gunfire coming from all the windows, on all floors, and a solid ring of 37 and 57 mm gunfire outlining the flat, open roof.

It was difficult to get to the power plant without lighting up the hospital.

We were always assigned three targets when we went north. The primary was always hot, since the North knew when we were coming. The secondary often didn't seem very important, and the third usually fell into the category of what was dubbed a "suspected Vietnamese turnip target." If I had to scrub on the primary target, I usually took my troops hunting to either Dien Bien Phu, just a few miles east of the Laotian border, or to the Hoa Binh area south and west of Hanoi on the Black River.

Looking at Dien Bien Phu was always a surprise, since one might expect to see something of the historic battle site where the French were defeated in 1954. There were some primitive looking shacks spread randomly around the crude dirt road that ran west to east. One never hung around to survey the area in detail, but at 500 mph you could make out the bowl-shaped valley where the French were slaughtered and the surrounding higher ground from which the Vietnamese ended French colonial rule.

You could depend on it for an alternate target. We almost always found six to

10 wooden, single-story Quonset hut-like buildings spaced along the dirt road. We would bomb them and they would blow sky high and burn, indicating fuel and ammunition storage. The next time we got weathered out and came back, they would have rebuilt some huts, others would be under construction, and we would repeat the routine.

### Get Me Home Tankers

If we got skunked downtown, and the weather didn't look good out at Dien Bien Phu, I'd take my guys hunting along Route 5, to the southwest toward Hoa Binh.

The area seemed quiet, I never saw any people moving about on the ground, but we always found a target. Once we discovered a significant supply area and got a lot of major secondary explosions. When we came back the next day with a full strike force, we did significant damage.

Quite logically, the Navy provided the workforce for the seaward side of the Hanoi-Haiphong complex, and they didn't often need any Thud augmentation for their missions. The prime target of Haiphong was always off-limits, ensuring the North of a viable harbor, extensive storage facilities, and access to supply routes south.

The Thuds did have the dubious distinction of responsibility for the small portion of the northeast rail line that remained open to attack.

This link between North Vietnam and China was protected by the prohibitive Chinese border zone to the north and the Hanoi prohibited zone to the south.

That left a 15-mile middle segment that Thuds were tasked to hit with two four-ship flights every morning and two four-ship flights every afternoon. However, there was never anything at the site other than a few boxcars we had destroyed earlier—and devastating flak.

Our directed times on target, altitude, airspeed, and direction of flight were always exactly the same. Every morning a flight out of Korat and a flight out of Takhli would refuel over the water and cross the coastline inbound at the same spot and almost immediately be on a 15-mile run for their lives. The insane practice would be repeated every afternoon.

The North Vietnamese moved every gun they could onto that stretch, and in mid-1967 there was an average of one anti-aircraft gun every 18 feet. The Thuds were like clay pigeons on a skeet range at this point. The only thing to see was how many made it out and how many holes pilots had in their aircraft when they returned.

The "get me home tankers" always flew in what looked like beautiful sky to us as we left the heart of the North. We never could have done the job without them, and when we came out all shot up and desperately needing fuel, they seldom hesitated to come after us. That resulted in formal, career-damaging discipline for some tanker crews that broke rules, but if they knew we needed them, they didn't care. The sight of a tanker, when you were close to losing it, was one of the best in all of Southeast Asia.

If the weather was nasty, all you saw on the way home was the inside of clouds. If it was clear, and if your fuel was good, you could drop down, take your oxygen mask off, and cruise home. The tougher the mission had been, the longer it seemed to take to get past those hundreds of miles over nothing but scrubby trees and rice paddies.

