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About the cover: A-10 Thunderbolts over Idaho. Photo by Jim Haseltine. See "Hogs of a Higher Order," p. 54.

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Editorial

By Robert S. Dudney, Editor in Chief

Wars of the QDR

One year ago this month, Robert M. Gates took a public shot at the Pentagon's venerable two-war strategy. The Defense Secretary told National Public Radio he wondered whether it "makes any sense in the 21st century." The Gates remark looked like a death sentence, but maybe it wasn't.

Take, for example, the most recent Quadrennial Defense Review, issued on Feb. 1. It reports, "Past defense reviews have called for the nation's armed forces to be able to fight and win two major regional conflicts in overlapping time frames. ... This QDR likewise assumes the need for a robust force capable of protecting US interests against a multiplicity of threats, including *two capable nation-state aggressors"* [emphasis added].

The QDR's main author, Undersecretary of Defense Michele Flournoy, flatly declared, "Our forces, to be sure, will still be able to fight and win two large-scale regional conflicts."

These remarks are surprising, given Gates' stated antipathy for the concept. Moreover, the QDR claims elsewhere, "It is no longer appropriate to speak of 'major regional conflicts' as the sole or even the primary template for sizing, shaping, and evaluating US forces." Come again?

Clearly, the Pentagon's new 105-page blueprint of the capabilities and requirements for the military stirs considerable confusion. It is easy to see why. The old "strategy" focused primarily on major conventional-force wars. The new one is a lot mushier—and hard to assess.

The first thing to say is the old two-war "strategy" was not a strategy at all. It was a force-sizing standard, theoretically obligating Washington to keep forces sufficiently large and well-equipped to fight and win two big conventional wars at more or less the same time. It was put in place in the early 1990s and has survived numerous reviews since then.

For nearly two decades, the standard justified the number and types of aircraft, ships, tanks, and other weapons the services acquired. It also helped keep budget-cutters at bay.

With this QDR, the Pentagon does not so much abandon the concept as it deemphasizes it and swaddles it in complexity. It concedes the need but says defense planning should encompass a wide range of other scenarios, such as irregular warfare with insurgents, high-end wars in cyber and space domains, and terrorist attacks with weapons of mass destruction.

"You may have to do not just two major conflicts," Gates explained, "but a broad range of other things, as well, or perhaps in the future one of those conflicts and then a number of other contingencies." He called the old way "too confining." To quote Ms. Flournoy, DOD is "break[ing] from the post-Cold War focus on canonical conventional wars."

The old "strategy" focused on major conventional-force wars. The new one is a lot mushier—and hard to assess.

Fair enough. The argument, however, is not so much with this basic concept—on which there is fairly wide agreement—but about the force levels and budgets proposed to go with it.

The QDR forecasts an Army of 73 brigade combat teams; a Navy of 10 or 11 carriers and wings and 53 to 55 attack subs; a Marine Corps of four divisions and air wings; and special operations forces comprising 660 teams, three Ranger battalions, and 165 mobility and fire support aircraft. That is roughly today's force.

As for the Air Force, the QDR projects, among other things, a force structure of 16 to 17 fighter wing equivalents, of which six are air superiority FWEs and the others theater strike types. That's a reduction of three to four wings from the last published force list, which some years ago approved 20 FWE.

In short, the Pentagon seems to have substantially expanded the mission set, even as it trims a military force already considered to be too small for the two-war strategy.

Defense officials seem to recognize the problem. The solution, in Gates' words, is a military force of "maximum versatility across the widest possible spectrum of conflict."

To gain all of this new versatility, the QDR directs emphasis on "enablers" such as a new air-sea battle concept, long-range strike, space and cyberspace improvements, and targeted "investments" to "rebalance" the armed forces in ways that expand their capabilities to fight the wars in Afghanistan and Iraq as well as other places.

The plan has gotten a lukewarm reception in Congress, where Democrats and Republicans alike complained it lacks priorities and calls for too few forces to meet the future threats and missions envisioned. Rep. Ike Skelton (D-Mo.), chairman of the House Armed Services Committee, opined that Gates was seeking a force "capable of being all things in all contingencies."

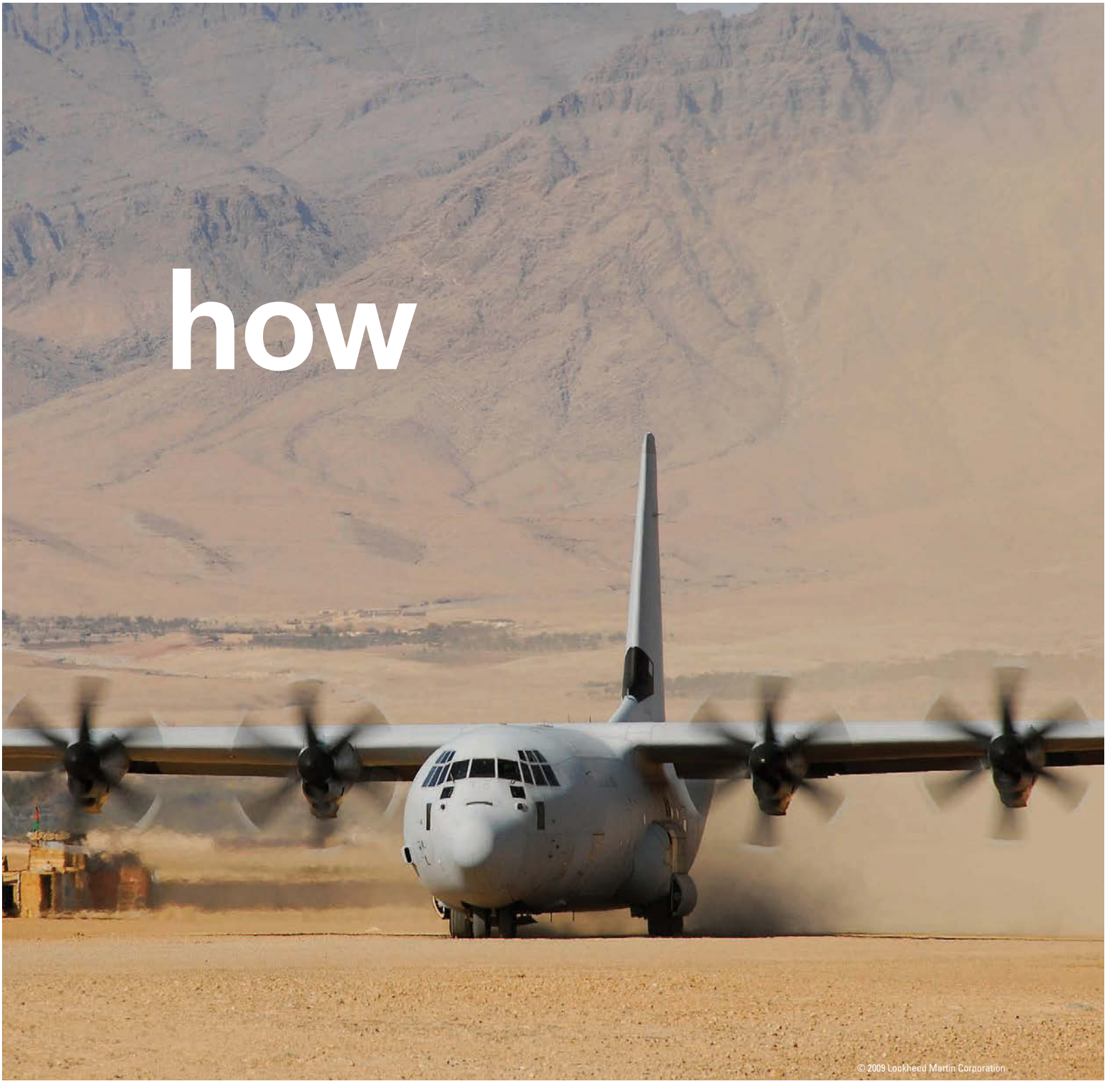
Others contend the Pentagon, in its determination to win irregular wars in Afghanistan and Iraq, neglects US conventional forces—a charge with which Gates takes what he calls "the strongest possible issue."

Unfortunately, the protean nature of the new force-planning construct resists detailed analysis—at least by the public. The QDR does not quantify the number and types of contingencies for which US forces must prepare, and thus there is no yardstick against which to measure the fielded force.

According to a Jan. 28 dispatch from InsideDefense.com, an online news service, DOD has written "a classified QDR annex," with which "the Office of the Secretary of Defense" might be able to "exercise a stronger hand" in service equipment plans. The article quotes an unnamed service official as saying, "I think it [the new QDR] denies the military departments an algebraic formula for explaining their needs."

We hope the matter of force structure does not end here. We note that Congress has mandated an assessment of the new QDR by an independent 20-member panel of military and foreign policy heavyweights. According to a Pentagon release, the group will be "assessing the QDR, its recommendations, stated and implied assumptions, and any vulnerabilities of the strategy and force structure underlying the report."

In our view, that classified annex would make an excellent place to start. ■



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Letters

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The Obama Bomber

Robert Dudney's editorial, "The Obama Bomber" *[January, p. 2],* highlights a long ongoing issue on our Air Force bomber status. For over a half-century, the debate between political administrations and current and retired Air Force leaders on developing bombers has always been at odds. There was always a budget problem as to whether we should address replacing the B-52 fleet.

I became involved with the initial research and development cadre for the B-1. We received armchair advice from [those in] Congress as to whether we could afford it, but whenever we briefed them on the amount of money going into their state and the corresponding jobs it would produce once in production, we received favorable funding for the program. Within our own Air Force operational wings, the debate on the merits of having a stick versus a wheel in the cabin brought so many opinions.

Today, we are hearing about whether to have a manned or unmanned bomber, as well as should it be conventional or a nuclear bomber. Once the "nuclear" word is spoken, flags go up, for we have yet to make the public feel comfortable about having nuclear energy. Using nuclear [weapons] as a "US umbrella over our allies" may be in our best interest, but I wonder if our allies would feel the same way. Indeed, exploratory discussions are valuable at the beginning, but once pen is put to paper, we in the Air Force should have a united agreement as to the best bomber we can deliver to meet the future threats of the world. For whatever bomber we end up with and considering the past history of the B-52, we may have this new bomber in our inventory for a very long time.

Col. Ronald L. Baker, USAF (Ret.)
Springfield, Va.

Your recent editorial on "The Obama Bomber" seems to conclude that the new weapon for global strike is a subsonic long-range bomber, probably manned, probably nuclear capable, with sophisticated equipment for reconnaissance, ultimate avionics, and extreme stealth. I believe that such an aircraft will be enormously expensive, subject to the same syndrome you accurately characterize for the F-22 and the B-2.

I believe the answer to highly responsive global strike is a conventionally armed ICBM. The Peacekeeper missile system clearly demonstrated all the technology needed except for terminal guidance of the earth-penetrating projectile(s). Such a system would have to be based on the coasts to provide for ocean splash of spent stages and to clearly separate the CICBM from the nuclear ICBM. The cost per missile precluded serious consideration of ICBMs for conventional delivery in the past, but some new factors are now extant. The most expensive parts of an ICBM were the inertial guidance and the nuclear warheads. GPS resolves the guidance cost, and conventional earth penetrators are nowhere near nuclear warhead costs.

The future mission for global strike is most likely a time urgent target, probably heavily defended, and possibly buried. An earth penetrator delivered in 30 minutes at Mach 8 would take care of that class of target. A lot of work was done on potential terminal guidance of re-entry vehicles, but the ICBM force has been such a "Lost Patrol" since SAC was stood down, that few even know what is possible in terms of accuracy.

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. (E-mail: 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

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To educate the public about the critical role of aerospace power in the defense of our nation.

To advocate aerospace power and a strong national defense.

To support the United States Air Force and the Air Force family and aerospace education.

Careful analysis might rule out a CICBM, but I believe it is wise to consider it before we attempt to build an aircraft system that has to strike the toughest targets while also doing the ISR mission. Attempting to design something in between an SR-71 and a B-2 will prove to be very costly.

Lt. Gen. Aloysius G. Casey, USAF (Ret.)
Redlands, Calif.

Combatants and Collaborators

David Wood's article "Holding Fire Over Afghanistan" claimed civilians died when a German air controller called in an air strike "on a gathering of Taliban fighters who had hijacked two fuel tanker trucks" *[January, p. 28].*

How do we know this? I have two reasons for questioning this:

1. Taliban fighters don't wear uniforms, so how do we know that any of those killed were civilians?

2. Anyone who gathers around a celebration of the hijacking of a fuel tanker is either a combatant or a collaborator.

Capt. Glenn C. Tuley, USAF (Ret.)
West Melbourne, Fla.

STRAT-X

With considerable interest, I have read and reread the article by Peter Grier in the January issue of the magazine, describing, to some extent, the STRAT-X study *["STRAT-X," p. 52].*

I found the article well written, erudite, plenty of camp verbiage and use of words to delineate the considerations pertinent to the siting and launching of missiles which it was "hoped" would deter attack from the USSR. Yet I had to look in vain for discussion of the other half of considerations which (I *hope* at least) were in the purview of the contract given the RDA.

Please correct me if I'm wrong (I admit to being opinionated, bigoted, and biased), but in the article I found no attention to the problem of "aiming point accuracy." With the present possession of our GPS capabilities, most any target on Earth can be located to amazing accuracy. As an engineer in the mid-60s with GE's DSD, I learned that the location of Moscow was some longitude and latitude—plus or minus 25 miles.

If my high school geometry still pertains ($A = pi \times r^2$), Moscow (probably) was somewhere within an area of some 2,000 square miles.

Bullet, baseball, or bomb—to likely hit a target, its location, and the expectable trajectory from where you are to where it is, need to be considered and used.

Lt. Col. James W. Dopp, USAFR (Ret.)
Cortland, N.Y.

The Light Attack Aircraft

Sometimes it's like talking to a rock: Irregular airpower is not about US capability; it's about building indigenous airpower. To paraphrase (and correct) Mr. Marcus Weisgerber's thesis in "The Light Attack Aircraft" in the January 2010 issue *[p. 56]:* The US Air Force does *not* need to re-evaluate the mix of systems needed to provide CAS and armed overwatch in irregular conflicts in the future. The US Air Force needs to have effective airpower that puts *local* forces in the lead for irregular conflicts. We're not going to see Iraqi and Afghan pilots in F-35s anytime soon.

If it's our fight, conventional or irregular, USAF airpower has shown itself more than capable of meeting the challenge, albeit at a high cost and with some resistance at the irregular end of the spectrum. However, when the conflict turns into an insurgency or irregular warfare (IW), it is essential that local forces take the lead in their own fight. To do this, local forces need airpower tailored to their needs and resources. USAF irregular airpower, including light attack, has definite utility in the fight, but that cannot be its primary mission. The primary mission for USAF in these conflicts must be to provide and demonstrate an initial capability while building local forces' capabilities with systems that fit within the local government's resources. That's a capability for budgets measured in millions, not billions, of dollars. Cessna Caravans with sensors, C-27s, and AT-6/Tucanos, not TR-1s, C-17s, and F-16s.

Light attack is only one aspect of a complete airpower package that must include lift, ISR, etc., along with a robust training and advisory element that can take a demonstrated USAF capability and develop the local force's ability to acquire, operate, and support that airpower.

Absent this key point, it is easy to see why irregular airpower requirements compete poorly for limited resources. The focus must be on developing indigenous airpower to even begin to understand the requirement.

Col. John Jogerst, USAF (Ret.)
Navarre, Fla.

As a three-tour close air support vet of the Southeast Asia war, I was excited to read about the interest in a cheap, light attack, turboprop fighter.

The need: easy to maintain, extremely fuel efficient, long on-station time, and, oh, did I mention cheap? (Does that sound like an AT-6B, which we already operate—and is a US-built airplane?)

Then you go on to read what the procurement guys want: global positioning links, laser guided munitions, terrain

scanning capability, jet engines, eventually, two jet engines, a forward-firing Gatling gun, an electro-optical-infrared system, etc., etc. In other words: another F-16!

So, your concept of "a bunch of young lieutenants and captains who are out there [fighting] every day, working with the ground forces ... and getting really, really good at it" goes down the technology tubes.

Naw, the Army would really hate that.

Lt. Col. Jack Doub,
USAF (Ret.)
Valdosta, Ga.

A Habit of Heroism

As a sergeant, E-4, of the late '60s era, I felt immense pride reading about the heroism of Duane Hackney *["A Habit of Heroism," January, p. 63].* To have been a part of USAF during his service serves to remind me of the selfless, dedicated airmen with whom I served.

Thanks for all you do for our active duty personnel and veterans.

Julian C. Steiner
Bell City, Mo.

I was honored to be in the 1967 group of Outstanding Airmen of the Year and sat next to Duane Hackney at the AFA awards dinner in Atlanta. He was an impressive and humble young airman, but had one fear. As dinner ended, he said to me that he sure wanted a cigarette but that his mother was in the audience (sitting with my wife) and would kill him if she saw him smoke. He was an honor to the uniform.

CMSgt. Al Zarb,
USAF (Ret.)
Enumclaw, Wash.

Silver Bullet Blunder

I'm a retired USAF master sergeant and a World War II history enthusiast. Thanks for a great article on the "blunders" between the Japanese Army Air Force and Navy Air Force in your December 2009 issue *["Silver Bullet Blunder," p. 68].* It makes you wonder how many more American lives would have been lost if they had worked together. I enjoyed the article and learned something also.

MSgt. Jerry Felder,
USAF (Ret.)
Gulfport, Miss.

I found the article "Silver Bullet Blunder" to show an interesting coincidence—whether the author is making an oblique point or just had an accidental insight, the analysis is relevant. He said, "The Japanese leaders now believed that a major war could be won by a small number of superior aircraft flown by superb crews."

I think this same fallacious thinking is prevalent today in Secretary Robert M. Gates' decision to limit F-22 production. While the "boots on the ground" thinkers might draw additional ammo from the comment, it bodes ill for those who would place all their bets on one capability of limited capacity, no matter how good those things are.

The rest of the article adds insight into the current psychology of our leaders as well and is recommended reading with these parallels in mind.

Lt. Col. Thomas M. Hargrove,
USAF (Ret.)
Grapeview, Wash.

More on Speed

I would like to explain to retired Lt. Col. Richard F. Colarco the advantages of spending money on combat speed (supersonic) since the F-100 was introduced *["Letters: The Sixth Generation Fighter, December, p. 4].* I'm most impressed that he actually recognizes his ignorance of the advantages of speed in combat aircraft as well as his demonstrated ignorance of the history of combat engagements involving supersonic speed. I'm relieved that he doesn't appear to ever have been in a position to require the advantages of speed in a real life-and-death combat situation. There's nothing wrong with ignorance, of course, as long as you aren't placed in a position that actually requires the knowledge of modern air combat tactics like setting the requirements for modern fighters of the future. I could quote some statements by some current DOD leadership to highlight the horror of reasoning in ignorance, but I'll pass that up as an apparent lost cause in the current military budget crisis.

One of the phrases I learned early in my career of flying fighter aircraft is "speed is life." This phrase means different things to different missions, but it is true for a variety of missions and situations (not all). I can assure Lieutenant Colonel Colarco that the requirements planners don't sit around and wonder what would be fun for pilots, so "let's make it go really fast."