It was a neat time to think of the ice-cold towel and the thermos of ice water your crew chief had waiting for you once you landed. ■

*Jack Broughton is a retired USAF colonel and fighter pilot. During his time on Active Duty he was the recipient of four Distinguished Flying Crosses, two Silver Stars, and the Air Force Cross. He is the author of two memoirs from the Vietnam War era, Thud Ridge and Going Downtown. His most recent article for Air Force Magazine, "The Bleeding of America's Jet Fighters," appeared in February 2013.*

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\*Executive Director (President-CEO) Emeritus

By Frances McKenney, Assistant Managing Editor



## Emerging Leaders

The Air Force Association began an Emerging Leaders Program in 2013 as an avenue to secure AFA's future.

Emerging Leaders volunteer for a year. With guidance from a mentor, they participate on a national-level council, attend national leader orientations, and serve as National Convention delegates. Here's the sixth Emerging Leader's profile.

### TSgt. Timothy J. Tichawa

**Home State:** Illinois.

**Chapter:** Robert H. Goddard.

**Joined AFA:** 2011.

**AFA Offices:** Member of the national-level Aerospace Education Council. California State VP for aerospace education. Was Goddard Chapter Secretary.

**AFA Awards:** State-level Meritorious Service award. Chapter-level Presidential Exceptional Service.

**Military Service:** 12 years on Active Duty.

**Occupation:** Flight chief (space operations), 533rd Training Squadron, Vandenberg AFB, Calif.

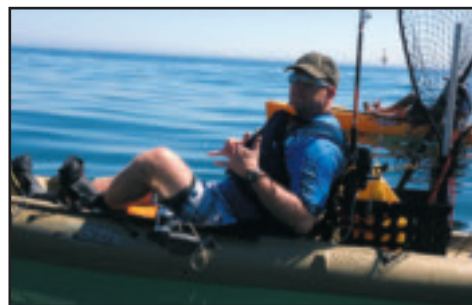
**Education:** A.A.S., Community College of the Air Force. B.A., Ashford University. Working on an M.S., Colorado Technical University.

### Q&A

**How did you first learn of AFA?** I had a group commander, and he was asked to put together the state convention. ... I didn't attend the state convention, but I helped plan it. I thought, "Wow, this is a great organization."

**How is AFA of value?** I've benefitted most from my networking. ... Between networking and professional development—that's another big one—I've gotten to meet some of the great NCOs and leaders.

**How can AFA increase membership?** By helping people realize that the organization is for the Total Force, by really telling the enlisted story. Everything that AFA does should include the enlisted perspective to it. ... We should somehow tie in e-membership to that—that it may be more affordable [for junior enlisted]. That was a great move to reach out to the young.



Tichawa fishes from a kayak off California's Gaviota State Park with the Jurassic Sport Fishing group.



Maj. Michael Belardo and CMSgt. Gary Brown receive applause at the Central Florida Chapter's Gala. L-r: Tim Brock, gala chairman; CMSAF James Cody; Gen. Mark Welsh, USAF Chief of Staff; Air Force Secretary Deborah Lee James; and Bill Palmby, chapter president.

## Florida Gala Salutes the Guard and Reserve

The Air Force Gala in Orlando, Fla., organized by the **Central Florida Chapter**, honored "citizen airmen"—the Air National Guard and Air Force Reserve.

Held in conjunction with the Air Warfare Symposium and Technology Exposition, the 30th annual gala also paid tribute to industry partners of the Guard and Reserve. As Chapter President William G. Palmby told the audience, employers "truly understand the importance of allowing these warriors the time they need for training and operational duty."

The chapter named seven AFA Jimmy Doolittle Educational Fellows. Col. Frank L. Amodeo, commander of the 403rd Wing at Keesler AFB, Miss., accepted the award for his unit, singled out for its unique mission of hurricane reconnaissance. Maj. Jose Ariza accepted the honor on behalf of the 146th Airlift Wing at Channel Islands ANG, Calif. The award recognized the ANG's airborne firefighting mission. Together, Amodeo and Ariza represented the homeland responsibilities of the Guard and Reserve.