The dilemma comes when actually explaining modern Western (US) tactics. If I could explain it in *Air Force* Magazine, then potential adversaries would have access to the tactics as well. It's kind of like telling al Qaeda that we're listening to them and giving the details how we're doing it in the *New York Times.* In the perverse world of modern journalism, it probably gave the reporter's career a boost, but it also has the deadly consequence of the enemy figuring a way around our tactics. If Colarco and I both got in F-15 simulators and started 50 miles apart with the same parameters (altitude, speed, missile inventory, etc.) I can guarantee that he would be a "mort" every time if he stayed subsonic. Eventually after many times of taking multiple missiles in the cranium (remember we're in simulators), he might figure out a few things that help him survive a little longer (including supersonic speed). But there's a world of difference between surviving a little longer and establishing air dominance (F-22 with the correct tactics). There aren't any tactics I know of that say the F-22 will supercruise until the plane runs out of gas and not make it to the fight. That tactic would come from reasoning in ignorance. Fast acceleration and a high supersonic top end is a wonderful thing to have in your bag of tricks, and a severe disadvantage without. I know it's a stretch, but you'll have to take my word for it that the US became the most advanced Air Force in the world by studying the art of air combat and learning (and applying) a few things over the years.

Col. Jim Drake,
USAF (Ret.)
Kaneohe, Hawaii

Letters

Retired Gen. John Michael Loh says it like it is *["Letters: Gates and the B-2," January, p. 4].* We can all hope there is someone in that current "can of worms" called the Capitol who is willing to stand up and be heard on what USAF (not Gates) says and knows what is best.

Gates is as wrong with his current opinions as he was in firing Gen. T. Michael Moseley.

It is apparent I am thinking like a fighter pilot. I was in 1944 and for a while after that.

Lt. Col. Stanley E. Stepnitz,
USAF (Ret.)
Decatur, Mich.

Classics

The last page of your issue every month, "Airpower Classics," which features a new noteworthy airplane is so informative and interesting. The Hawker Hurricane featured in December is a worthy subject. The specifics about the armament may not be totally accurate since the British aircraft used .303 machine guns and you list it as sometimes having .50 caliber machine guns. Otherwise, a great layout on that page.

Richard Domingue
Tucson, Ariz.

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Washington Watch

By John A. Tirpak, Executive Editor

The adequate Air Force; Grappling with F-35 problems ....

"Calibrated Ambition"

To handle multiplying missions without more people, the Air Force won't be able to do all its assigned tasks as comprehensively as it once did, and will be aiming instead for simple sufficiency in areas where it's been accustomed to dominance.

That was the assessment from Air Force Chief of Staff Gen. Norton A. Schwartz, in an interview shortly after the Fiscal 2011 defense budget was unveiled. The Air Force, Schwartz said, will remain fixed at 332,000 people, but with increasing demands on its manpower in remotely piloted aircraft, irregular warfare, and other emerging missions, it won't have the money to pursue full-up capabilities as it always has.

"We will not grow because we can't afford it," Schwartz said. Manpower is the single largest expense facing the Air Force, and the growth of pay and benefits expenses is eating deep into hardware budgets.

"If we grow people, that will force out content in our programming, and we're just not going to do that," Schwartz said.

The content, though, is going to be scaled back to live within the service's limited means. The new long-range strike system, postponed from 2018 to "the mid-2020s," Schwartz said, won't be survivable against the toughest air defenses, because the Air Force can't afford to make it so. New satellites will be smaller and cheaper, with less capability. The F-35, which the Air Force wanted to buy at 110 a year or better to address its aging fighter problem, will only be bought at 80 per year. No strategic airlifters will be bought for more than a decade.

Speaking a few days after the first flight of Russia's fifth generation PAK FA fighter, which bears a close resemblance to USAF's F-22, Schwartz said the event "clearly reinforces the notion that we need to press on with the F-35 ... in sufficient numbers," and that maintaining "a force of 4.5 generation fighters is not where the Air Force wants to be in the medium term."

Schwartz declined to answer directly whether the progress of the PAK FA demands reconsideration of the F-22—curtailed last year at 187 aircraft—reiterating that USAF should concentrate on the F-35, which has less power and agility. Asked if the F-35 will be sufficient to maintain air dominance, he said, "Not forever. But ... for the near term, yes."

The "theme" of this reshaped Air Force, Schwartz said, can be summed up as "calibrated ambition"—reaching for only those systems that are urgently needed, and with high confidence of near-term success. Systems that cost too much or bear too much risk won't even get out of the gate.

On the new bomber, for example, "we will probably not invent totally new things," said Schwartz. "What this will be is integration, ... manufacturing process improvement, and ... making sure that we can deliver what we promise."

Nonperforming programs "are going to get killed," he asserted, and "nonperforming program managers will probably find other work." Those who are successful "are going to be heroes," he added.

Only those systems deemed most relevant to the most-likely missions will be pursued, and only if they have application to many kinds of missions.

Systems asked to do too many missions often collapse from what is called mission creep, but Schwartz pledged that the Air Force will exercise extreme discipline in setting realistic initial requirements and sticking to them, without changes to a program's baseline.

USAF photo

Schwartz foresees sufficiency.

The long-range strike system will get going in 2013, Schwartz forecast, although he cautioned "that's not a signed, sealed, and delivered arrangement." It will be part of a portfolio of systems including standoff weapons and possible penetrating remotely piloted aircraft, as well as a Prompt Global Strike system able to hit targets half a world away in a few minutes.

The new bomber will follow the block upgrade approach, and Schwartz said the "A" model "may not do everything onboard to accomplish the mission," but will rely on other aircraft, offboard sensors, and standoff munitions.

"My hunch is that long-range strike systems will become more self-sufficient over time," he said. When asked if the initial version would be able to penetrate the toughest enemy airspace by itself, he answered, "At the extreme end of the threat, probably not." However, in "something less than an extreme threat, it will be very capable." He said that ambition for the system will have to be confined largely to the existing, deliverable status of technology, and "not trying to stretch ourselves ... too much."

With regard to the bomber, "the 'B' model will incorporate new things, no doubt. But I think the focus here is things that are relatively mature technologies, that we can incorporate and integrate and readily manufacture."

In most systems, the Air Force will be "less insistent on doing it all by ourselves, or all on a single platform."

As missions expand but the manpower doesn't, Schwartz said, USAF will have to be "ingenious" in figuring out ways to do more with fewer people. He expects a big push in automation to reduce, for example, the manpower requirements of remotely piloted aircraft. Each one demands 140 people to launch and fly, a number that Schwartz said is not sustainable.

Schwartz said that in space, the Air Force won't be buying $2 billion satellites anymore, and will instead rely increasingly on commercial providers of visual and radar imagery.

Schwartz said he agrees with Air Force Space Command chief Gen. C. Robert Kehler that "for military or national security space, at least on the DOD side, we need to approach this with less complex satellites that presumably would cost

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less and maybe be not quite as versatile, but would satisfy military requirements."

He doesn't doubt there will be exceptions to the rule "in those cases where there's a requirement for exquisite capability."

The combat search and rescue helicopter mission is exemplary of the Air Force's new approach, and Schwartz acknowledged that the service has abandoned the effort to buy a CSAR-X helicopter.

The existing HH-60 Pave Hawk helicopters do the CSAR mission reasonably well, and recapitalizing the existing worn-out aircraft with a "modern generation descendant" of the same airframe will provide about 80 percent of the capability USAF wanted from a new machine. That'll have to be enough, because that's all the Air Force can afford.

Likewise, whenever the Air Force can rely on existing production lines, such as the C-130J, to provide a common basic aircraft for missions as diverse as weather and gunships, it will do so, because it must take advantage of economies of scale, Schwartz said.

The Air Force doesn't need any more C-17s, he asserted, and likely won't pursue a "stretched" version, given the performance so far of the re-engined and upgraded C-5M. However, he said the C-17 fleet will "need to be tidied up" with structural and other improvements following its heavy wartime use.

In the face of these scaled-back acquisition plans, is Schwartz concerned about the long-term health of industrial base?

"In some [cases], we will have to pay close attention," he said. "In the aircraft area, the low observable [stealth] industrial base is certainly a consideration," and that concern underlies a $1.7 billion five-year effort to keep stealth technologies developing. He's also worried about solid rocket motor production, especially if NASA's need for launch vehicles declines, as seems likely with the demise of the moon program.

Schwartz said the Air Force must confront the fact that as the nation runs up "trillion dollar deficits," the service will have to get by with fewer resources.

Throttling Back the F-35

Defense Secretary Robert M. Gates fired the F-35 program manager, took away $614 million in award fees from the contractor, and slowed the program in early February, saying it had gotten off track and was too important not to get right. He also elevated the program manager's job from a two-star to a three-star general officer.

Speaking at a press conference to unveil the Fiscal 2011 budget, Gates said his spending plan of $10.7 billion to buy 42 F-35s represented "a strategy to stabilize its cost and schedule." The plan had been to buy more F-35s, but testing delays and alarms raised by various cost assessment groups caused him to adopt a slower approach, he said.

The F-35 faces "no insurmountable problems," but is a "critically important" program, he asserted.

"Possibly more" of the fighters could be bought, "depending on contractor performance," Gates noted. Program executives at Lockheed Martin, the F-35 prime contractor, later said they've been told the F-35 will move to a "buy to budget" arrangement, wherein the services can buy more F-35s within a fixed budget if costs come down, and they could still receive the docked funding if cost and schedule improve. Overall funding, however, will not increase, they said.

Gates removed Marine Corps Maj. Gen. David R. Heinz, the Lightning II stealth fighter program manager, saying, "One cannot absorb the additional costs that we have in this program, and the delays, without people being held accountable."

He visited the F-35 plant in Fort Worth, Tex., late last summer and proclaimed himself pleased with the fighter's progress. However, after the estimating teams looked the program over and Pentagon acquisition, technology, and logistics chief Ashton B. Carter "immersed himself" in the program over several months, "it was clear that there were more problems than we were aware of when I visited Fort Worth," Gates said.

Lockheed Martin photo

Slower pace for the F-35.

"I think that the restructuring program that Dr. Carter has put in place will work. It is realistic; the cost estimates are now in accord with what the joint estimating teams are predicting, rather than what the program is predicting."

Air Force Chief of Staff Gen. Norton Schwartz, speaking to reporters a week before the budget announcement, said the F-35 move was being made to "reduce concurrency, to lengthen the period associated with testing, to increase the number of test assets, and make the production rate somewhat less ambitious." Schwartz said the Air Force was still committed to the F-35 and that the program delays wouldn't affect his plans to retire early some 250 legacy fighters from the USAF fleet.

Carter and others had concluded "that the path we were on was too aggressive," Schwartz said.

Gates has not tolerated disagreements with his thinking on major programs, having fired other generals and leaders for taking contrary positions. He fired a former Chief of Staff and Secretary of the Air Force partly as a result of disagreements about the F-22, for example.

Heinz, who had been the F-35 program manager just nine months, had expressed the opinion that the F-35 program should carry two engines into production to preserve competition. Gates has tried to terminate the second F-35 engine in each of his budget proposals, saying it is unnecessary. Congress has rebuffed him each time.

One of the arguments against halting the F-22 last year was that the F-35 might run into significant problems, but Gates cursorily dismissed any notion that the Raptor's termination should be rethought.

"I don't think there's any need to go on with the F-22," he said flatly.

If programs break their cost and schedule by too much, they incur a "Nunn-McCurdy breach," so-called after the law setting the limits. Such a breach demands a program be terminated, or, if it is too critical to cancel, be restructured and scaled back to live within its funding. Asked if the F-35 will incur a Nunn-McCurdy breach, Gates said, "I'm not sure."

Lockheed Martin program executives, in a telecon with reporters the next day, said a Nunn-McCurdy breach would be the government's "call" to make. Lockheed officials said they don't see it happening, but noted that they don't have control over a program's total costs. Personnel, military construction, and government-furnished equipment also figure in program cost.

They noted that the Pentagon would issue its revised selected acquisition reports—costs for its various programs—this month, and if a breach were incurred, it would be announced with the SAR. ■

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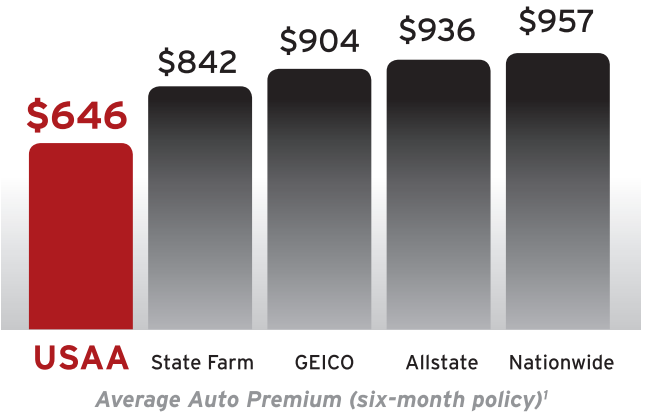

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Air Force World

By **Michael Sirak,** Senior Editor, with **Marc Schanz,** Associate Editor

Airmen Killed in Afghanistan

TSgt. Adam K. Ginett, 29, of Knightdale, N.C., and SrA. Bradley R. Smith, 24, of Troy, Ill., died in separate incidents in January in Afghanistan while supporting combat operations.

Ginett died Jan. 19 near Kandahar Airfield of wounds he suffered from an improvised explosive device. He was an explosive ordnance disposal technician who had deployed from the 31st Civil Engineer Squadron at Aviano AB, Italy.

Smith was killed on Jan. 3 near Kandahar when an IED exploded near his vehicle, the *St. Louis Post-Dispatch* reported Jan. 11. He was assigned to the 10th Air Support Operations Squadron, an Air Force tactical air control party unit stationed at Ft. Riley, Kan., that operates with elements of the Army's 1st Infantry Division.

Airman's Remains Recovered in Haiti

The remains of Maj. Kenneth Bourland, 37, of Birmingham, Ala., were found Feb. 7 at the Hotel Montana in Port-au-Prince, Haiti, where he had been staying on official business.

Borland was part of a five-member delegation from US Southern Command, including US Army Lt. Gen. P. K. Keen, SOUTHCOM deputy commander, that had traveled to Haiti on Jan. 12, the day the magnitude 7.0 earthquake struck the Caribbean nation, collapsing the hotel among the widespread damage.

The four other members of the group survived. Air Force officials said Bourland, a career helicopter pilot, had been selected for promotion to lieutenant colonel in June 2009, and action is pending on a posthumous promotion.

USAF Studies Huey Replacement

The Air Force issued a request for information in mid-December, seeking industry input on the in-production helicopter designs well-suited to be the Common Vertical Lift Support Platform, the much-desired replacement to the service's Vietnam War-era UH-1N Huey helicopters.

Per the solicitation, Air Force officials anticipate acquiring up to 93 new platforms to supplant the current fleet of 62 Hueys, which protect the nation's ICBM fields, shuttle VIPs, and rescue civilians. USAF wants the first operational unit of six new helicopters ready for use by September 2015.

Among its attributes, CVLSP should be capable of: carrying nine combat-equipped troops and four crew members, maintaining at least 135 knots true air speed, flying 259 miles unrefueled, and surviving against small-arms fire.

Boeing Starts Building A-10 Wings

Boeing announced Jan. 18 that it had started work on the first replacement wing set for the A-10 Thunderbolt II ground-attack aircraft at its production facility in Macon, Ga. The company expects to deliver this first set in September for installation by 2011.

The Air Force contracted Boeing in 2007 to supply some 242 wing sets to replace the wings on so-called thin-skinned A-10s that were starting to experience cracking. Boeing will deliver the sets in four parts—three wing sections and an installation kit—to Hill AFB, Utah, where Ogden Air Logistics Center technicians will install the wings.

Meanwhile, as an interim fix to ensure safety of flight with the thin-skinned A-10s, Air Force technicians are adding steel straps and stronger fittings to some of these aircraft.

Mullen Outlines Priorities

Adm. Michael G. Mullen, Chairman of the Joint Chiefs of Staff, on Dec. 21 signed out his new Joint Guidance for 2009-10.

The new guidance focuses on three priorities: defending US interests in the Middle East and South Central Asia; maintaining the health of the US military force (people and systems); and balancing global strategic risk. It closely follows the previous guidance, except for the addition of South Central Asia to the defending-US-interests priority.

Mullen emphasized "strengthening professional relationships with our regional counterparts" in the Middle East and South Central Asia as "essential to addressing our shared interests,"

USAF photo by A1C Brett Clashman

and he advocated "finding the right size, shape, and posture to globally detect, deter, and defeat current and future threats."

Family Center Opens at Dover

The Air Force on Jan. 6 opened the Center for Families of the Fallen on the grounds of Dover AFB, Del., for family members who travel to the base to witness the return of their fallen loved ones' remains.

Dover is the site of the sole US military mortuary in the continental US where military personnel who die overseas are returned home. The new center, a 6,000-square-foot facility, created by renovating a former base convenience store, is designed to provide a comfortable waiting and grieving area for the families.

"This center is emblematic of our genuine gratitude to the families of our fallen service members," said Air Force Chief of Staff Gen. Norton A. Schwartz at the dedication ceremony. Construction began in November 2009 and was completed within 60 days. The center replaced a smaller facility that had served in this role.

Extended BMT Proving Successful

Air Force Secretary Michael B. Donley toured the Basic Expeditionary Airman Skills and Training complex at Lackland AFB, Tex., and presided over the basic

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As an A-10 lands nearby, F-22s on the flight line at Nellis AFB, Nev., prepare to launch for a Red Flag sortie. Raptors from Elmendorf AFB, Alaska, and Holloman AFB, N.M., flew in the latest Red Flag, a highly realistic training exercise that plays out over a 15,000-square-mile range in southern Nevada. This Red Flag event drew nearly 1,300 uniformed participants, some 80 aircraft, and 19 units from the United States and Britain.

Senior Staff Changes

RETIREMENTS: Lt. Gen. Jack L. **Rives.**

PROMOTIONS: To Lieutenant General: Richard C. **Harding. To Major General:** Gerard A. **Caron.**

NOMINATION: To be Major General: Byron C. **Hepburn.**

CHANGES: Maj. Gen. Gerard A. **Caron,** from Dep. Command Surgeon, AETC, Randolph AFB, Tex., to Cmdr., 79th Medical Wg., AFDW, JB Andrews, Md. ... Brig. Gen. Russell J. **Handy,** from Cmdr., 57th Wg., ACC, Nellis AFB, Nev., to Dir., Air Component Coordination Element, US Forces-Iraq, Baghdad, Iraq ... Lt. Gen. Richard C. **Harding,** from Cmdr., AF Legal Ops. Agency, Bolling AFB, D.C., to JAG, USAF, Pentagon ... Brig. Gen. Paul T. **Johnson,** from Cmdr., 355th FW, ACC, Davis-Monthan AFB, Ariz., to Cmdr., 451st Air Expeditionary Wg., ACC, Kandahar Airfield, Afghanistan ... Brig. Gen. Michael A. **Keltz,** from Vice Cmdr., 7th AF, PACAF, Osan AB, South Korea, to Asst. Dir., Ops., Plans, Prgms., & Rqmts., PACAF, Hickam AFB, Hawaii ... Brig. Gen. Terrence J. **O'Shaughnessy,** from Vice Cmdr., 13th AF, PACAF, Hickam AFB, Hawaii, to Cmdr., 57th Wg., ACC, Nellis AFB, Nev. ... Brig. Gen. Robert P. **Otto,** from Cmdr., 9th Recon Wg., ACC, Beale AFB, Calif., to Dir., ISR Capabilities, DCS, ISR, USAF, Pentagon ... Maj. Gen. Joseph **Reynes Jr.,** from Dir., Air Component Coordination Element, US Forces-Iraq, Baghdad, Iraq, to Dir. for Jt. Experimentation, JFCOM, Norfolk, Va. ... Brig. Gen. John F. **Thompson,** from Cmdr., 303rd Aeronautical Sys. Wg., Wright-Patterson AFB, Ohio, to PEO, Strat. Sys., AF Nuclear Weapons Ctr., AFMC, Kirtland AFB, N.M.

SENIOR EXECUTIVE SERVICE RETIREMENT: Brendan **Godfrey.**

SES CHANGES: Devin L. **Cate,** to Dep. Dir., AF Rapid Capab. Office, Office of the Admin. Asst. to the SECAF, Pentagon ... Frederica **Darema,** to Dir., Mathematics, Info. & Life Sciences, AF Office of Scientific Research, AFMC, Arlington, Va. ... Gregory L. **Garcia,** to Dep. Dir., Intl. & Rqmts., AFMC, Wright-Patterson AFB, Ohio ... Stephanie Paige **Hinkle-Bowles,** to Dep. Dir., Force Mgmt. Policy, DCS, Manpower, Personnel, & Svcs., USAF, Pentagon ... Robert S. **Jack II,** to Dir., Identity Assurance & Public Key Infrastructure, Office of the Asst. SECDEF, Networks & Integration/DOD Chief Info. Officer, Pentagon ... William C. **Redmond,** to Dir. of Staff, AFRC, Robins AFB, Ga. ... Scott **Reynolds,** to Dir., Global Combat Spt., DCS, Log., Instln., & Mission Spt., USAF, Pentagon ... Thomas P. **Russell,** to Dir., AF Office of Scientific Research, AFMC, Arlington, Va. ... John E. **White,** to Dir. of Engineering & Tech. Mgmt., ASC, AFMC, Wright-Patterson AFB, Ohio. ■

military training graduation ceremony on Jan. 8.

"This is the first-year anniversary of the extension of BMT from 6.5 to 8.5 weeks," Donley told the fresh crop of graduates. He said those extra two weeks, which were added to incorporate instruction in skills that better prepare airmen for the current fights in Afghanistan and Iraq, are making their mark.

"I think it has succeeded," he said of the extension. But the service needs to continue ensuring that this training stays relevant to current threats, such as dealing with improvised explosive devices, said Donley. "This is exactly the type of training we need to give our airmen from the very beginning," he said.

Public Meetings Review F-35 Basing

The Air Force in mid-January began a set of public scoping meetings to discuss the potential beddown of combat-ready F-35 Lightning II strike fighter units at one or more of the six candidate bases: Hill AFB, Utah; Mountain Home AFB, Idaho; Shaw AFB, S.C.; Burlington Arpt., Vt.; Jacksonville Arpt., Fla.; and McEntire JNGB, S.C.

These meetings allowed citizens from the communities around these installations to express their views on the basing as part of the environmental impact analyses required by US law before the Air Force may render any final basing decisions, which are expected in early 2011. The meetings were scheduled to conclude in mid-February.

Back in October 2009, the Air Force announced those six active duty bases and Air National Guard installations as candidates to host operational F-35s, along with five additional prospective sites for F-35 training: Eglin AFB, Fla.; Holloman AFB, N.M.; Luke AFB, Ariz.; and the ANG stations in Boise, Idaho, and Tucson, Ariz.

Black Sheep Get First F-22

The 8th Fighter Squadron at Holloman AFB, N.M., in December took delivery of the first of its 20 planned F-22 Raptor stealth fighters. This aircraft, the unit's new flagship, arrived Dec. 21. It was formerly assigned to the 1st Fighter Wing at Langley AFB, Va.

Holloman's 49th Fighter Wing is scheduled to receive 40 F-22s. Its 7th Fighter Squadron, sister unit to the 8th, was near its full complement of 20 as of late January. The 8th, known as the "Black Sheep," is expected to have its 20 F-22s in place by around the end of 2010.

The unit had been without aircraft since April 2008, when it retired its F-117 Nighthawk stealth aircraft. Holloman is also under consideration to host F-35 Lightning II strike fighters. Air Force officials have

USAF photo by SrA. Zachary Wolf

That's Smokin': *An F-22 powers over Langley AFB, Va. It was flown by Maj. Dave Skalicky, commander of the Raptor Aerial Demonstration Team. The 14-member team travels worldwide to showcase the aircraft's exceptional maneuverability.*

said if F-35s end up there, they might relocate the F-22s.

Joint Base Initiatives Advance

Air Force officials on Jan. 7 activated the 633rd Air Base Wing at Langley AFB, Va., the host unit that will oversee operations of JB Langley, which stood up at the end of January.

The new joint base, consolidating the base support functions of Langley and the Army's nearby Ft. Eustis under one administrative roof, is one of 12 joint bases being created as a result of BRAC 2005. Like all future joint bases, the goal is to reap cost savings by eliminating redundant base support services for nearby installations.

On Jan. 8, Air Mobility Command officials activated the 628th Air Base Wing at Charleston AFB, S.C. It will serve as the host unit for JB Charleston, the union of Charleston Air Force Base and the nearby Naval Weapons Station. Like JB Langley, its formal merger occurred at the end of January.

Pilot Error Caused F-16 Collision

Air Combat Command investigators found that an F-16 pilot's failure to reduce air speed and execute proper maneuvers when rejoining his flight lead during a nighttime training mission over the Atlantic Ocean last October led to a midair collision that killed the pilot and damaged the flight leader's aircraft.

Capt. Nicholas Giglio lost his life when the F-16s collided, ACC said Jan. 11 in releasing the findings of its accident investigation board. His F-16 impacted the water and was destroyed. Capt. Lee Bryant, the flight lead, was uninjured and managed to land his moderately damaged aircraft safely at Charleston AFB, S.C.

Giglio also experienced a radar failure that diverted his attention, according to ACC. Both F-16s were from the 77th Fighter Squadron at Shaw AFB, S.C. The collision occurred 145 miles southeast of the base.

C-130J Makes Africa Debut

The 86th Airlift Wing at Ramstein AB, Germany, in December concluded its first mission to Africa when using one of its new C-130J Super Hercules transport aircraft.

The wing's 37th Airlift Squadron on Dec. 19 completed the mission, carrying 17 US troops from Mali to Ramstein on a C-130J after they had helped train Malian forces. The flight was in support of 17th Air Force (Air Forces Africa), also headquartered at Ramstein.

The 37th AS is building a force of 14 C-130Js, which are replacing C-130Es that the unit flew for decades. As of late January, 10 of the 14 C-130Js were in place, with the final four expected to arrive by later this year. Compared to earlier C-130 variants, the J model has features such as greater range and more payload capacity.

US Repositioning GPS Satellites to Bolster Coverage

US Strategic Command announced Jan. 7 that it had initiated an effort with Air Force Space Command to improve the signal coverage provided by Global Positioning System navigation satellites to warfighters in places such as Afghanistan.

"Terrain in geographically challenging areas can degrade complete coverage of GPS signals," stated the command in explaining the decision.

Accordingly, STRATCOM said GPS satellites would be repositioned, essentially spreading out the constellation so that the number of satellites in view from any single point on Earth would increase, potentially enhancing the accuracy of GPS receivers.

The plan replaces the existing strategy of placing new satellites close to older ones to mitigate loss of coverage if one satellite goes down.

It is expected to take about 24 months to implement as the satellites are repositioned based on constellation health.

"The beneficial impact to all GPS users, including civilian users, will be slowly realized during that time period," stated the command.

The new strategy takes advantage of the current size of the GPS constellation, which STRATCOM said is the largest in GPS history. There are more than 30 satellites on orbit.

STRATCOM said this initiative is just one of the efforts with the Air Force to enhance GPS capability continually.

Along those lines, the Air Force on Jan. 11 transitioned to a new version of the software used with the GPS ground control element at Schriever AFB, Colo.

This new software build includes telemetry, tracking, and command functions for the new GPS Block IIF satellites, the first of which is expected to be on orbit in mid-2010.

It also features robust security improvements, such as "over-the-air" distribution of encryption keys to properly equipped military users, stated the Space and Missile Systems Center in a Jan. 7 release.

45th Fighter Squadron Reactivated

Air Force Reserve Command officials on Jan. 7 formally reactivated the 45th Fighter Squadron, an A-10 Thunderbolt II training unit, at Davis-Monthan AFB, Ariz. The unit last flew A-10 ground-attack aircraft before its deactivation in 1994.

The resurrected squadron, which falls administratively under the 917th Wing at Barksdale AFB, La., forms a classic associate arrangement with Davis-Monthan's active duty 355th Fighter Wing to train new, upgrading, and returning A-10 pilots.

The Air Force in 2008 announced its intent to bring back the 45th FS, which traces its roots to the 45th Pursuit Squadron, activated in Hawaii in 1940. The 917th Wing also has the 47th FS, a stand-alone A-10 training unit at Barksdale.

AMP Developmental Testing Done

The Air Force in mid-December concluded the development test and evaluation phase of the C-130 Avionics Modernization Program under which the service is adding modern cockpit displays and communication and navigation systems to 221 C-130H-model transport aircraft.

According to a Dec. 22 release from the 412th Test Support Squadron at

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USAF photo by SSgt. Angelita Lawrence

A Room With a View: ***TSgt. Kevin Owen keeps watch from the ramp of a C-17 Globemaster III over the mountains of Afghanistan. He and crew members from the 816th Expeditionary Airlift Squadron had just delivered a load of container delivery system bundles to a base in Afghanistan as part of a combat resupply mission on Feb. 2.***

Edwards AFB, Calif., the three-year effort tallied 295 test missions, including globe-spanning expeditions, and more than 1,000 flight hours. The first AMP test aircraft flew in September 2006.

With the AMP upgrades, these C-130 aircraft are expected to remain viable for decades and be capable of flying safely in congested international airspace.

C-5 RERP Ramps Up

Lockheed Martin announced on Jan. 11 that it had received the next funding increment to continue modernizing a portion of the C-5 Galaxy transport fleet with new engines and reliability improvements.

The $344.3 million infusion covers work on 15 aircraft during the low-rate production phase of the C-5 Reliability Enhancement and Re-engining Program. While all 111 C-5s in the fleet are getting state-of-the-art avionics under a separate modernization project, only 52 C-5s are slated to receive the RERP improvements.

A C-5 with both sets of new gear is designated a C-5M Super Galaxy. Already, the Air Force has three C-5Ms, all used as test aircraft. The next C-5M is expected to arrive in the fleet come September, said Lockheed.

Spangdahlem Retains Importance

Gen. Roger A. Brady, outgoing US Air Forces in Europe commander, told airmen of the 52nd Fighter Wing at Spangdahlem AB, Germany, on Jan. 8 that the base will continue to be an important fighter hub in Europe as well as a site for supporting air mobility missions even after the planned retirement of 18 of the wing's 42 F-16s.

"We have some capability here that we don't have other places," explained Brady, who is retiring after leading USAFE since January 2008. Gen. (sel.) Mark A. Welsh III has been confirmed by the Senate to replace him.

Spangdahlem's fighter drawdown will essentially strip the base of one of its two F-16 squadrons and about 450 manpower authorizations. It is part of the broader Air Force plan to phase out up to 254 legacy fighters across the fleet in Fiscal 2010 to free up funds for fighter modernization. The 52nd Fighter Wing also has one A-10 squadron.

Singapore F-16 Training To Arizona

Sen. John McCain (R-Ariz.) announced Jan. 7 that the government of Singapore has decided to train its F-16 pilots with the Arizona Air National Guard's 162nd Fighter Wing at Tucson Arpt, Ariz.

"This decision will bring an additional $60 million into Tucson's economy," wrote McCain. He added that it was also a vote of confidence as the Tucson Air Guard unit vies to be selected to operate F-35 Lightning II strike fighters.

The Ohio ANG's 178th Fighter Wing at Springfield-Beckley Airport learned Jan. 4 it would not get the new contract, reported the *Springfield News-Sun* on the following day. The unit is losing its F-16s under BRAC 2005. It expects to wrap up its training mission for Dutch F-16 pilots this fall. As of late January, it had not been assigned a new mission.

SBIRS Reviews Completed

Air Force officials on Dec. 29 announced the successful completion of critical design reviews for the sensor payloads that will reside on the next batch of Lockheed Martin-built Space Based Infrared System satellites, which are designed to warn of ballistic missile launches.

This group encompasses the payloads for the next two geosynchronous satellites in the SBIRS series, GEO-3, and GEO-4, and the payloads dubbed HEO-3 and HEO-4 that will reside on classified intelligence spacecraft.

"Payload CDR culminates 21 months of effort replacing obsolete parts and implementing lessons learned from our first two GEO and HEO payloads," said

The War on Terrorism

Operation Enduring Freedom—Afghanistan

Casualties

By Feb. 11, a total of 973 Americans had died in Operation Enduring Freedom. The total includes 971 troops and two Department of Defense civilians. Of these deaths, 702 were killed in action with the enemy, while 271 died in noncombat incidents.

There have been 4,923 troops wounded in action during OEF. This number includes 2,067 who were wounded and returned to duty within 72 hours and 2,856 who were unable to return to duty quickly.

First MC-12 Arrives in Afghanistan

The first Air Force MC-12W intelligence-surveillance-reconnaissance aircraft destined for operations in Afghanistan arrived Dec. 27 at Bagram Airfield. That same day, the 4th Expeditionary Reconnaissance Squadron stood up at Bagram to operate these twin-engine turboprop aircraft.

"Knowledge is power and that is what we provide," said Lt. Col. Douglas Lee, the new unit's commander.

The MC-12 provides real-time full-motion video to ground troops and also collects signals intelligence. By late summer, the Air Force expects to have 24 MC-12s operating in Afghanistan. Six MC-12s already operate in Iraq out of Joint Base Balad.

Air Guardsmen Deploy to Afghanistan With A-10Cs

Air Guardsmen from Arkansas' 188th Fighter Wing and Maryland's 175th Wing arrived Jan. 11-13 at Kandahar Airfield, Afghanistan, with their A-10C ground-attack aircraft to form the 104th Expeditionary Fighter Squadron that will provide close air support to coalition troops in Afghanistan for several months.

These airmen relieved members of the 354th EFS there who returned to Davis-Monthan AFB, Ariz., after flying more than 2,500 sorties over six months at Kandahar.

For the airmen of the 188th FW, it was the first deployment with A-10s.

Operation Iraqi Freedom—Iraq

Casualties

By Feb. 11, a total of 4,378 Americans had died in Operation Iraqi Freedom. The total includes 4,365 troops and 13 Department of Defense civilians. Of these deaths, 3,478 were killed in action with the enemy, while 900 died in noncombat incidents.

There have been 31,648 troops wounded in action during OIF. This number includes 17,730 who were wounded and returned to duty within 72 hours and 13,918 who were unable to return to duty quickly.

US Forces-Iraq Stands Up

Activation of US Forces-Iraq, the new single headquarters organization for all US military forces in Iraq, took place Jan. 1 at Camp Victory, Iraq. It replaced organizations including Multinational Force-Iraq and Multinational Corps-Iraq that were inactivated at the same ceremony.

Army Gen. Raymond T. Odierno, who led MNF-I, now commands USF-I. Army Gen. David H. Petraeus, head of US Central Command, said at the ceremony the new command "represents another important milestone in the continued drawdown of American forces."

All US combat ground troops are expected to be out of Iraq by the end of 2011. Troops from 30 different nations served as part of MNF-I during its tenure, but the last coalition troops left Iraq in July 2009.

Hawk Base Returns to Iraqi Control

US Forces-Iraq on Jan. 1 transferred responsibility for Hawk Base near Baghdad back to the government of Iraq and the Iraqi Air Force, as part of the US drawdown of forces from the country.

Hawk was the first property within the larger Victory Base Complex to revert to Iraqi control.

The transfer included 31 facilities, four generators, and life-support equipment that now form the IqAF's permanent headquarters, which is collocated with the new Iraqi air operations center that is under construction.

Col. Scott Larrimore, SBIRS Space Group commander at Los Angeles AFB, Calif. HEO-1 and HEO-2 are already on orbit. GEO-1 is slated for launch in 2011, followed by GEO-2.

Toledo Solar Farm Expanding

Officials with the Ohio Air National Guard's 180th Fighter Wing in Toledo, together with local politicians and industry representatives, on Jan. 5 celebrated the new phase of expansion of the solar project at the Air Guard base at Toledo Express Airport.

The Phase 4 expansion will increase by 50 percent the output of this solar energy system, allowing it to generate 1.2 megawatts of electricity, or more than one-third of the base's energy needs, reported the *Toledo Free Press* Jan. 8.

Development and construction of this solar field began in 2006. It is the largest solar field in the state of Ohio and the largest on any National Guard base in the country. In less than two years, it has already saved the base about $140,000 in electricity costs, said Col. Mark E. Bartman, 180th Fighter Wing commander.

F135 Program Shifts Gears

Pratt & Whitney announced Jan. 5 that it had delivered the final F135 test engine in the configuration designed for the Air Force's F-35A and Navy's F-35C Lightning II strike fighters and was poised to begin deliveries of the production version of this engine.

This milestone is "another demonstration of the continued maturing" of the F135, said Warren Boley, Pratt & Whitney's vice president of F135 engine programs. F135 test units had already logged more than 12,850 test hours, both on the ground and in the air, by then.

The F135 is locked in competition with the General Electric-Rolls Royce F136 engine to power future F-35s. Congress continues to fund the F136 despite the Pentagon's attempts to terminate its development, citing more pressing funding needs.

New Bomber for China Threat?

Rep. John Fleming (R-La.) on Jan. 13 told Adm. Robert F. Willard, head of US Pacific Command, that the Pentagon should "put even more emphasis on the need for the next generation bomber" in light of China's new ballistic missile capability designed to negate US aircraft carriers.

Willard, appearing before the House Armed Services Committee hearing on potential Chinese security threats, said, "Certainly our bomber force and any recapitalization of our bomber force" are part of the defense strategy, which entails looking at a broad range of capabilities.

Fleming's Congressional district includes Barksdale Air Force Base, a B-52H bomber hub. He is co-chair of the Congressional Caucus on Long-Range

USAF photo by 1st Lt. Bryan Bouchard

Toward a Common Defense: *An F-15 of the 67th Fighter Squadron, piloted by Maj. Tom Hunt, takes off from Hyakuri AB, Japan, in early February. Almost 100 USAF airmen deployed from Kadena AB, Japan, to participate in a week-long training exercise alongside their Japanese counterparts.*

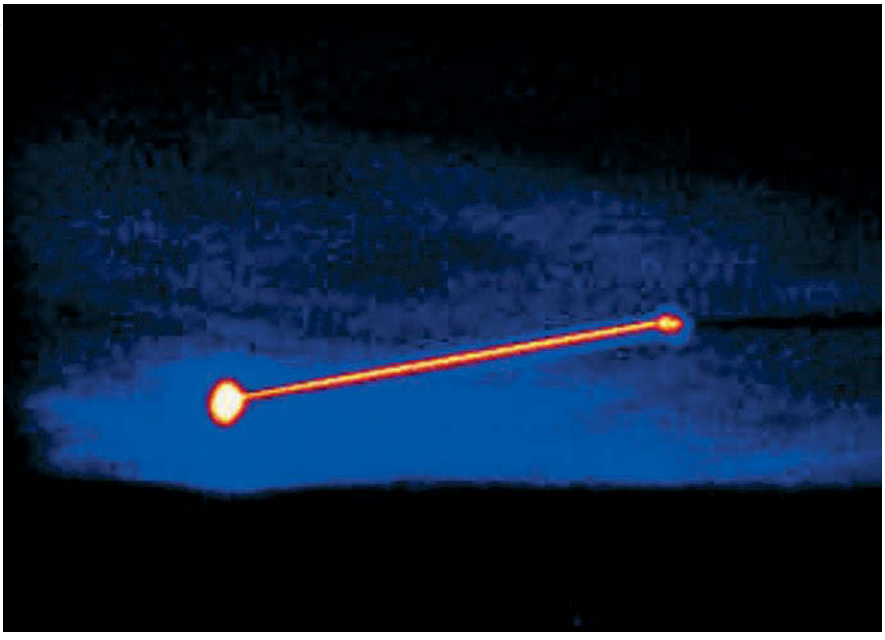
Strike, along with Rep. Madeleine Z. Bordallo (D-Guam).