Maj. Michael Belardo (fourth from left in the photo at top), a B-2 weapons officer, accepted the award for the 131st Bomb Wing at Whiteman AFB, Mo. It was highlighted as the only ANG entity flying and maintaining Spirit stealth bomb-



Maj. Jose Ariza (second from left) and Col. Frank Amodeo accept congratulations from Welsh and James.

Photos by Dan Higgins

ers. CMSgt. Gary Brown, the 310th Space Wing command chief from Schriever AFB, Colo., joined Belardo on stage. He represented the Reserve's only space wing. Belardo and Brown symbolized the aerospace power projection capabilities of USAF's two Air Reserve Components.

Southwest Airlines Capt. Chuck Magill and Dustin Baird were named Doolittle fellows—to underline corporate and small-business support for reservists—as was Ronald Young, executive director of DOD's Employer Support of the Guard and Reserve organization.

In a culmination of the gala, the chapter named AFA President Craig R. McKinley as an H. H. Arnold Fellow. The honor served to spotlight McKinley's 38 years of military service and his firsts: He was the first national guard officer to become a four-star general and the first National Guard Bureau chief appointed a member of the Joint Chiefs of Staff.

### Yes, I Know Polly—Part II

Do you know Polly?

With her help, the **Gen. Bruce K. Holloway Chapter** put AFA on Page 1 of its local newspaper.

*The Daily Times* in Blount County, Tenn., declared that "Top Stories for Monday, Feb. 24" included AFA's \$1,300 Chapter Matching Grant to a school in Maryville.

Chapter Treasurer Pauline K. "Polly" Morrisey presented the check to health sciences teacher Carla Woodard and students Allie Israel and Jessica Hechevarria (left to right in the photo) at William Blount High School.

But the grant really originated through another chapter member: retired Col. Thomas M. Shaughnessy, the AFJROTC senior aerospace science instructor at Blount.

Shaughnessy said, "We don't even have a budget for textbooks. Our school is pretty needy." He knew Woodard's vocational-technical program wanted funding help. So, Shaughnessy said, "I hooked her up with Polly."

**Polly Morrisey (far right), the Gen. Bruce K. Holloway Chapter treasurer, presents an AFA matching grant to William Blount High School. The funds paid for the centrifuge in the foreground.**



Photo by Darryl Sullivan, courtesy of *The Daily Times*

He explained, "I know Polly Morrisey because we invite her every year to our banquet, and she presents the outstanding JROTC cadet award."

Morrisey does far more than hand out the award; she keeps in contact with the student. As a result, months after the medal presentation, the cadet still knows her name. (See [airforcemag.com](http://airforcemag.com). Search: Yes, I Know Polly.)

AFA Chapter Matching Grants promote science, technology, engineering, and math and can be used for activities such as science fairs, science and technology programs, field trips, or career days.

At Blount High School, the matching grant allowed Woodard to buy a microhematocrit centrifuge and basic supplies. The centrifuge determines the ratio of red-cell volume to whole blood volume and helps diagnose blood loss, anemia, and bone marrow failure, for example. Having the machine gives the students hands-on training for their future careers, commented Shaughnessy.

It's the kind of thing that happens when you know Polly.

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At the CAP awards night in Waukesha, Wis., Alexander Vargo (far left) was part of the color guard and also received an AFA CAP Outstanding Squadron Cadet of the Year award. Billy Mitchell Chapter President Victor Johnson made the presentation.



Gold Coast Chapter's (left to right) Virginia Montalvo, Fran Shaw, and Ran Meriam with a photo of Fort Lauderdale's F-86. Standing is new chapter member Marine veteran Edward Weber.

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Promoting Air Force Airpower

In February, the **Gold Coast Chapter** set up an AFA membership table at the air show. With its display, the chapter highlighted its own vintage fighter aircraft restoration effort.

Chapter President Virginia Montalvo, Secretary Fran C. Shaw, and Treasurer Ransom Meriam manned the table, with a large photograph of F-86H, No. 53-1255, as the focus.