Boeing Logs More C-17 Orders

Boeing on Jan. 6 announced a contract signing to supply the United Arab Emirates with six C-17 Globemaster III transport aircraft. The UAE will take delivery of four C-17s in 2011 and two in 2012, according to the company. It is the second Middle East nation after Qatar to buy the C-17.

Two days later, Boeing disclosed that it had received a letter of request from India for the "potential acquisition" of 10 C-17s to replace and augment the Indian Air Force's Russian-made An-32 and Il-76 airlifters.

DOD image



Zap, Pow!: *The Airborne Laser on Feb. 11 destroyed a ballistic missile during its boost phase. The proof-of-concept demonstration at Point Mugu NAWC, Calif., was captured in this infrared image. The ABL test bed is a heavily modified 747 equipped with a massive high-energy laser capable of tracking and destroying enemy missiles while they are over enemy territory.*

As of mid-January, there were 212 C-17s in use worldwide, including 193 with the US Air Force. Australia (four), Britain (six), Canada (four), Qatar (two), and the 12-member Strategic Airlift Capability consortium (three) operate the remainder. In mid-December, news surfaced that the Royal Air Force will acquire a seventh C-17 in December 2010.

Pilot's Remains Identified

The Department of Defense announced Jan. 12 that it had identified the remains of Air Force Maj. Russell C. Goodman, who was shot down in an F-4B Phantom fighter over North Vietnam on Feb. 20, 1967.

They were scheduled for return to his family for burial in Alaska. Goodman was flying with the Navy from USS *Enterprise* on an exchange program. Navy Lt. Gary L. Thornton and he were on a bombing mission against a North Vietnamese railroad yard in Thanh Hoa province when their F-4B was struck by anti-aircraft fire and exploded.

While Thornton was able to eject—and was taken captive—Goodman

was killed. Goodman's remains were recovered during two crash site excavations between 1993 and 2008 and identified with forensic tools, including DNA identification.

Offshore Drilling and Eglin

Col. Bruce H. McClintock, commander of the 96th Air Base Wing at Eglin AFB, Fla., told Florida state legislators on Jan. 13 that oil and gas drilling in waters near the base would threaten its operations, reported the *Pensacola News Journal* Jan. 14.

The legislators were considering a measure that would lift the 20-year-old drilling ban in Florida waters. McClintock told them that above-water pumping stations attract sportfishing, whose participants would be at risk during tests in which missiles are fired at drones over the Gulf of Mexico.

Spent missile and drone bodies "have to fall somewhere," he said. Lobbyists for drilling maintain that exclusion zones would be sufficient to protect military training areas.

Vietnam War Airman Laid to Rest

The remains of CMSgt. Melvin D. Rash, a C-130 loadmaster, missing since his aircraft went down on May 22, 1968 near the Vietnam-Laos border, were laid to rest Dec. 7 with full military honors at Arlington National Cemetery in Arlington, Va.

The *Newport News Daily Press* reported Dec. 28 that the aircraft's wreckage was found in 2002, but it took another six years for military investigators to get to the site and find the human remains of Rash and four more of the aircraft's nine crew members.

According to the Pentagon's Defense Prisoner of War/Missing Personnel Office, Rash's remains were identified in March 2009. He was 21 at the time of the crash, which was due presumably to enemy fire. The remains of CMSgt. John Q. Adam, one of Rash's crewmates, were laid to rest in Kansas City, Kan., last July.

Obituaries

■ Retired Maj. Gen. John J. Pesch, Air National Guard director from April 1974 to January 1977, died Jan. 10 at his home in Virginia at age 88. Pesch entered the Army Air Corps in 1942, initially flying the A-24 and later the B-17 in which he flew 31 combat missions. He joined the Maine Air National Guard after the war and returned to active duty for the Korean War and again in 1959, serving on the Air Staff. After a stint with Air Defense Command, he became deputy director in 1966 of the Air Guard at the National Guard Bureau. Retired Lt. Gen. John B. Conaway, former NGB chief, said Pesch "reset the Air National Guard after the Vietnam War with new fighter force structure and established the active duty rotational missions" for it.

■ Retired Lt. Gen. James F. Record, who led 12th Air Force and Air Forces Southern prior to his retirement in 1997, died Dec. 22 from a form of leukemia at age 71, according to a notice in the *Arizona Daily Star.* Record entered the Air Force in 1961 through ROTC at Purdue University in Indiana and earned his pilot wings in 1962. He flew as a forward air controller in O-1 and O-2 aircraft and was an F-100 instructor pilot in Vietnam, accumulating 616 combat missions. Over his career, he

John P. Murtha, 1932-2010

Rep. John P. Murtha, a 19-term member of Congress and chairman of the House Appropriations defense subcommittee, died in February at the age of 77.

Murtha was one of the most influential and hawkish Democrats in Congress, known for his advocacy of weapon systems and benefits for military veterans. He was one of the chief Congressional opponents of President Obama's termination of the F-22 Raptor, the F136 engine for the F-35 strike fighter, and the new VH-71 Presidential helicopter. He pushed to resolve gridlock over the KC-X aerial tanker replacement by promoting the purchase of both competing entries in that competition. He was the first combat veteran of the Vietnam War to be elected to Congress.

Murtha was born in West Virginia in 1932 and grew up near Pittsburgh. He dropped out of college to join the Marine Corps in 1952, saying he felt compelled to serve during the Korean War. He became a drill instructor and was selected for officer candidate school. He joined the Marine Corps Reserve in 1955 and continued to serve until 1990, retiring as a colonel after 35 years.

In civilian life, Murtha ran family businesses. He graduated from the University of Pittsburgh with a degree in economics, on the GI Bill.

He volunteered for active duty in Vietnam from 1966 to 1967, receiving the Bronze Star Medal and two Purple Hearts during his service as an intelligence officer near Da Nang.

Murtha was elected to Congress in 1974, on his second try, after serving in the Pennsylvania legislature. He became chairman of the HAC defense panel in 1989, and remained chair until 1995. He was its ranking Democrat from 1995 to 2007, and became its chair again in 2008 when the Democrats won back the House. In 2006, he failed in a bid to become majority leader.

Dubbed by critics "the king of pork," Murtha was unapologetic for channeling federal funds to his Pennsylvania district, which struggled with the loss of steel and coal jobs. His skill in getting money for his district, and a willingness to throw contracts to constituents caused him to be dogged by investigations and inquiries most of his tenure, but he was never officially charged with wrongdoing. In the infamous "Abscam" scandal of 1982, Murtha was named as an unindicted co-conspirator. In late 2009, a House ethics panel declined to bring charges against him for earmarking $100 million that went to a defense contractor in his district.

Murtha led many Congressional delegations abroad and advised Presidents of both parties on military and foreign affairs matters. He worked to secure Congressional funding for the Nunn-Lugar amendment, providing funds to decommission nuclear weapons of the former Soviet Union.

Working with Texas Congressman Charlie Wilson, Murtha steered funds to provide Afghan rebels with weapons and Stinger missiles to combat the Soviet invasion of Afghanistan.

Murtha voted to give President George W. Bush the authority to pursue war with Iraq in 2002, but later became the war's most visible Congressional critic, eventually declaring the conflict militarily unwinnable. In 2005, he said the war "is not going as advertised," that the US was pursuing a "flawed policy wrapped in illusion," and called for an immediate withdrawal of US troops.

Adm. Michael G. Mullen, Chairman of the Joint Chiefs of Staff, said, "That we remain the greatest military in the history of the world is testament in no small part to his vigilance and stewardship."

Defense Secretary Robert M. Gates said he would always be grateful for Murtha's "personal efforts on behalf of the Afghan resistance fighting the Soviets—efforts that helped bring about the end of the Cold War."

Gates said that although he and Murtha "did not always agree, ...I always respected his candor and knew that he cared deeply about the men and women of America's military and intelligence community."

—By John A. Tirpak

USAF photo by SSgt. Samuel Morse

***Vaporized:** An F-16 piloted by Capt. Cory Farrer takes off Feb. 3 on the final day of an operational readiness exercise at Misawa AB, Japan. The huge cloud of vapor behind the aircraft is steam and snow kicked up by the fighter's jet exhaust.*

commanded three fighter wings and an air division. He later served as first deputy commander of Joint Task Force Middle East in the late 1980s and commanded the Joint Task Force Southwest Asia from November 1992 to March 1993. Post military, Record joined Hughes Aircraft and remained with the company (acquired by Raytheon) until 2007.

■ Retired Lt. Gen. Robert H. Warren, US Air Force Academy superintendent from July 1962 to July 1965, died Jan. 9 in his home in Charleston, W.Va., at age 92, according to a notice in the *Charleston Daily Mail.* Born in Yankton, S.D., in 1917, Warren graduated from West Point in 1940 and received his flying wings the following year. During World War II, he led several bomber units, including the 376th Bombardment Group, and flew 38 combat missions in the B-24 bomber. During the latter part of his Air Force career, Warren served as assistant deputy chief of staff for personnel on the Air Staff and as deputy assistant secretary of defense for military assistance and sales. He retired from the Air Force in July 1971.

■ Retired Col. Albert J. "Red" Wetzel, who led the Titan missile program, died Dec. 26 in New Orleans at age 91. Wetzel entered pilot training in 1942, flying a number of aircraft, including the B-47 in Strategic Air Command. He also served as chief project officer for USAF's first ground-launched cruise missile, the Matador, and while leading the Titan program, helped develop procedures for ballistic missile launch from hardened, underground silos and for launch of the manned Gemini spacecraft. As executive assistant to the commander of the Ballistic Systems Division, he established a scientific advisory group. Before retiring from the Air Force in 1965, he served as director of Strategic Programs with the Undersecretary of Defense for Research and Engineering. He was inducted into the Space and Missile Pioneers Hall of Fame in 2003. ■

News Notes

■ Vice Adm. James A. Winnefeld Jr. was nominated Dec. 23 to receive a fourth star and take command of US Northern Command and NORAD. He would replace Air Force Gen. Victor E. Renuart Jr., who has led both commands since March 2007 and is to retire.

■ President Obama on Dec. 22 announced that Howard Schmidt is the White House cybersecurity coordinator, responsible for orchestrating the activities across the US government to protect US cyber networks.

■ Air Force Global Strike Command on Jan. 19 declared the 90th Missile Wing at F. E. Warren AFB, Wyo., mission ready following the unit's first full-scale no-notice nuclear surety inspection since it moved under the new command in December 2009.

■ Retired Gen. John D. W. Corley, former Air Combat Command commander, on Jan. 13 was inducted into the Order of the Sword, the highest honor of the enlisted corps, during a ceremony in Omaha, Neb.

■ CMSgt. Mike Ramos, a soon-to-retire Air Force Special Operations Command combat controller, on Jan. 5 received the Legion of Merit to honor his more than 30 years as a leader in special tactics operations.

■ An Air Force MQ-1 Predator remotely piloted vehicle crashed Jan. 15 in southern Afghanistan. Air Forces Central said the loss was not due to hostile fire. An investigation was launched to determine the cause.

■ A student pilot's loss of situational awareness while practicing aerobatics near Columbus AFB, Miss., on July 9, 2009, caused him to eject from his T-6 trainer aircraft, resulting in the aircraft's loss and his slight injuries, the Air Force announced Jan. 12.

■ Capt. Ian Holt and MSgt. Karrie Warren were named the Air Force's top male athlete and female athlete, respectively, for 2009. Holt is a competitive cyclist assigned to F. E. Warren AFB, Wyo. Warren is a standout softball player from Tyndall AFB, Fla.

■ Ground-breaking took place Dec. 11 at McChord AFB, Wash., for the 23,500-square-foot building that will house the Washington Air National Guard's 262nd Network Warfare Squadron that supports USAF's cyber operations.

■ Boeing on Jan. 8 delivered the fourth KC-767 tanker to the Japanese Ministry of Defense, thereby completing Japan's order for the new tankers. Handover of the first three tankers occurred in February 2008, March 2008, and March 2009, respectively.

■ The Berlin Airlift Exhibit, after traveling to 29 different cities, is now on permanent display at Travis Air Museum on the grounds of Travis AFB, Calif. A ribbon-cutting ceremony took place on Dec. 10 to open the now-permanent exhibit. ■

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Issue Brief

By Adam J. Hebert, Executive Editor

Stealth for the Other Guys

An event that many thought might never come finally arrived on Jan. 29. On that day, the world for the first time witnessed a flight of a Russian stealth fighter.

It was Sukhoi's PAK FA aircraft. The event was wrapped in secrecy on a scale worthy of the Soviet Union. There were no advance photos of the fighter. There was no advance announcement of the flight. There were no foreigners on hand to witness the 47-minute event. Only after the flight's successful completion did Moscow even acknowledge it at all.

At that point, though, Sukhoi and Kremlin officials held back nothing. They went all out in their praise of the fighter and its purported capabilities. The subtext was that, finally, someone had broken the US monopoly on low-observable aircraft.

The PAK FA is still shrouded in secrecy. In light of Russia's tortured quest to develop a "fifth generation" rival to the F-22 Raptor, the blackout is sure to continue for a long while. The "Raptorski," as it is called in the West, will be a modern Russian mystery.

Sukhoi photo by Sergey Pashkovskiy

Russia's PAK FA stealth fighter has made its debut.

Russia's claims about the aircraft's schedule and capabilities are bold, however, and the US would be foolish to ignore them or to believe they don't spell trouble.

The PAK FA will enter developmental service with the Russian Air Force's test and evaluation unit "in 2013," said Prime Minister Vladimir Putin, adding that "large-scale procurements will start in 2015."

"It's going to be no worse than an F-22," said Anatoly Kornukov, the former commander of Russian air forces. "I've been in an F-22, and I know."

PAK FA is the Russian acronym for Future Aviation System for Tactical Aviation. Also known as the T-50, the fighter bears a strong resemblance to both the F-22 and the F-35, and is sized between the two Lockheed Martin-built stealth fighters. Russian officials claim their fighter will cost less than the F-22, will offer the ability to supercruise, and boasts a longer range than the F-35.

It is designed for aerial combat, ground attack, and even maritime attack missions when equipped with 3,300-pound antiship weapons. The PAK FA can carry eight missiles internally, according to Pravda, and will be able to attack multiple targets simultaneously.

This makes the T-50 a multirole strike fighter, like the F-35. Unlike the F-35, however, it will have two engines.

The engines on the test aircraft immediately raise questions about how advanced it really is, however. Despite Sukhoi claims that the PAK FA has "unprecedented small radar cross section in radar, optical, and infrared range," the current engines are derivative and have traditional, nonstealthy round nozzles.

Russian officials acknowledged the fighter is not yet ready for front-line service. Putin himself said "a lot remains to be done in terms of engines and armament."

US Air Force officials have acknowledged for years that top-of-the-line Russian fighters on the world market already outclass the most advanced versions of USAF's fourth generation fighters such as the F-15 and F-16. Until the F-35 is ready for combat, the American advantage in worldwide air combat resides in the quality of its pilots and in the F-22.

It is too soon to predict when the PAK FA will be operational and whether it represents a full-up fifth generation fighter or a hybrid utilizing carryover technology.

Still, the fighter threat is increasing in terms of both quantity and quality, noted Lt. Gen. David A. Deptula, deputy chief of staff for intelligence, surveillance, and reconnaissance, last September. "It behooves us to remember the success of the Russian MiG-21, the most widely produced and deployed jet fighter in history. Over 50 countries operated the MiG-21, not just Russia or China, ... [so] we need to be prepared to deal with advanced fighter technology in quantities and locations beyond Russia and China."

Indeed, India is a charter partner in the PAK FA program. Other current customers of Russian fighters include longtime US adversaries such as Iran, Syria, and Venezuela.

"The Russians are working on the PAK FA, and China is working on their XXJ or F-12," Deptula continued. "Export of both fighters will likely take place, and the prices they'll charge will likely undercut the F-35. This provides the opportunity for both nations to acquire near-F-22 performance while attempting to proliferate the systems [in] F-35-like quantities."

That's a sobering prospect for those who want the US to maintain air superiority in any future conflict. ■

More information: http://www.AFA.org/events/conference/2009/scripts/Deptula.pdf

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F-15Es from the Louisiana Air National Guard pass over wetlands during a training mission.

USN photo by Petty Officer John P. Curtis

Photo by Kevin Jackson

Guard and Reserve in a Time of Trouble

The back-up components need to modernize even while strengthening intelligence, cyber, and UAV capabilities.

By Marc V. Schanz, Associate Editor

As current budget austerity—and the prospect of more to come—rolls across the Air Force, officials are searching high and low for ways to do more with less. This is the reason that USAF is seizing an opportunity to improve integration of the Air National Guard, Air Force Reserve, and active duty Air Force.

"I think we're making progress," said ANG Director Lt. Gen. Harry M. Wyatt III of the relationship between the reserve components and USAF headquarters. "The lines of communication and dialogue are open," he said.

For all that, though, Wyatt conceded, "Any time you have recapitalization issues, change is going to be difficult."

As Wyatt and others tell it, there are two main areas of concern for the Guard and Reserve.

First, fighter and bomber flying missions are going away because of decisions made through the 2005 Base Realignment

A B-52 belonging to Air Force Reserve Command lands at Barksdale AFB, La.

and Closure process and servicewide efforts to rebalance the force to save cash for modernization efforts.

The Guard and Reserve are trying to close the capabilities gap with a strategy known as "concurrent and proportional recapitalization." The goal is to place critical missions at their optimal locations—across the Total Force.

The force planning construct used to build and resource capabilities is fairly nebulous, said Lt. Gen. Charles E. Stenner Jr., AFRC commander, but USAF is trying to enhance active, Guard, and Reserve capabilities by pushing all three components into new missions and constructs simultaneously.

"In the past, everyone was an entity unto themselves," Stenner said. But now—in an era where the distinction between the reserve components and the active duty has become increasingly blurred—old assumptions are getting a hard look across the active and reserve sectors. "We can no longer afford to have any slop or slack," Wyatt said.

The Guard Scrambles

With reserve forces increasingly integrated into expeditionary taskings, the approach is the only one that makes sense for the long-term health of the Total Force, Guard and Reserve officials argue.

Second, there is mounting concern that many highly experienced troops might be forced out of many Guard and Reserve units. When the fighters and bombers leave, manpower-intensive tasks such as fighter maintenance give way to new missions.

One area under particular scrutiny is the air defense of the United States. Since September 2001, the Air Guard has played a crucial role for NORAD, flying thousands of Operation Noble Eagle sorties.

Since the preponderance of the mission is flown by the ANG, Guard leadership is very concerned about the long-term health of its fighter force, because the homeland taskings are a large burden on a force already assigned frequent expeditionary rotations. The ANG operates and maintains around 30 percent of USAF's aircraft inventory, but mans 16 of the 18 air sovereignty alert sites where fighters can be dispatched by NORAD. In 2008, more than 200 incidents required these alert fighters to scramble.

The pace has not let up, particularly in the tense aftermath of the Dec. 25 Northwest Airlines foiled bombing attempt by a Nigerian national with ties to al Qaeda. On Jan. 6, two Oregon ANG F-15s scrambled to escort a Hawaiian Airlines flight back to Portland after the crew reported a passenger disturbance on board. Two days later, two F-16s were dispatched by NORAD to escort a San Francisco-bound AirTran flight as it landed in Colorado Springs, Colo., where an intoxicated passenger who had locked himself in the aircraft's bathroom was detained by law enforcement.

Though the mission costs the ANG about $104 million a year, according to Wyatt, the Air Force did not set up alert sites as a "steady-state mission" after 9/11. Several alert units have reported numerous difficulties performing both expeditionary and homeland defense missions. According to testimony from the Government Accountability Office last year, 17 of 20 units interviewed reported personnel issues were a serious concern. This was due to the practice of programming alert operations in two-year stints, leading to the loss of experienced personnel.

Force structure is exacerbating the problem. Unless USAF alters its fielding

Total Force KC-135 Stratotankers from many units line the ramp at Eielson AFB, Alaska, during an exercise.

USAF photo by SSgt. Joshua Strang

USAF photo by Bob Barko Jr.

C-130 pilot Maj. Joe George of the 910th Operations Support Squadron keeps an eye out as his aircraft takes on relief supplies bound for Haiti.

schedules or extends the service lives of its F-15 and F-16 fighters, it will lack enough aircraft for alert missions starting in 2015, according to the National Guard Bureau.

Eight of the 11 F-16 units with alert missions have aircraft which reach the end of their service lives between 2015 and 2017. In some instances, the Vipers are scheduled to exit the fleet almost 10 years before the planned arrival of replacement F-35s. This is, needless to say, a risky proposition.

Congress, after hearing from a reluctant Air Guard, consequently asked hard questions of the Air Force about its plan to retire a portion of its legacy fighter force—what became known in the Pentagon as the combat air forces reduction, or "CAF Redux." When the Air Force rolled out its Fiscal 2010 budget last spring, it advanced a controversial plan: the retirement of 250 legacy F-15s, F-16s, and A-10s in 2010 in order to redistribute $3.5 billion into modernization accounts, new munitions, and intelligence-surveillance-reconnaissance assets.

While the retirements were spread out over the force, the plan raised hackles due to a long-simmering problem: The fighter force structure, particularly Guard and Reserve, relies heavily on older fighters for both air expeditionary force rotations and its frequent homeland defense taskings.

A Reduction of Legacy Fighters

While progress has been achieved on improving the Guard's funding for the air defense mission, Congress put the blocks on the planned CAF reduction, citing a lack of a fully formed replacement plan for the ANG's fighter force.

House lawmakers, led by Rep. Gabrielle Giffords (D-Ariz.) and Rep. Frank LoBiondo (R-N.J.), inserted an amendment in the 2010 defense appropriations bill, requiring the Air Force to submit a report to Congress detailing the reasons for the reduction and how the service will fill in the capability gaps. The language even suggested USAF seriously examine purchasing "generation 4.5" fighters for the Guard as a solution to this looming capability shortfall.

"The last thing we need at this critical time is to make the problem worse than it already is," Giffords said.

A report on the issue is scheduled for delivery to Congress in April, AFRC and ANG officials said.

But the future likely still holds some kind of reduction in force structure for Guard and Reserve fighters.

"What will likely come of the ... CAF Redux will be a smaller number than what was originally planned," said Maj. Gen. Patrick J. Moisio, the deputy director of the ANG and former commander of the 162nd Fighter Wing in Tucson, Ariz.—one of the 18 alert sites. Moisio is closely involved in Guard deliberations with USAF on future budgets and programs. He expressed optimism about the plans for the F-35, but concedes there are a range of alternatives being examined should the Lightning II face future delays.

"As we go forward making the 2012 [budget], as we look at the F- 35 coming into the inventory, ... I believe we will have another reduction of legacy fighters," he said in December.

A service life extension for newer Block 40 and 50 fighters is "definitely being looked at," he added, noting it should be adequate to see the Guard through any F-35 delays. "None of us want to have to do it on the pre-Block 40 fleet because it will be an expensive and risky proposition," he said.

US Northern Command is in the midst of its own review of the air defense mission. This is the first such thorough scrub since September 2001, and is a response to Congress' criticism that NORTHCOM has not been conducting routine risk assessments. The review is expected to be completed by early summer, according to Air Force officials.

"If you think about the new threats the country experiences, that we didn't experience before 9/11, I would be surprised if the requirement went down," Wyatt said of the review and the alert

USAF photo by SrA. Paul Duquette

MSgt. Ron Doyle marshals an MQ-1 Predator from the California ANG's 163rd Reconnaissance Wing.

mission. "The problem will be solved. It has to be solved."

Those working on ANG and AFRC modernization emphasize that the challenges surrounding the air sovereignty alert mission are not just about fighters, but symptomatic of how the regular Air Force and the reserve components view each other's traditional roles.

Few would argue that reserve forces are not an "instrumental part of the front-line fighting force," said Lt. Col. W. Mark Valentine, the chief of the ANG's strategic studies group in the office of the director. In an October 2009 paper he co-authored, Valentine said the reserve components' use as a fighting force has steadily increased in the last decade, but funding and equipping of the force has largely followed the historical paradigm.

"Despite Total Force rhetoric, which highlights the critical and indispensable contribution of the RC, the [active component] has yet to match these words with action—especially in the realm of recapitalization," he wrote.

Tight budgets are pushing change that some in the reserve components say is overdue. Col. Jay Jensen, the chief of programs at AFRC headquarters at Robins AFB, Ga., is at the center of the Reserve's plans for expansion and associations. "We're not just filling gaps," he said.

Working with the Air Staff, AFRC anticipates further growth into cyber warfare, intelligence and UAV operations, and the still-growing F-22 mission, he said. These efforts will ramp up after the release of the Quadrennial Defense Review.

In the Air Force's 2010 posture statement, Air Force Secretary Michael B. Donley and Chief of Staff Gen. Norton A. Schwartz announced the service would accelerate the integration of the Guard and Reserve into "new and emerging mission sets," including F-35 missions.

The Message Takes Hold

By considering the Guard and Reserve "for inclusion in emerging mission areas and basing strategies, we capitalize on the experience and unique skill sets that our Air Reserve Components contribute to the Total Force," the statement reads.

The direction is bearing fruit, Wyatt believes, pointing specifically to the updated F-35 beddown report released in October of last year.

"A lot of folks, including myself, were concerned about the recapitalization of the [Guard] and the fact that the preliminary beddown locations were not too favorable," Wyatt said. However, five of the 11 bases on the latest list are Air Guard locations—operational units at McEntire Joint National Guard Base, S.C., Burlington Arpt., Vt., Jacksonville Arpt., Fla., and training sites at Air Guard stations in Boise, Idaho, and Tucson.

"I believe our message of concurrent and proportional recapitalization across the force is taking hold," Wyatt said. "I think that we have demonstrated there is some good common sense behind concurrently fielding new capabilities across the Total Force."

Total Force capabilities are crucial to the force's success, however, and Wyatt notes the days when the nation could afford "tiered readiness" and a dedicated air defense fleet are gone. The demands on USAF are such that if top-tier capability is only in the active duty, the operations tempo would put disproportionate stress on the active duty, he said.

With a balanced strategy, the Guard and Reserve can act both as a strategic reserve and as a fully capable operational force, Wyatt said.

The so-called "fighter gap" is symptomatic of a larger problem—suboptimal past procurement plans, Valentine said. The goal of concurrent and proportional modernization is to rectify the gaps created when the reserve components were viewed solely a strategic reserve instead of the operational force and "shock absorber" for surging demands it has become since 9/11.

However, Guard and Reserve leadership both express bullish optimism about future years' plans, citing the current climate as both a challenge and an opportunity to remake and invest in a force which has drastically changed since 2001.

Since BRAC and Total Force initiatives began, six wings moved, in essence,

USAF photo by MSgt. Mike R. Smith

Air National Guard battlefield airmen evaluate equipment at the ANG and AFRC Test Center in Arizona.

USAF photo by SrA. Jacqueline Romero

AFRC airmen parachute out of an HC-130 over Davis-Monthan AFB, Ariz., during a multilift airdrop exercise.

Stenner said of AFRC force structure. A lot of missions and hardware have moved around, but the Reserve feels it now has a foundation ready to aggressively grow into new missions such as remotely piloted vehicle (RPV) operations, cyber warfare, and nuclear missions. The Reserve now operates USAF's nuclear-capable B-52H formal training unit, for example.

"I want to be everywhere there is an active duty mission. I want to have some kind of a Reserve presence," Stenner said of the command's future plans.

As part of the Reserve's expansion in new areas, it is adding billets—about 4,256 over the next four years, according to AFRC. While many of the billets are slated for expanding mission areas prioritized by Defense Secretary Robert M. Gates, such as RPV operations, distributed ground stations, and network operations, many are going to beef up and modernize areas such as training for fighter and airlift crews, battlefield airmen, and RED HORSE units. These are not "rebates," Stenner sad. They are "new mission sets our partner commands have identified," he said.

The Reserve, much like the Guard, is moving forward with the establishment of more classic associate units—where active duty personnel share their mission or aircraft with reservists—and active associations, arrangements where a reserve unit hosts active duty.

This past fall, AFRC announced 500 active duty airmen would associate with AFRC units at Keesler AFB, Miss., March ARB, Calif., and Peterson AFB, Colo., by 2012, flying C-130H and J airlifters. Last October, Air Mobility Command stood up three active associate units, bringing active duty airmen to serve with Air Guardsmen and Reservists, flying KC-135s at Scott AFB, Ill., Pease Intl. Tradesport ANGB, N.H., and Birmingham Arpt., Ala.

From Vermont to Wyoming, Guard and Reserve officials have been testing and experimenting with how to get the most combat power from these new arrangements. The last BRAC round directed the Guard and Reserve to form so-called "reserve component associations," where Reserve and Guard organizations are paired in a mission.

"I have to admit, early on I was reluctant," Stenner conceded. "When you look at them in the same location, it's the same demographic, and that's not healthy when you have to compete in fiscal terms. But we found at the unit level, the folks will figure out how to get that done."

As Budgets Tighten

Tinker Air Force Base's 507th Air Refueling Wing—a partnership between Oklahoma Air Guardsmen and Reservists—added four KC-135s to the unit's existing eight airframes, Stenner noted, and increased its mission output by 70 percent.

"It comes down to capability. How do I get it at the most efficient way? The cheapest is to use all reserves; most expensive is all active duty. ... We look at the curve and see where the best spot is," he said.

The Guard is also moving to aggressively transition to new missions and expand associate constructs, including cyber warfare and MQ-1 Predator and MQ-9 Reaper operations. Late last year, Wyatt said he presented the ANG's flight plan to Schwartz, detailing numerous units and mission areas the Guard seeks to build associations with.

"General Schwartz asked me, 'Does your concurrent and proportional theme apply to transitioning from flying missions to nonflying missions?'" Wyatt said. "I said, 'Yes it does'"—with the assumption that the shifts out of flying missions apply across the force. "If the direction of USAF is to transition more units out of flying missions, it needs to be concurrent."

Wyatt said most of the Guard's wings have experience levels around 80 percent or higher, where experts say 60 percent is "abnormally good" for most units. Pilot experience in fighter units is measured by flight hours, for example, and pilots are considered "experienced" when they achieve 500 hours in their primary aircraft. With the wealth of Air Guardsmen with prior service, it is common for Guard units to have some 80 percent of their pilots with 500 hours. (For comparison, the average active duty squadron is between 40 and 50 percent experienced.)

With very little sacrifice, the Guard can transfer the experience by associating with younger active duty airmen to raise the experience levels of the active force, providing greater balance, Wyatt noted.

The reserve component is very thrifty, several officials point out. ANG provides about 30 percent of the Total Force's flying capability across all mission areas at approximately the cost of six percent of the Air Force's budget, Moisio noted. "That is something that is important for us to look at as the budget gets tighter as the years go on," he added. "I think the Air Force as a whole is realizing what they can get from us for a relatively small investment."

Future mission areas being examined for expansion include the bomber community and the future Long-Range Strike program, Wyatt said. "We have room for growth there."

The reserve component dealt with BRAC as best it could, he said, but a more deliberative process is now under way—an "enterprisewide look" toward maximizing manpower efficiency, utilizing experience better, and helping to develop true Total Force leadership for the Air Force.

Stenner optimistically foresees a Reserve force more closely integrated with the active duty and Guard. "We are looking to get a whole lot more efficient on how we present our forces."

"While I think the challenges are great, I think the opportunity for reaping the benefits are even greater," Wyatt agreed. ■

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USAF photo

Manned aircraft will be able to penetrate future advanced defenses. Now somebody tell the simulation gang.

Historically, there has been a mismatch between the air combat attrition predictions of analysts' computer models and the actual attrition experienced in major air campaigns. Simply put, the models have always erred on the pessimistic side.

Understanding the sources of this mismatch is important today because many Air Force and Pentagon experts are at it again. This time, they are claiming that even stealthy fifth generation fighters and B-2 bombers cannot penetrate future threat arrays without unacceptable losses. They conclude that the Air Force must depend almost solely on weapons launched from standoff distances to defeat future integrated air defense systems (IADS).

If this viewpoint takes hold, the consequences would be severe. Such a

Top: An Air Force B-52 bomber, centerpiece of Linebacker II. Left: North Vietnamese SAM battery, a key threat to US aircraft. B-52 attrition in the 11-day campaign was less than two percent, not the 33 percent predicted by analysts' models.

The Simulation-Reality Mismatch

By John Michael Loh

belief undermines the perceived value of airpower, weakens our ability to deter potential adversaries, and will raise the cost of equipping future air forces.

However, an accurate review of history reveals a far different picture of the ability of USAF aircraft to penetrate contemporary defenses.

In the Linebacker II campaign over heavily defended Hanoi and Haiphong in December 1972, analysts predicted we would lose one B-52 out of every three B-52 sorties flown. We lost 15 B-52s out of 729 B-52 sorties in the 11-day campaign, an attrition rate less than two percent, not 33 percent.

In the June 1982 Bekaa Valley War, the Israeli Air Force mounted a mass suppression of enemy air defenses (SEAD) campaign against a Syrian air defense force in Lebanon equipped with modern, state-of-the-art Soviet systems. There, analysts' models of similar threat arrays predicted an attrition rate of 10 to 20 percent. In 1,100 fighter sorties, the IAF lost no aircraft—zero percent attrition, not 10 to 20 percent.

In the first four days of the January 1991 Desert Storm campaign over heavily defended Baghdad, Air Force leaders predicted a loss of 30 to 40 combat aircraft on the first night, 20 the second night, 10 the third night, and five on the fourth night, for a total of about 70 losses. Analysts' models predicted far greater losses. Coalition forces flew 7,000 combat sorties (shooters) in those four days and lost 27 fixed wing aircraft, an attrition rate less than 0.4 percent, less than half what had been predicted by Air Force estimates, and way below analysts' predictions.

The Faults of Modeling

Why do analysts' models invariably predict high loss rates against state-of-the-art defenses when actual combat experience yields significantly lower attrition? The answer lies in understanding modeling limitations and the actual execution of operational strategies and tactics in air campaigns.

Models that simulate combat between friends and foes are useful to assist combat planners and tacticians in developing strategies and tactics, and to find gaps in capabilities for those who develop operational requirements. They also assist scientists and engineers in understanding the technical innovations and developments necessary to counter threat systems.

Models are also valuable for evaluating the relative impact of adding or subtracting threats and friendly forces, but not for absolute outcomes.

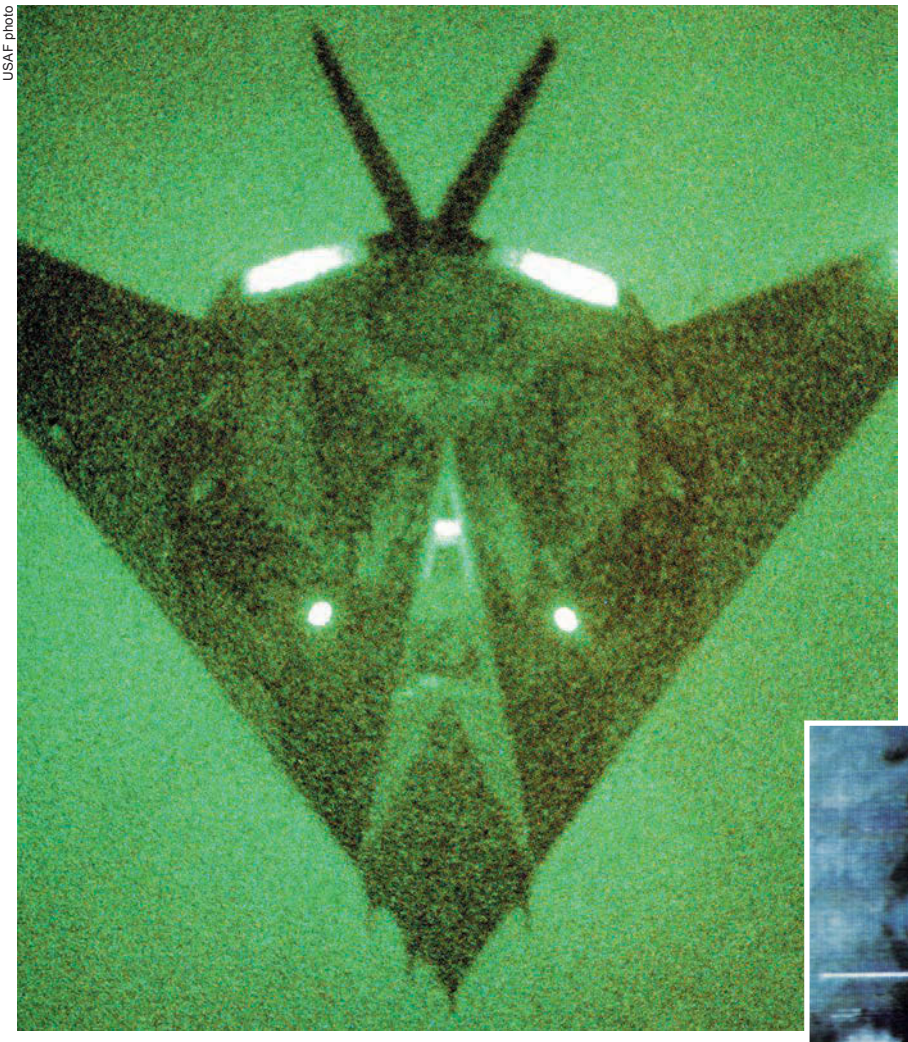
Good analysis identifies the variables of combat actions having the greatest leverage. Competent analysts then perform sensitivity studies to understand the impact of altering variables, but not to predict absolute answers. Good modeling is meant to inform decision-makers of the relative consequences of different courses of action.

However, models lose their fidelity when they try to simulate large-scale air campaigns because they cannot faithfully replicate the enormous complexity, including the countermeasures, tactics, and on-scene decisions of actual combat. Many models simply take a single, one vs. one, encounter and extrapolate the results to an entire air campaign. That is grossly faulty modeling. They invariably grant to the adversary capabilities in both operator competence and system performance that exceed actual experience. These three examples from the real world illustrate the dangers of trying to

An Israeli Air Force F-16, a major player in the Bekaa Valley War. In June 1982, IAF fighters flew 1,100 sorties and demolished the Syrian Air Force. Israel lost zero aircraft, though analysts had predicted attrition of up to 20 percent.

IDF photo

USAF photo



use modeling and simulation beyond their useful purposes.