This Sabre began its association with the chapter in 1970 when then-leader Robert M. Rawls persuaded Fort Lauderdale to acquire it from the Maryland Air National Guard for display.

By 1999, however, the aircraft had fallen into disrepair because of weather exposure. Chapter members then organized a restoration that involved trucking the fighter jet down the coast to Homestead Air Reserve Base.

Reservist volunteers worked for five years on the restoration, with the chapter funding materials and supplies.

In 2004, the chapter dedicated the F-86 at Fort Lauderdale's Holiday Park. The next year, Hurricane Wilma knocked it off its display pedestal. The chapter again led a restoration and rededicated it for Veterans Day 2010.

## Silver

**Nation's Capital Chapter** President Bruce A. VanSkiver awarded an AFA Silver Medal to Ellen Petersen, the outstanding Aerospace Studies 300 cadet at Det. 130, based at Howard University in Washington, D.C.

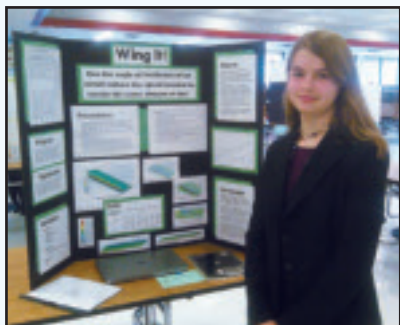
Lt. Gen. David S. Fadok, commander of Air University, was guest speaker for the event and helped with the presentation, along with detachment commander Lt. Col. Darryl Terrell. Petersen is finishing her junior year at American University, one of several colleges in an AFROTC consortium with Howard University. According to VanSkiver, she has been selected for the remotely piloted aircraft career field. ■



## How To Stand Out at the Science Fair



**Anna Zimmerman displays her AFA Certificate and Recognition Medal. The science fair awarded the First in Class plaque on the right. Below: Merritt Kendzior's research produced a project called "Wing It!"**



The **Sarasota-Manatee Chapter** in Florida continues to build its presence at a local science fair.

In January, Chapter President Michael R. Richardson presented awards for two projects at the Lockheed Martin-Manatee Regional Science and Engineering Fair.

Anna Zimmerman, a ninth-grader from Braden River Middle School, evaluated the performance of a hybrid rocket motor using beeswax versus a paraffin-based fuel. She entitled her project "An Eco-Friendly Rocket Fuel." (Beeswax came out on top.)

Merritt Kendzior, a ninth-grader at Southeast High School experimented with varying a wing's angle of incidence to change the speed needed to create a specific amount of lift. Both students come from Bradenton, Fla.

This is the chapter's third year of involvement with the science fair. How did they do this?

■ Ask the school system. "We knew we needed to do something in the aerospace education field," recalled Richardson, so he began phoning school officials. On his second try, he reached a teacher who complained, "Gee, I'm really busy right now. I'm getting ready for the science fair." Bingo. He was in.

■ No need to be a judge. The chapter got on the radar by providing awards to highlight aerospace-oriented projects, not by judging entries.

■ Stand out from the crowd. Richardson said, "I made an effort to provide distinct awards": an AFA Certificate that he prints on heavy card stock on his computer and places in a blue presentation folder; an AFA calendar; an aerospace-related book; a medallion hanging on a ribbon; and a backpack of Air Force goodies from the local recruiting station. He presents this bounty at the fair's awards ceremony, where the chapter's recipients differ from the other awardees. "They walk away from me with their hands full," Richardson said. "That makes them stand out." His marketing background taught him this technique.

■ Compile a list of media contacts. "I went around town and picked up every paper I could find," Richardson said. He looked through each newspaper's staff list to find pertinent email addresses.

A web search in February revealed that all of the after-action coverage of this science fair originated with Richardson's emailed press releases to those on this contact list.