Modern air defense systems consist of surface-to-air missiles (SAMs), radar-directed anti-aircraft artillery (AAA), fighter interceptor aircraft, and early warning, target acquisition, and target tracking radars. These systems are joined together via voice and data links in an integrated command and control network. The entire system of systems is called an integrated air defense system. Every nation that we would consider a potential adversary deploys IADS around its high-value assets.

A National Asset To Retain

The first SAM-based IADS arrayed against US forces was in North Vietnam, and our Air Force was ill-equipped to deal with it. The North Vietnamese, with Soviet advisors, had pieced together a Russian-style IADS to protect high-value targets such as airfields, power plants, harbors, and command centers. The centerpiece was the SA-2 missile and Fan Song radar arrayed in batteries of six missiles each. USAF took heavy losses until it equipped its fighters with radar warning and self-protection electronic countermeasures pods, and provided defense suppression assets such as the F-105 Wild Weasels with anti-radiation missiles and support jamming EB-66s. However, political constraints on attacking targets in the Hanoi and Haiphong areas prevented a full-fledged suppression and destruction of the IADS, so airmen had to operate in the face of SAM and AAA defenses.

That changed with Linebacker II. The politicians removed all targeting constraints. The North Vietnamese had upgraded their IADS with an improved radar system and many more SAM batteries. However, the Air Force was able to plan and execute a rollback of the SAM, AAA, and radars systematically to allow the B-52s to bomb their primary targets effectively. The combination of support jamming with standoff EB-66s, lethal defense suppression with F-105 Wild Weasels, self-protection jamming and chaff on the B-52s, use of decoys and deception, and smart flying tactics on the part of the B-52 crews resulted in mission success with few losses.

What did the analysis miss? Well, it did not account adequately for the systematic destruction of the IADS components as a prelude to the bombing of primary targets. It did not account sufficiently for the effectiveness of support and self-protection jamming by all the players. It did not account for the decoys and deceptive tactics employed to confuse the enemy. It did not account for the changes in tactics of the B-52 crews as they varied their routes, call signs, attack parameters, and escape maneuvers in succeeding waves of attacks. It did not account for the aircrews' on-scene, real-time situational awareness that allowed the crews of individual flights of fighters and bombers to make changes on the fly—audibles at the line of scrimmage, as it were—to succeed.

This latter factor, decentralized execution, the ability of USAF aircrews to operate relatively independently of the command and control system if necessary, and make smart decisions during execution, is the product of realistic training programs and the competence of Air Force people that remains the hallmark of America's combat pilots and crews. Models cannot simulate this unique strength. This factor, alone, is a national asset that the Air Force must retain now and in the future.

In combination, these factors overwhelmed the North Vietnamese IADS,

USAF photo

Top: F-117 stealth fighter aircraft in the Gulf. Above: Downtown Baghdad target on Jan. 17, 1991, seen through an F-117 strike camera. In the first four days of the war, the coalition attrition rate was less than 0.4 percent, far below estimates.

resulting in less than two percent attrition for the lumbering, nonmaneuverable B-52 force, a rate that the analysts had predicted would be at least 10 times higher.

In 1982, at the time of the Israeli Bekaa Valley attacks, the Syrians, with hundreds of Russian "advisors," had deployed the most modern IADS available. It consisted of 19 batteries of SA-3 and SA-6 radar guided SAM batteries, SA-7 infrared guided SAMs, ZSU-23 radar guided AAA, and MiG-21 and MiG-23 fighters. The Soviets hailed this array as the showcase of air defenses. It was a model of the IADS they had arrayed against NATO in Eastern Europe. It was their state-of-the-art system to demonstrate to the world how effective an IADS could be. The analysts' models also considered it nearly impenetrable without heavy losses. They projected loss rates of 10 to 20 percent for aircraft flying into this defense system.

The Israeli government considered this escalation of forces in southern Lebanon a hostile invasion of its right to protect and defend its citizens in northern Israel. Syrian provocations at the time also forced the Israelis to act. On June 9, 1982, the Israelis, flying about 600 F-15 and F-16 sorties and 100 support sorties, destroyed 17 of the 19 SA-6 batteries and downed 23 MiG fighters without a single loss. The initial wave of attackers took only about 10 minutes of concentrated, intense action over the Bekaa Valley to accomplish this victory. The Israelis followed this attack with a second day of intense bombing and air combat. Israeli pilots destroyed the remaining two SAM batteries and another 15 MiGs, again without a single loss.

So, why the mismatch between the models' predictions and the actual outcomes? The Israelis were equipped with US-supplied fighters and electronic combat systems, and their strategy and tactics were a mirror image of Air Force training in Red Flag exercises over the Nevada ranges.

They perfected the combat principles of surprise, force saturation, deception, synchronization of attacks, and operating inside the opponent's reaction time, all simultaneously. They were superbly trained, and their equipment, designed to counter just such a defensive array, worked as designed.

The attrition models, as detailed as they had become by 1982, were not able to account for the dynamics, on-scene decisions, and operational tactics of the actual battles. They also simulated a higher than warranted level of proficiency by the Syrian and Russian forces. All in all, the Bekaa Valley campaign demonstrated the severe limitations of modeling when used to predict absolute force-on-force attrition.

Greater Efficiency, Less Attrition

In the years between Linebacker II and Desert Storm, the Air Force recognized the continued huge investment in SAM, MiG, and radar-based defenses by the Soviets and their client states. Having learned its lessons well, the Air Force embarked on its own vast investment in electronic combat systems and electronic warfare training. The Air Force upgraded its Wild Weasels with the F-4G and the High-speed Anti-Radiation Missile, developed self-protection ECM jammers and chaff and flare dispensers for its combat aircraft, fielded the EF-111 for close-in support jamming, developed wide-area emitter location systems, and developed new standoff weapons like the Conventional Air Launched Cruise Missile. The Air Force also developed night attack systems such as LANTIRN, to deny the enemy the sanctuary of night operations. The Air Force also sharpened its operational strategies and tactics in large-force exercises in Nevada with Red and Green Flag programs. It deployed an array of simulated SAM missiles, radars, and MiG fighters, called Aggressors, in the Nevada desert to hone its capabilities against modern threat arrays.

Most importantly, however, the Air Force began its investment in stealth technology as the means to negate the massive investment in radar-based defenses by the Soviets and their client states. This investment has paid big dividends with the fleet of stealthy fighters and bombers, such as the F-117, F-22, F-35, and B-2, and JASSM cruise missiles. Now, the Air Force can execute air campaigns with smaller force packages, led by stealth fighters and bombers. This allows for greater efficiency, even less attrition, and overwhelming results.

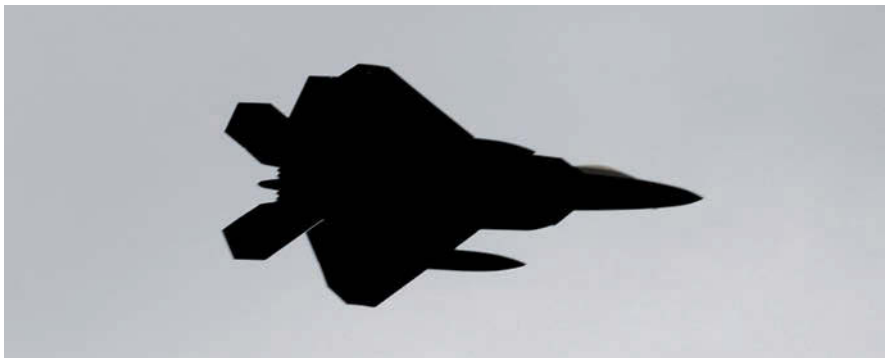
If DOD and the Air Force continue to invest wisely in the technologies required to stay at least a generation ahead of any potential adversary, and train USAF crews to think smartly and with innovation, then US forces can win quickly, decisively, and with low attrition regardless of the analysts' predictions to the contrary.

This investment and operational strategy paid big dividends when put to the test in Desert Storm. The Iraqis had netted together a sophisticated French-built IADS, called KARI. Analysts estimated that, outside Moscow, Baghdad had the highest concentration of air defenses of any city in the world. It consisted of the most modern, state-of-the-art Soviet SAMs and MiGs, including the MiG-29. Measured by the attrition models at the time, this threat array should have extracted an attrition rate of 10 to 20 percent during the first few days.

The air campaign, led by the stealthy F-117, succeeded because the coalition forces overwhelmed the IADS during three days and nights of intense air attacks. It was not easy and required a significant change in tactics after the second night of attacks. The attacking aircraft shifted from low-altitude attacks to medium-altitude attacks to avoid the intense, barrage, firing by small-caliber AAA and shoulder-fired SA-7 IR missiles that had downed several aircraft

USAF photo

Infrared image of a nighttime target, seen on an F-15E head-up display. Use of such systems to deny enemies respite from attack, combined with innovative tactics, have helped USAF keep down its own attrition and raise mission success rates.



USAF photo by SrA. Christopher Bush

An F-22 fighter goes through its paces over Guam. Stealthy fighters, bombers, and cruise missiles, as well as new electronic combat and cyber weapons, will be key to future attrition-denial schemes.

the first two days. Low altitude (under 200 feet) had been the preferred tactic, except for the stealthy F-117, in nearly all the training for defense suppression missions. Flying under 200 feet allowed the attackers to avoid radar detection and radar guided SAMs. In Desert Storm, however, the electronic suppression and lethal attacks by HARM missiles on SAM radars had negated the SAM threat early, allowing the Desert Storm air commanders, Lt. Gen. Charles A. Horner and Maj. Gen. Buster C. Glosson, to order attacks at medium altitudes and avoid the intense barrage fire at low altitude. This is another example of making changes during the course of the battle that are not accounted for in attrition modeling.

In Desert Storm, the coalition forces achieved complete control of the air within seven days with an attrition rate under 0.4 percent. For the entire war, the coalition lost one aircraft for every 1,800 combat sorties flown. However, the important lessons from Desert Storm were the execution of the SEAD campaign with smartly conceived force packages, operating inside the opponent's reaction time, employing stealth, electronic combat, decoys, and intense attacks with manned fighters, and changes in tactics as the campaign progressed, to reduce attrition and increase effectiveness.

In all three of these campaigns against formidable, state-of-the-art air defenses, the actual attrition was well below that predicted. Today, analysts in DOD and contractors supporting them are once again predicting that manned fighters and bombers cannot fly in the teeth of modern defenses without unacceptable losses. They conclude that only standoff weapons and unmanned vehicles should penetrate these defenses until, and if, the threats are reduced to zero or low threat conditions allow other aircraft to perform their missions.

There are many problems with this conclusion. First, as these three examples have shown, smart planners with multiple attack systems can plan SEAD campaigns that penetrate and take down even the toughest defenses with a combination of a few standoff attacks and many force packages with penetrating attackers and support systems.

The Human Touch

The objective of a SEAD campaign against IADS is to gain and maintain control of the air so as to allow unimpeded ground and air operations from that time forward. This requires the right forces, surprise, concentrated attacks to confuse the adversary, operating inside the opponent's reaction time, and destroying the nervous system of the IADS quickly and decisively as the three examples have shown. A force cannot do that with standoff attacks alone, or with unmanned attacks whose links can be severed, whose situational awareness is deficient, and whose operators cannot respond quickly as conditions change during execution of the mission. Thus, it is imperative that the US Air Force retain the capability to conduct full-scale SEAD campaigns with manned, penetrating bombers and fighters that can accomplish the mission with acceptable attrition.

This means continued fielding of fifth generation fighters, development of a new stealthy, manned penetrating bomber, a new stealth air launched cruise missile, and significant investments in stealth, electronic combat, and cyber technologies. As potential adversaries continue to field more capable IADS, DOD must stay at least a generation ahead.

Manned bombers and fighters also have much greater flexibility to change missions and to adapt to different scenarios than do cruise missiles and unmanned aircraft. Bombers and fighters can launch standoff weapons as well as penetrate. On the other hand, large platforms designed to act as "trucks" launching cruise missiles have little value in other applications.

Can modeling and simulation be improved, shedding its limitations so as to allow accurate predictions of the outcome of large-scale campaigns? RAND researchers, under contract to DOD, have recognized the severe limitations of campaign models that are forced to operate at higher and higher levels of complexity. DOD is attempting to increase the fidelity of its models and use them only for limited applications, but researchers acknowledge that no model can simulate the thousands of decisions and interactions that occurred in real-world SEAD campaigns such as the Linebacker II, Bekaa Valley, and Desert Storm examples. Models may be good for measuring relative outcomes in small encounters but not absolute attrition for large air campaigns.

As the Air Force develops the operational requirements for long-range strike, electronic warfare, and future combat aircraft, it needs to recall the historical examples that demonstrate that integrated air campaigns, with SEAD as the first priority, work if planned and carried out with vision and air leadership.

The challenge for Air Force leaders today is to recognize that, however potent they appear on paper, IADS have exploitable limitations. Then, they need to invest in the right sets of systems—bombers, fighters, weapons, electronic combat, deception, cyber—and aircrew training programs to defeat them, underpinned by a strong science and technology investment. This will ensure that future air forces do what past air forces have always done, gain and maintain control of the air quickly and decisively, despite the predictions of the critics who argue otherwise. That is, after all, the primary mission of the Air Force. ■

Retired Gen. John Michael Loh was commander of Air Combat Command (1992-95), commander of Tactical Air Command (1991-92), and vice chief of staff of the Air Force (1990-91). He flew 204 combat missions in the Vietnam War and retired in 1995 after 35 years of active duty service. This is his first article for Air Force *Magazine.*

Verbatim

There, Not Here

"We must continue to push our best talent forward and into the fight. I will take gaps in manning the Joint Staff in order to support the war. I expect combatant commanders and services outside of CENTCOM to consistently make choices, however painful, that fully support the fight."***—Adm. Michael G. Mullen, Chairman of the Joint Chiefs of Staff Guidance for 2009-2010, Dec. 21.***

The Soviet Mistake

"I'm the first to tell people that tactically, militarily, [the Soviets] did a lot of things well. But they killed more than a million Afghans in the process, and they created an environment in which the antibodies of the society literally surged against them."***—Gen. Stanley A. McChrystal, top US and NATO commander in Afghanistan,*** **Mideast Stars and Stripes,** ***Jan. 2.***

The Air Force in 2025

"I see an Air Force that will continue. There is a transition under way where certain things have become more prevalent. Certainly that is true about remotely piloted aircraft. The need for intelligence, surveillance, and reconnaissance certainly has ascended. But there are certain enduring qualities that will be true in 2025. What the joint team expects of us is to provide domain control of air and space on behalf of the joint team, [and] that will remain a prime imperative for the Air Force. I think, likewise, placing distant targets at risk wherever they may be on the planet will remain a driving imperative."***—Air Force Chief of Staff Gen. Norton A. Schwartz,*** **Air Force Times,** ***Dec. 22.***

The Airpower Mystique

"Airpower is not very well understood; however, it is often favored by politicians because it seems, on the face of it, one way to deal with a problem. It is seemingly cheap, although it really isn't. Also, it seems to give a sense of instant gratification."***—Angus Ross, Naval War College professor,*** **Westport (Conn.) News,** ***Jan. 1.***

The Decision on Iraq

"I was surprised initially with the speed at which we were going into Iraq, and I never understood it. ... Never to my knowledge, and I'm pretty sure I'm right on this, did the President [George W. Bush] ever sit around with his advisors and say, 'Should we do this or not?' He never did it."***—Richard L. Armitage, deputy secretary of state, 2001-05,*** **Prism** ***(new National Defense University magazine), December.***

Cyberwar 90 Percent Defensive

"If we led with attack, people would say, 'That's just nuts. That's completely irrational.' You've got to be about the defense."***—National Security Agency Deputy Director Chris Inglis, contending that 90 percent of US Cyber Command's focus will be on defensive measures,*** **Washington Post,** ***Jan. 3.***

Look, Up in the Sky

"It used to be that when three drones were in the sky over North Waziristan, it used to signify that an attack was forthcoming, and people would be scared of being hit. Now there are four or five drones in the sky all the time, and sometimes as many as six."***—Haji Pazir Gul, journalist in Miranshah, Afghanistan,*** **The National** ***newspaper (Abu Dhabi, United Arab Emirates), Dec. 27.***

Upsetting the Balance

"If we don't develop a missile defense system, a danger arises for us that with an umbrella protecting our partners from offensive weapons, they will feel completely safe. The balance will be disrupted, and then they will do whatever they want, and aggressiveness will immediately arise both in real politics and economics."***—Russian Prime Minister Vladimir V. Putin,*** **New York Times,** ***Dec. 30.***

It All Depends

"If you just want to go from point A to point B in uncontested airspace and gather targeting data, an unmanned system can do the job."***—Lt. Gen. David A. Deptula, USAF deputy chief of staff for intelligence, surveillance, and reconnaissance,*** **Defense Daily,** ***Dec. 15.***

Only Plausible Option

"Negotiation to prevent nuclear proliferation is always preferable to military action. But in the face of failed diplomacy, eschewing force is tantamount to appeasement. We have reached the point where air strikes are the only plausible option with any prospect of preventing Iran's acquisition of nuclear weapons. Postponing military action merely provides Iran a window to expand, disperse, and harden its nuclear facilities against attack. The sooner the United States takes action, the better."***—Alan J. Kuperman, director of the University of Texas at Austin Nuclear Proliferation Prevention Program,*** **New York Times,** ***Dec. 24.***

Where Does It End?

"To sustain public support, a protracted war needs a persuasive narrative. Americans after Dec. 7, 1941 didn't know when their war would end. But they took comfort in knowing where and how it was going to end: with enemy armies destroyed and enemy capitals occupied. Americans today haven't a clue when, where, or how their war will end. The Long War, as the Pentagon aptly calls it, has no coherent narrative. When it comes to defining victory, US political and military leaders are flying blind."***—Andrew J. Bacevich, Boston University professor,*** **New York Daily News,** ***Dec. 23.***

35—Plus More

"We definitely operate the aircraft at a higher rate here than we do back home. These are 35-plus-year-old aircraft, and they do take more of a beating here, but thanks to the great relationship we have between maintenance and operations, these planes keep on truckin' every day and should continue to do so for another 35-plus years."***—SSgt. Nick Kenneally, C-130H flight engineer deployed to Southwest Asia,*** **Air Force Print News,** ***Dec. 30.***

Deadly History of IEDs

"In Afghanistan, we are up against a determined and clever foe who mastered the use of this deadly technology long before our forces set foot in the mountains of the Hindu Kush. Recent translations of Soviet general staff studies reveal that the Soviets lost nearly 2,000 soldiers and 1,200 vehicles to IEDs [improvised explosive devices] during their nine-year Soviet-Afghan war. That IEDs have defeated another technologically advanced military, in the very same place we fight now, only adds to the urgency of our mission."***—Deputy Secretary of Defense William J. Lynn III, Dec. 30.***

Unified Response

The killer earthquake that shook Haiti touched off a massive USAF response.

Below, TSgt. Aaron Avery, standing in the cavernous cargo bay of a C-17 transport, prepares to release pallets of relief supplies on Jan. 18. The C-17 and aircrew flew the first humanitarian airdrop mission of Operation Unified Response, moving more than 69,000 pounds of supplies into earthquake-stricken Haiti.

USAF photo by MSgt. Shane Cuomo

***Supplies rigge
the capital, br
14,500 prepac
performed by
Airlift Wing, C***

USAF photo by SSgt. Desiree N. Palacios

Left, Haitians seeking to get off the island line up to board a C-17 at Toussaint Louverture Airport in Port-au-Prince. In this photo, a Haitian picks his way through rubble from the shattered National Cathedral, devastated by a 6.1-magnitude aftershock in Port-au-Prince on Jan. 20.