**American University cadet Ellen Petersen received an AFA Silver Medal from (l-r) Lt. Col. Darryl Terrell, Nation's Capital Chapter President Bruce VanSkiver, and guest speaker Lt. Gen. David Fadok, Air University commander.**



**Susan Loricchio, a New Jersey state VP (left), presented Isaac Alberto with an AFA CAP Outstanding Squadron Cadet of the Year Award. At right: Jersey City Composite Squadron Commander Gilberto Sanchez.**



**Sal Capriglione Chapter VP Anthony Devino (second from left) and President Joseph Capriglione (third from right) presented an AFA CAP Outstanding Squadron Cadet of the Year Award to John Glidden III (center). Glidden is from the Teaneck, N.J., Composite Squadron.**

## reunions@afa.org Reunions

**34th BS.** Oct. 2-5 in San Diego. **Contact:** Rod Breland, 5731 Hickory Ridge Blvd., Baton Rouge, LA 70817 (225-751-2058) (rodbrel@msn.com) (www.mlrsinc.com/34thbombsqd).

**606th Special Ops Sq.** April 24-26 at Hope Hotel near Dayton, OH. **Contact:** Phil French (937-287-4766) (fossilphil@hotmail.com).

**Radar station veterans.** May 18-23 in Reno, NV. **Contact:** Woody Woodworth (927-868-2495) (lgwdwrth@roadrunner.com).

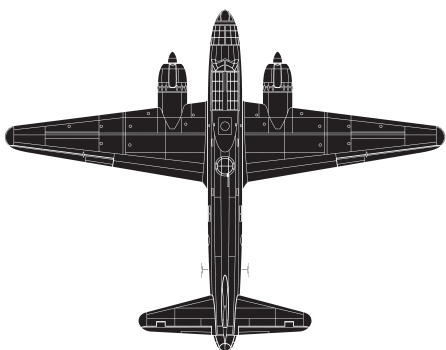
**SAC.** May 15-17 at Sam's Town Hotel and Casino in Shreveport, LA. **Contact:** (318-529-3023).

**Pilot Tng Class 62-G,** Laredo AFB, TX. May 12-15 in Las Vegas. **Contact:** John Kikta (702-876-6216) (jjkikta@cox.net).

**Wheelus AB.** June 27-29 in Dayton, OH. **Contact:** Judy Martin Moore (276-728-5391) (jmmooore919@aol.com).

Email reunion notices four months ahead of time to [reunions@afa.org](mailto:reunions@afa.org), or mail notices to "Reunions," *Air Force Magazine*, 1501 Lee Highway, Arlington, VA 22209-1198. We reserve the right to condense notices.

## G4M Betty



The Japanese Imperial Navy Air Service G4M Betty was the nation's medium bomber counterpart to the A6M fighter. Both aircraft were designed by Mitsubishi and about equal in wartime prestige and fame. Adm. Isoroku Yamamoto, the fleet commander in chief, had called for a long-range, four-engine heavy bomber able to operate from land bases. Japan's naval leadership instead decided to produce an ultra-long-range twin engine aircraft, sacrificing armor and self-sealing fuel tanks. The result was the rotund Betty, which achieved phenomenally long range but also suffered a stunning loss rate.