AP photo by Gerald Herbert

ed with parachutes float down toward inging 14,000 bottles of water and ked meals. The Jan. 23 airdrop was a C-17 and aircrew of USAF's 437th harleston AFB, S.C.

USAF photo by TSgt. James L. Harper Jr.

In the wake of Haiti's devastating Jan. 12 earthquake, which measured 7.0 magnitude on the Richter Scale, USAF and other US armed services mounted Operation Unified Response, a massive Total Force relief effort. As can be seen in the photos on these pages, airmen had key roles. ***|1|*** *An injured Haitian receives treatment from two Air Force Special Operations Command medics, MSgt. Douglas Brook (l) and TSgt. Nicholas Wentworth in Port-au-Prince.* ***|2|*** *A1C Brian Long, 87th Medical Group, Joint Base McGuire, N.J., carries a Haitian child from an ambulance to the base's passenger terminal.* ***|3|*** *Three airmen at JB McGuire load equipment on a C-17 bound for Haiti.*

USAF photo by MSgt. Russell E. Cooley IV

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USAF photo by SSgt. Danielle Johnson

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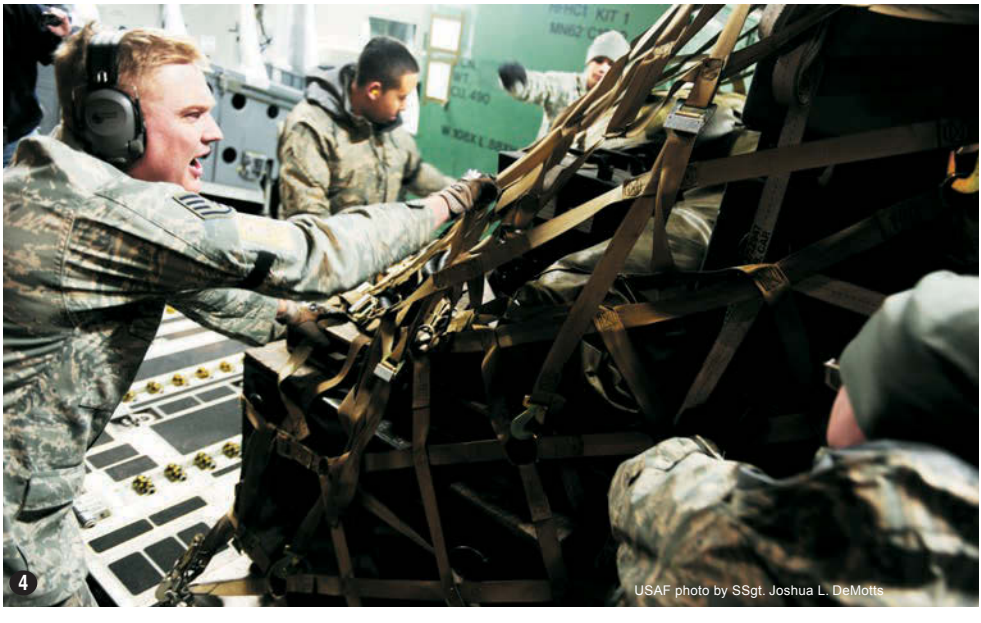
USAF photo by SrA. Katie Gieratz



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USAF photo by SSgt. Joshua L. DeMotts

|4| *Airmen of Air Mobility Command's 621st Contingency Response Wing at JB McGuire secure a pallet on a C-17. The deliveries often made life-and-death differences in the stricken island nation.*

*|**1**| Critical tasks were performed by USAF's combat controllers such as this unidentified airman of the 23rd Special Tactics Squadron, Hurlburt Field, Fla. Often, special operations airmen were first on a scene to re-open airfields and facilities. They also helped operate Toussaint Louverture to handle the stream of relief aircraft bearing equipment and supplies. |**2**| Military and civilian aircraft fill the airport ramp in Haiti. This photo was taken Jan. 16 by an OC-135 Open Skies aircraft of the 45th Reconnaissance Squadron, Offutt AFB, Neb. US authorities tasked the OC-135 to survey earthquake damage with its panoramic cameras. |**3**| Airmen from Hurlburt carry an injured Haitian to a medical treatment site. |**4**| Americans buckled into a USAF C-17 prepare to leave Haiti on a special Jan. 18 flight. This C-17 and crew, with the 452nd Air Mobility Wing, deployed from March ARB, Calif., to Haiti. |**5**| SSgt. Lynzey Thorton (r), a loadmaster of the 41st Airlift Squadron, Gulfport-Biloxi Arpt., Miss., and another unidentified airman load a Humvee onto a C-130J for the hop to Haiti. The massive scope of earthquake destruction and humanitarian need dictated round-the-clock airlift operations.*

*|**1**| Col. Todd Wall, a C-17 pilot, carries a sleeping toddler making the flight to the US. |**2**| Mobility airmen at Charleston shove a pallet of food and other consumables onto a C-17 bound for Haiti. The pallet was part of a 116,000-pound shipment of food and water needed by desperate Haitian survivors. |**3**| A pararescueman of USAF's 23rd Special Tactics Squadron and several other rescuers climb a ladder to reach a woman trapped for seven days in a collapsed building. |**4**| Detailed image of the devastated National Cathedral in Port-au-Prince, taken by an Air Force RQ-4 Global Hawk two days after the earthquake. |**5**| Civilian rescue teams, some of them bringing specially trained search and rescue dogs, were frequently ferried by C-17s to Haiti. Here, Ron Wickbacher and his dog, Dawson, wait their turn to board a C-17 at March.*

1 USAF photo by MSgt. Alvin Johnson

USAF photo by SSgt. Daniel Bowles

2

3 USAF photo by TSgt. James L. Harper

USAF photo

4

5 USAF photo by 2nd Lt. Holly Hess

USAF photo by TSgt. James L. Harper Jr.

USAF photo by TSgt. James L. Harper Jr.

USAF photo by SSgt. Joshua L. DeMotts

USAF photo by SSgt. Desiree N. Palacios

*|**1**| A combat controller from the 23rd STS at Hurlburt checks out the just-delivered pallets air-dropped into Port-au-Prince on Jan. 18. |**2**| Parachutes laden with life-saving supplies float from a C-17. The airlifter also has the ability to land on short and unimproved airstrips. |**3**| Airmen offload heavy equipment from a C-17 from Charleston at the Port-au-Prince airport. The airmen are assigned to the 621st Contingency Response Wing. Operation Unified Response is expected to continue for weeks to come. |**4**| Haitians standing in a queue are dwarfed by a C-17 parked at the airport terminal.*

*|**1**| Airmen at Charleston stand ready to help launch a C-17 for relief operations to Haiti. |**2**| The OC-135B aircraft took this shot of a C-130 on its final approach to the airport at Port-au-Prince. The devastation was documented in 10,000 feet of film photographed from the OC-135B. |**3**| Airmen at McGuire, having already loaded one Humvee, continue the task of filling this C-17 with humanitarian supplies and rescue gear. |**4**| Reservist Maj. Mark Smith, 437th Airlift Wing, performs a preflight walk-around inspection before the start of a relief flight in Charleston. |**5**| Air National Guardsmen assigned to the 156th Airlift Wing, Puerto Rico, guide cargo onto a C-130 during nighttime operations.*


1 USAF photo by SSgt. Joshua L. DeMotts


USAF photo by A1C Perry Aston
2


3 USAF photo by SSgt. Joshua L. DeMotts


USAF photo by SSgt. Joshua L. DeMotts
4


5 USAF photo by SSgt. Desiree N. Palacios

USAF photo by SSgt. Joshua L. DeMotts

1

USAF photo by TSgt. James L. Harper Jr.

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3

USAF photo by SSgt. Greg C. Biondo

USAF photo by SSgt. Desiree N. Palacios

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*|**1**| TSgt. Robert Mabry, a loadmaster of the 437th Airlift Wing, conducts nighttime preflight duties on a Haiti-bound airlifter. |**2**| Wheels down, a C-17 from JB McChord, Wash., lands at Port-au-Prince on Jan. 24. |**3**| A Japanese C-130 at Homestead ARB, Fla., awaits cargo loaded by Japan Air Self-Defense Force personnel and US airmen from Homestead's 70th Aerial Port Squadron. |**4**| With a civilian airliner in the background, combat controllers of the 23rd STS talk to aircraft circling the airport awaiting landing clearance. The earthquake put the control tower out of action. Once USAF combat controllers established operational control, humanitarian relief flights numbered 120 a day.* ■

The F-35 Lightning II makes its first flight.

Getting on With the Neighbors

Lockheed Martin photo by David Drais

USAF moves to ameliorate the concerns of citizens in communities near major Air Force bases.

By Megan Scully

As the Air Force considers where to base its fleet of F-35 stealth fighters, service officials are trying to strike the right balance between meeting the services' operational and training needs while being good neighbors to the communities just outside the base gates.

It's difficult—a challenge that Air Force installations increasingly have encountered in recent years. Some say that the 2005 Base Realignment and Closure (BRAC) round taught USAF the need to be more sensitive to community concerns. Others point to the fact that many once-isolated Air Force bases now have growing communities not far from their runways—making community more important than ever before.

This balancing act has become a central facet of the effort to bed down the F-35 fleet as officials work to address concerns about noise and the safety implications of fighter operations.

"The Air Force is very sensitive to those concerns, and we are taking those very seriously," said Kathleen I. Ferguson, deputy assistant secretary of the Air Force for installations. Individual communities' reactions to the possible arrival of the F-35 vary widely—even among different communities surrounding individual bases.

In some cases, one town fully supports the potential arrival of F-35s while neighbors are worried the noise of the new fighter could drive down property values and hurt quality of life.

In 2008, F-35 manufacturer Lockheed Martin and the Air Force Research Laboratory conducted a study at Edwards AFB, Calif., which found the F-35's takeoff and flyover noise was comparable to the F-22 and the Navy's F-18, but slightly louder than the F-16.

Acoustic levels, however, vary greatly depending on a number of conditions, including topography, weather, and time of day. All of this makes the exact noise levels of the F-35 a relative unknown for the bases that could receive the fighter.

To be sure, the Air Force has already considered the noise implications of the F-35 for the local communities surrounding the 11 bases that made the short list last year to become home to the first F-35s. But noise—or any other environmental issue—was far from an initial disqualifier.

In making up its short list, the Air Force considered each installation based on a 100-point scale of qualifications and characteristics. Ten of those points were based on environmental issues, three points related to noise factor, three related to encroachment, three to air quality, and one point was given to communities that passed legislation which protected the base from encroachment.

No bases were specifically eliminated from the short list because of encroach-

ment or noise issues, but the formal environment impact study is just now getting under way. This review—which will include input from the communities during public hearings at each installation—will look more closely at noise, encroachment issues such as development, and similar concerns. The environmental impact studies at each base need "to help guide our decisions as we move forward," Ferguson said.

The EIS will feed into other reviews, including site surveys to be completed by Air Combat Command and Air Education and Training Command, which will conduct detailed assessments of what would be required to bed down F-35s at each of the short list sites and how much it would cost. Combatant commanders' requirements will also be considered in the final decisions, the first of which are expected in early 2011.

As the process unfolds, the Air Force's goal is to be "open and deliberate and transparent" with the communities, Ferguson said. But the need for communication with local communities extends well beyond the F-35 to include other Air Force programs and initiatives such as basing new unmanned aerial vehicles, the MC-12 intelligence-surveillance-reconnaissance aircraft, and the C-27J small airlifter.

"We're committed to working with all the communities closely," Ferguson said. "Really, our installations, people, missions can't be successful without support from our communities," she added.

Nowhere has community concern over the F-35 received more attention than at Eglin Air Force Base in Florida, which was tapped during the 2005 BRAC round to host the initial F-35 joint training schoolhouse.

As part of that BRAC decision, the Air Force initially planned to base 107 F-35s at Eglin, but last year trimmed the initial deployment to 59 aircraft. Despite the smaller number of fighters guaranteed for Eglin, anxiety over the F-35s has not abated in nearby Valparaiso. The town's population of 6,000 is particularly affected by the runway that runs north and south on the base.

Neighboring Niceville (and the Niceville-Valparaiso Chamber of Commerce) fully supports the arrival of F-35s. The arrival of the F-35s would bring in new full-time base personnel, who would breathe new life into local real estate markets, local boosters point out. Meanwhile, an influx of student pilots from the United States and other countries would fuel local restaurants, shops, and other businesses—and potentially provide a future base of loyal tourists for the area along the Gulf of Mexico.

"That's really what we're hoping for," said Jim Heald, the chairman of the chamber's Military Affairs Committee and a retired Air Force colonel. "It will be an impact."

Suing the Air Force

But the city of Valparaiso filed a Freedom of Information Act lawsuit against the Air Force in 2008, which was settled in July 2009. The city council, concerned that the Air Force's newest fighters would be far noisier than the F-15s, which took off from Eglin's runways for 30 years, also voted last year to sue the Air Force for failing to seek alternatives to mitigate the potential noise from the F-35. Both sides are still negotiating a settlement for the suit.

"While we cannot comment further on pending litigation or our hopes and/or expectations, we have continuously maintained an open relationship not only with the city of Valparaiso but all of the surrounding communities," said Maj. Gen. Charles R. Davis, Eglin's Air Armament Center commander. "Most importantly, we have heard the communities' concerns and are looking into every available avenue to determine mitigation measures to support the mission and address [the] communities' concerns."

Alternatives include more heavy utilization of the runway that runs east to west on the base and using noise mitigation flying techniques for the F-35s.

Service officials are currently conducting a supplemental environmental impact study reviewing the beddown of the 59 F-35s, as well as the consequences and potential mitigation if the Air Force decides to increase the number by up to another 48 aircraft. That study will be completed in September.

As the service weighs how to abate the noise of the F-35s, Valparaiso Mayor Bruce Arnold already is declaring victory on the issue.

"Essentially, I feel that we have prevailed in our suit," he said. "Our suit was from the standpoint that we felt that the Air Force did not look at sufficient alternatives to mitigate the noise problems over our city."

Rep. Jeff Miller (R-Fla.), whose district includes Eglin, emphasized that the "vast majority" of his constituents support the arrival of the F-35. Valparaiso's opposition "has slowed the process down," he added.

In October, Luke AFB, Ariz., won a major basing victory when it made the short list to become a training site for the F-35. But just to the north of the base, the city of El Mirage, Ariz., has staked out a lonely position as a voice of discord in the community discussions about possibly bedding down the F-35 in the fast-growing area 20 miles west of Phoenix.

El Mirage officials insist that they don't want to see the situation escalate into a bitter battle similar to Valparaiso's. Instead, they say, they are supportive of bringing the F-35 to Luke as long as officials can assure them upfront the noise will not adversely affect their community. But the issue has already caused the city's mayor, Fred Waterman, to resign last year. Waterman said he had "become a lightning rod for anger and negativity both from within and from outside of our city" because of issues at Luke.

The city's new mayor, Michele Kern, continues to express concerns about the noise implications of the F-35. Stacy Pearson, a spokeswoman for the city, said El Mirage officials are not opposed to the F-35, but they would like an F-35 test flight at Luke so they can hear for themselves whether the airplane is louder than the F-16s the community is used to. Pearson added that the city, which is situated just off the landing approach, wants assurances the noise will be a significant part of the scoping for the EIS.

"You can be supportive of a base and still ask questions about what it is going to do to your property value," Pearson said.

The city's refusal to back the F-35—including its decision not to take part in an online pro-F-35 campaign called LukeForward.com—has caused a rift with its neighbors. The online campaign, which so far has registered nearly 15,000 supporters, addresses the noise issue on its Web site but stresses that the environmental impact study will consider it "as part of its site-specific data collection."

Other cities that have signed on to LukeForward.com don't see it the same way as El Mirage.

The city of Goodyear, south of the base, would be affected by most take-offs and has backed the fighter's arrival despite the possibility of increased noise. Goodyear Mayor James M. Cavanaugh points to the communi-

USAF photo by MSgt. Robert W. Valenca

An F-16 belonging to Singapore prepares for a Red Flag exercise at Nellis AFB, Nev. The booming city of Las Vegas is visible in the background.

ties' need to keep Luke a viable and busy base—something the F-35 mission would do for decades to come. Luke's economic impact on the state is estimated at $2.1 billion annually.

"Not having Luke Air Force Base would have a significantly more dramatic change in our quality of life and our property values than having a noisy airplane," said Cavanaugh. "Not getting the F-35 would be a blow to Luke and this local area," he added.

Rusty Mitchell, director of Luke's community initiatives team, acknowledged that El Mirage's relationship with the base and the other communities surrounding Luke has become "strained" over the issue.

"The bottom line is the [environmental impact study] is the appropriate venue for the public to have their comments, concerns, and questions addressed and answered," Mitchell said. "We're just starting the process." Mitchell stressed that Luke has long had a good relationship with the community, which has supported compatible development practices as the population has grown around the base.

Indeed, Arizona has provided extensive legislative protections for Luke and its two primary auxiliary airfields, causing state officials to boast that it is the most statutorily protected military facility in the country. In 2001, Arizona memorialized in law the noise lines from a 1988 noise study, resulting in a legislatively protected area roughly twice the size of the current F-16 mission at Luke. And in 2004, Arizona passed an additional law which afforded the same protections at all auxiliary airfields plus the base's main airfields.

Meanwhile, there are ongoing efforts to annex lands to provide further protection for Luke's flying mission.

"We don't use the word 'encroachment' here at Luke," Mitchell said. "We use the words 'managed growth.'"

Support in Las Vegas

As the area around Nellis AFB, Nev., has become more densely populated, officials at the once-isolated installation north of Las Vegas have put an increased focus on reaching out to the local community. When the Air Force decided years ago to bed down 36 F-35s at Nellis starting in 2012, few in the community balked despite the fact that nearby North Las Vegas has doubled in size—to more than 200,000 residents—in the last 10 years.

Nellis officials attribute the support to the base's successful outreach efforts. "We've been here for [nearly] 70 years, but we want to make sure we can continue to be here for the next 70 years," Deborah MacNeill, director of public partnerships at Nellis, said of the base's efforts to communicate with the community on all matters, including the F-35.

Nellis has seven different types of aircraft in its inventory, including the F-22, and another 20 which operate on its runways on a transient basis—probably leaving local residents prepared for changing noise levels. Luke, although a busy base, only has F-16s.

In 2008, a draft environmental impact study found that basing the F-35s at Nellis would expose nearly 14,000 people to "unacceptable" noise levels. The draft study, which drew nine comments from local citizens, recommended the Air Force mitigate the noise levels before issuing the final report. The final report has not yet been released.

"Mitigation options include additional public involvement in noise abatement decisions, education programs on noise attenuation measures, assessments of the adequacy of existing soundproofing, and funding and technical assistance to sensitive receptors and communities to reduce the adverse noise levels," the draft report states.

Meanwhile, the city of North Las Vegas is working with Nellis to ensure that its growth is compatible with Nellis' mission. Frank Fiori, director of planning and zoning for North Las Vegas, said they do get a few calls from citizens concerned about noise and refers those to the base as they await the results of the final EIS.

"We did review the draft EIS, we did air our concerns and comments, and we'll wait and see," Fiori said. He added that the base's concerns have not risen to the level of calling in outside consultants or doing any sort of additional studies to counter or challenge the environmental study that was done.

In the meantime, the base continues to work closely with the city and Clark County, which includes North Las Vegas, to ensure the two entities can continue to co-exist and even expand without harming the other.