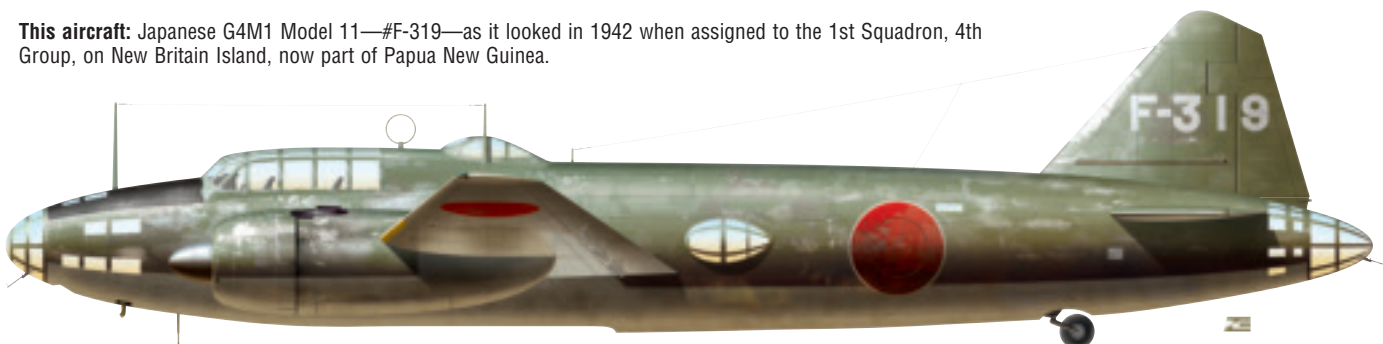
The Betty bomber was a twin-engine, midwing, all metal, stress-skinned monoplane. It was easy to fly and proved easy to maintain in the field. Initially, its 1,100 imperial gallon wing tanks had no protection. Its bomb bay doors were normally closed in flight but had to be removed in some models for bombing missions. The Betty was successful when flown against poorly defended Chinese targets but could not survive in combat against US fighter aircraft or in the face of ac-

curate anti-aircraft fire. Despite having effective tail defense armament, the Betty was so easy to set afire that it was called "Zippo" by US pilots and "Type 1 Lighter" by the Japanese themselves.

The Betty was used in war-opening strikes at the Philippine Islands on Dec. 8, 1941. A 27-ship fleet of Bettys helped sink the British warships HMS *Prince of Wales* and HMS *Repulse* off Malaya on Dec. 10, 1941. These were the first capital ships sunk at sea in wartime by airpower. They then participated in every major battle of the war. On March 21, 1945, the Betty fleet suffered heavy losses attempting to launch piloted Okha rocket-powered missiles at US ships. The aircraft's most famous mission occurred on April 18, 1943: US P-38s attacked and downed the G4M carrying Yamamoto as it approached Bougainville Island.

—Walter J. Boyne

**This aircraft:** Japanese G4M1 Model 11—#F-319—as it looked in 1942 when assigned to the 1st Squadron, 4th Group, on New Britain Island, now part of Papua New Guinea.



### In Brief

Designed, built by Mitsubishi ★ first flight Oct. 23, 1939 ★ number built 2,436 ★ crew of seven ★ **Specific to G4M1:** two Mitsubishi Kasei radial engines ★ defensive armament one 20 mm cannon (tail turret) and four 7.7 mm machine guns ★ load up to 1,892 lb of bombs or one aerial torpedo ★ max speed 265 mph ★ cruise speed 196 mph ★ max range 3,750 mi (G4M2) ★ weight (loaded) 28,350 lb ★ span 81 ft 8 in ★ length 65 ft 6 in ★ height 16 ft 1 in.

### Famous Fliers

**Notables:** Hiroshi Hayashi, Joji Higai, Jun Takahashi. **Test Pilot:** Katsuzo Shima.

### Interesting Facts

Nicknamed "Hamaki," or "Flying Cigar" ★ carried Japanese Fleet Adm. Isoroku Yamamoto on fatal mission (shot down by USAAF in 1943) ★ produced in numbers greater than any Japanese bomber ★ flown in combat from Aleutians in north to Australia in south ★ served as basis for 30 heavily armed G6M "escort fighters" ★ suffered 182 losses (of fleet of 240) in first 90 days of war with US ★ relied on rubber sheets on wing outer surfaces as fuel tank protection ★ transported Japanese surrender-planning team to Ie Shima on Aug. 19, 1945 ★ operated by Indonesian air force after World War II.



A formation of early production G4M1 Betty bombers.



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