"Compatible uses are the best way to ensure that bases are good neighbors," MacNeill said. For instance, the base and the local government have been working together on a 11,000-acre area which functions as an all-terrain vehicle park. The county wants to turn it into a multiuse recreational area and have more organized events there. Local officials are working with the base to ensure that any activities and crowds would stay outside Nellis' noise or departure area.

"The planning is the key," MacNeill said. "And the Air Force is recognizing that they need to be a more active community partner." ■

Megan Scully is the defense reporter for National Journal's *CongressDaily in Washington, D.C., and a contributor to* National Journal *and* Government Executive. *Her most recent article for* Air Force *Magazine, "High Velocity Maintenance," appeared in the August 2009 issue.*

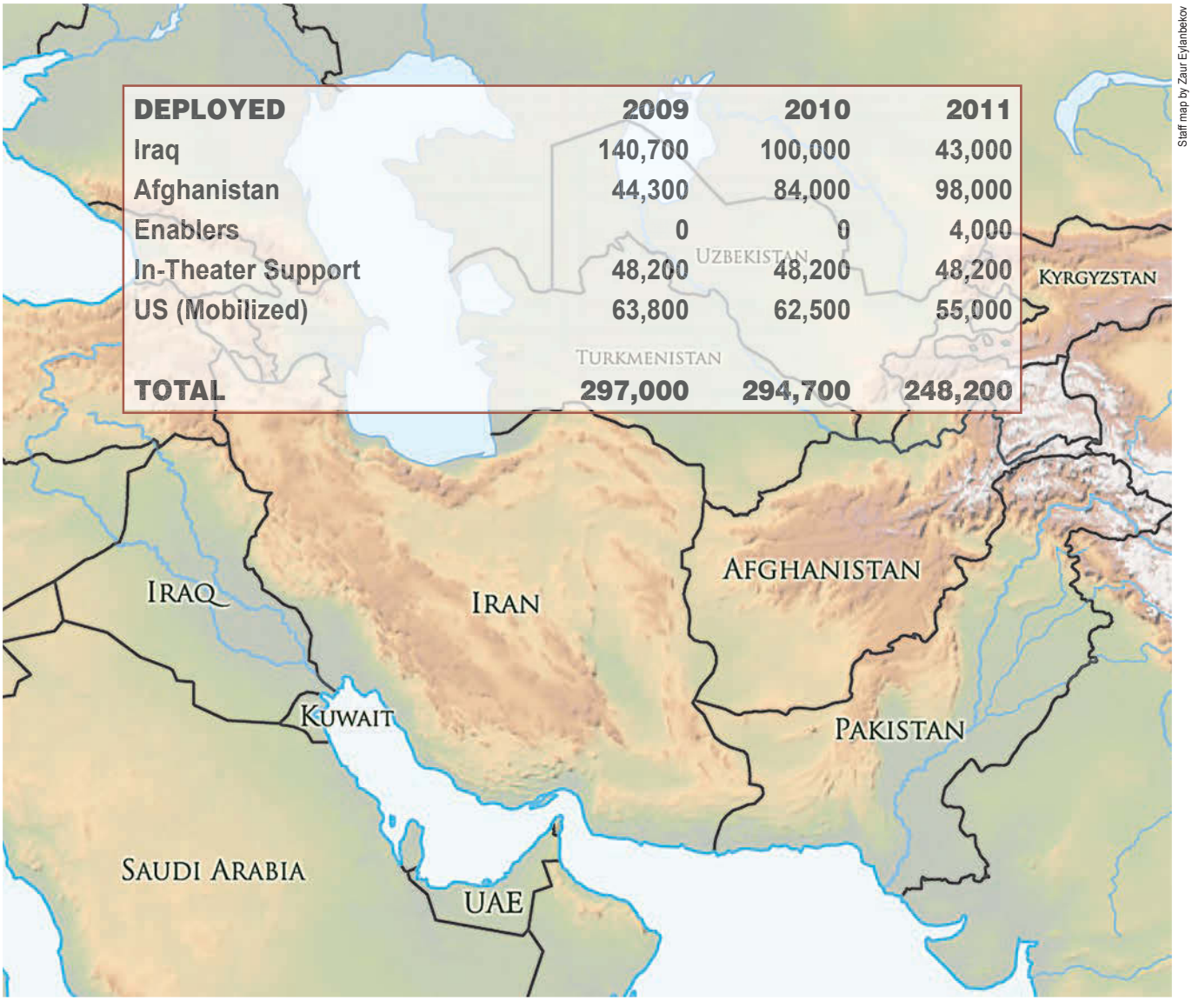
Chart Page

By Tamar A. Mehuron and Heather Lewis

Where the Troops Are

In this year, the US force making war in the Greater Middle East will average 294,700 troops of all services. Of this number, 79 percent will be in-theater and 21 percent mobilized in the US. In the following fiscal year, the American force in Iraq will be cut by more than half, while the contingent in Afghanistan more than doubles in size, compared to what it was in 2009. These, at least, are the assumptions built into DOD's latest budget, made public on Feb. 1.

US Service Personnel in Greater Middle East Wars



Staff map by Zaur Eylanbekov

Source: FY 2011 budget documents, Department of Defense, Feb. 1, 2010.

The Super Galaxy

A C-5M is heavily modified with new engines and more than 70 other improvements.

Lockheed Martin photo

By John A. Tirpak, Executive Editor

The C-5M's new engines, advanced controls, and other features could turn the Galaxy from problem to star performer.

Tests of newly upgraded C-5 Galaxy airlifters, which were wrapped up in January, have proved that the giant aircraft can be rendered operationally relevant for several decades to come. The results, in conjunction with a soon-to-be-released major mobility study, may reopen debate about the proper mix of strategic lift aircraft.

The operational evaluations were conducted throughout late 2009. They demonstrated that C-5s equipped with new engines, new avionics, and about 70 other improvements will climb faster, fly farther, and break far less often than the standard Galaxy.

This gives the Air Force a more reliable and useful asset. In fact, the improved C-5s broke many aeronautical records with a large payload, and made dozens of trips to the Middle East without interim stops or enroute aerial tanking. The results have impressed the Air Force leadership, which may reconsider its C-5 strategy later this year.

"The tests thus far have been very positive," said Air Force Chief of Staff Gen. Norton A. Schwartz in late January.

USAF photo by A1C Kenny Holston

Shown, back to front, are a C-5, C-17, and "stretched" C-130. Modified with a major upgrade, C-5Ms like the one below broke time-to-climb records and moved massive amounts of cargo in a surge exercise.

Lockheed Martin photo

Plans call for the Air Force to submit its final C-5 operational test report sometime this month. Schwartz noted that it will be considered in light of the new Mobility Capability and Requirements Study, to determine just how many C-5s USAF will seek to retain, and how many of those get re-engined.

The last major mobility study, completed in 2005, talked about roughly 300 airplanes in the strategic lift fleet, noted Schwartz. When the new MCRS is complete, he went on, "we'll make a determination—based on cost of operations—on what's the right mix, and how do we maintain the right number of platforms that will provide the reliability and cost of operations that we can effectively carry forward."

In other words, the Air Force will try yet again to find the right balance between new C-17s and upgraded C-5s, modified for extended service lives.

The C-5 fleet was divided into two main batches: the C-5As, which date back to the 1960s, and the C-5Bs, which were built in the 1980s. Two C-5Cs, converted from C-5As, are specially configured to carry exceptionally large cargo, such as rocket sections.

All C-5s are getting an upgrade called the AMP, for Avionics Modernization Program. The AMP provides modern navigation and communication equipment so that C-5s can function in modern civil-controlled airspace around the world. The AMP also provides a "digital backbone" for the airplane, solving many reliability problems stemming from analog electronic systems that are obsolete, and for which parts are no longer available. In the cockpit, pilots now have modern flight controls and amenities such as moving map displays and color multifunction displays to replace vast rows of "steam gauges."

Bad Actors

The AMP is the prerequisite for the second, more elaborate upgrade, which for now is only being performed on the younger C-5Bs. That second upgrade is the RERP, for Reliability Enhancement and Re-engining Program. The RERP replaces the C-5's old engines with a new variant of the General Electric CF6, which is employed on large commercial aircraft such as the 747 and 767 and USAF KC-10. The new motors provide far more power, and require far fewer overhauls and service events, meaning the RERP will greatly reduce the C-5's downtime.

Lt. Col. Michael Semo, C-5M program officer at Dover AFB, Del., noted that the new engines only need to be taken off the airplane every 10,000 hours for a major service, versus 2,000 hours for the existing engines.

"Multiply that by four engines per aircraft, ... and you see that this is a tremendous improvement in capability for us," he said. "That translates directly into a better mission capable rate."

Most problems that plague unmodified C-5s can be chalked up to engine headaches, although there are many other "bad actors" that hobble the aircraft as well. The RERP encompasses about 70 improvements, ranging from engine replacement to structural, hydraulic, and electrical enhancements, flight controls, and landing gear.

Aircraft that have received both the AMP and RERP upgrades are now designated C-5M.

In January, there were 59 C-5As, 46 C-5Bs, two C-5Cs, three C-5Ms, and one well into conversion, for a total of 111 aircraft.

The Air Force began its own internal debate on what to do with the

USAF photo by Nan Wylie

A1C Justin Fleming (l) and Amn. Alisha McKinney change a fuel probe on a C-5's wing. Galaxys receiving new engines will require fewer maintainers.

C-5s a decade ago. The aircraft at that time were poor performers, with mission capable rates dipping as low as 50 percent. The somewhat smaller C-17 offered an attractive capability in a brand-new airframe, able to carry outsize and oversize gear directly to shorter forward airstrips where the C-5 could not go. It was also assumed that the C-5As, already several decades old, were not worth updating because of their age.

However, fleet viability assessments showed that the C-5s were not really in very bad physical shape, despite their age. In 2004, a physical teardown analysis of a C-5A confirmed that the Galaxys had a probable life of more than 45,000 flying hours when they were built, of which about half has been consumed. Destructive testing of a C-5A in 2006 found no major structural problems.

"This aircraft is going to fly to 2040. Or beyond," said Lorraine Martin, Lockheed Martin vice president for the C-5 program. "2040 is really the minimum that they did the analysis against, but it can fly past that."

Once it was determined that the C-5 could go the distance, structurally, it remained to be seen whether the planned improvements in the RERP would actually deliver the on-time reliability and improved efficiency USAF needed to see to justify the upgrade as worthwhile. However, development costs of the RERP began to climb, and the project was deemed to be in breach of the Nunn-McCurdy Act, a law that stipulates that programs must be terminated or restructured if their costs grow unacceptably. The Pentagon responded by slashing the scope of the RERP to the C-5B models only. The C-5As, top Pentagon leaders decided, would get only the AMP to render them able to operate safely under new global air traffic management protocols.

Unprecedented Performance

While the RERP appeared to be in trouble, Congress continued to add C-17s to the Air Force's budget, even though the service did not request them and maintained that it only needed around 300 strategic airlifters, based on the 2005 mobility study.

When he was head of US Transportation Command, Schwartz in 2008 told Congress that the Air Force would have to cut back on something else if it were to afford the operation and maintenance of the unrequested C-17s.

"If you build above 205 C-17s," Schwartz said in budget testimony two years ago, "it means taking capacity out elsewhere, which probably means C-5As." Congress banned the Air Force from retiring any C-5s until the RERP testing was completed. In the meantime, Congress funded the Air Force for 223 C-17s, about 50 more than when the service first said it had enough.

This year, Schwartz seemed not to have changed his mind about reducing the size of the strategic fleet.

"I would say, we're going to retire some C-5As," Schwartz said in January, before the 2011 defense budget was unveiled. "Certainly, we're going to propose that, both to the leadership in the Pentagon and on Capitol Hill." However, he added that "it is not necessarily a closed door what will happen with the remaining aircraft that will stay with us some number of years," indicating that the Air Force may, indeed, petition to have the C-5As reinstated in the RERP.

As a surge test in the four-month operational evaluation, the three initial examples of the C-5M—one converted C-5A and two converted C-5Bs—flew 34 sorties in 31 days, flying war supplies directly from Dover to Incirlik

AB, Turkey. They moved so much cargo—3.8 million pounds—so fast that Incirlik became bottlenecked; the Air Force couldn't move the supplies on to their final destinations in-theater as quickly as the C-5Ms were bringing them in.

The on-time and surge performance was unprecedented for C-5s, long notorious for takeoff delays and scrubbed missions due to system breakdowns. However, the fact that the Incirlik missions were flown directly signified a new capability. A C-5A or B would have made a stop in Spain or required an aerial refueling tanker en route, or both, with a need for additional air and ground crews and the likelihood of an on-ground maintenance problem along the way—and at either end.

Versus unmodified C-5s, the C-5Ms saved more than 354 hours by going directly—nearly 15 days of additional capacity. Avoiding the enroute stop and flying at more efficient altitudes also saved 1.32 million pounds of fuel, or nearly 200,000 gallons.

"We achieved 103 percent mission reliability," said Semo. "We had 33 missions scheduled and flew 34" in the time allotted. The cargo flown was mostly "pallet trains" that roll on and roll off.

"That's what modern technology engines do for you," said Schwartz. The improvement was "significant," he said.

Capt. Cory Damon, a C-5 pilot and a participant in the surge test, said, "This is the C-5 you've always wanted. ... The performance is fantastic."

All programs are judged against what are called Key Performance Parameters, or KPPs. In the case of the RERP, the C-5Ms met all those required performance marks with room to spare. Mission capability, for example, had to be raised from the 50-to-60 percent range to 75 percent or better, which would bring it in line with USAF's standards. During the Air Force Operational Test and Evaluation Center tests, the C-5M racked up a 77.4 MC rate and a 94.4 percent launch rate.

The modified aircraft beat by nearly five minutes the required 25 minute climb to 31,000 feet on a hot day with a large payload, allowing them to rapidly reach what Damon called "the sweet air" of favorable flying altitudes. They surpassed the noise and emissions requirements of the FAA and foreign aeronautic agencies, achieved a break rate of 8.5 per 100 sorties, against a requirement for 10.5 or fewer, and surpassed the repair rates after four, 12, and 24 hours by a comfortable margin.

MSgt. James J. Busbea, a C-5M flight engineer involved in the operational test and evaluation, said the C-5A which was converted to a C-5M "in the surge, did as well as the [converted] B models." There were only "minor differences" in repair of the two flavors of C-5M, he said.

The results—which were still unofficial in late January—more than met the minimum performance USAF demanded in order to win approval to go ahead with modifying a significant portion of the C-5 fleet.

Not a No-brainer

In January, Pentagon acquisition chief Ashton B. Carter approved completion of the first low-rate initial production aircraft in the RERP. His actions gave the green light to finish three aircraft, start modifying five more, and buy parts for modifying a further seven.

"What's been most satisfying to me is that the operational results we're seeing today really do match or exceed what our engineering models were telling us back when we were designing this program," said Lockheed Martin mobility programs vice president Jim Grant.

"What we've seen with the first three test airplanes, and what we've seen in production now, is that ... those predictions are in fact accurate."

Quoting an Air Force estimate, Grant said the C-5 RERP "pays for itself" over the coming decades, based on the reduced cost of ownership and reduced usage of fuel.

Because it is a larger airplane than the C-17, the improved C-5M can also now fly farther than the C-17, while carrying twice the number of pallets and, in most cases, twice the number of outsize vehicles such as mine-resistant, ambush-protected all-terrain vehicles (M-ATVs), Apache helicopters, tanks, or armored personnel carriers.

By January, 60 C-5s had received the AMP, at program acquisition unit cost (in 2006 dollars) of $12 million apiece, and an average unit cost of $8 million (the first number includes research and development and facilitization; the second is the cost of just buying and installing the upgrade). The RERP, in 2008 dollars, costs $136 million a copy including R&D, and $109 million without counting start-up costs.

Congress has compared the AMP and RERP on the C-5—between $117 million and $148 million each, depending on how you count—against the cost of a brand-new C-17, with a pricetag of between $200 million to $250 million a copy. So far, it has funded both.

Applying the RERP to the C-5As, however, is "not the no-brainer it would appear," a senior Air Mobility Command official said.

Speaking on background, the senior official noted that the current schedule will not modify all the C-5Bs to C-5M configuration until 2016. At that point, he said, the C-5As will have aged another decade since the teardown analysis that evaluated their remaining life.

"We will have to see, in six years, whether that would still be an economical

USAF photo by Sue Sapp

A Galaxy is masked in preparation for paint removal. Sharply improved C-5 reliability will give USAF the equivalent of dozens more airlifters.

USAF photo

One of the first C-5s, circa 1970, in the "European One" camouflage scheme. The C-5s are now expected to serve to 2040 at least.

use of dollars, which we will not have in unlimited supply," the official said.

Gen. Duncan J. McNabb, head of TRANSCOM, said a year ago that he would be happy to "grow the force structure a little bit" with the increased capability that would come with performing the RERP on the C-5As as well as Bs. The additional capability could help offset the heavy use of C-17s, whose service lives are being consumed at a much faster rate than planned, he told a House Armed Services subcommittee. However, the extra RERPs would only be possible if the cost of the modification continues to come down.

That could happen. Lockheed Martin has been very aggressive in pursuing cost reductions on the RERP, Lorraine Martin said. In the cavernous hangar at Lockheed Martin's Marietta, Ga., plant where the RERP is performed, scaffolding has been erected all around the C-5s receiving the modification, as well as within them. Everything workers need to do their job is at their fingertips; otherwise, they would have to climb down and then up what amounts to a seven-story building to get parts and tools. It's part of an overall effort to find any time or process savings possible.

Jigs have been created that reduce alignment time of some parts from weeks to hours, Martin noted. In each of the four spaces available for the RERP in Marietta, the company has invested $6 million to streamline the process, she reported.

"The savings we'll see, not only in touch labor but in time, are going to be fairly dramatic," she said. "We expect to get the 12-month process that we're using on this aircraft down to eight months when we're at full rate. That's a fairly significant benefit, getting the aircraft back in the fight four months earlier."

Lockheed Martin will ramp up to a rate of 11 C-5M modifications per year at Marietta. It is using the same hangar space to do the RERP as it did in assembling the behemoths 25 years ago.

Low Hanging Fruit

She said the RERP contract is of the "fixed price, not-to-exceed" variety, meaning it behooves Lockheed Martin to make as many efficiencies as it can. If cost reductions are substantial enough, the government and the company will each share in the savings.

Martin said that in working on the As and Bs, the only apparent difference is that "the wiring is a little older" in the As, but Lockheed has found no major differences in the condition of the As and Bs. The aircraft, however, are inducted for the RERP upgrade having already gone through the AMP and a programmed depot maintenance, which is in itself a comprehensive overhaul.

The build rate of 11 C-5Ms could be increased, Martin said.

"We would love [to have] a higher build rate ... to have a more efficient line. And we've already shared our thoughts with the Air Force either for the current program, if things were to change for them, or if they want to add additional aircraft."

She said that Lockheed Martin could "add a couple easily" to go up to around 13 RERP aircraft a year, "or we could start earlier. We don't get to 11 until five years from now; we could start that earlier and we could add a couple of aircraft. If we wanted to go higher ... than 11 plus two or three, then we would look for additional infrastructure," since the giant hangars at Marietta would be full-up. She said the company has explored using facilities in other locations around the country "that are well-suited for C-5 maintenance, size-wise."

The most that could be done would be 15 to16 a year without adding more facilities and people to the process, Martin said.

The C-5M converted from an A model "performs just as smoothly" as the two converted from C-5Bs, Martin said, "so it's a capability that's there for the Air Force, Guard, or Reserve to use those aircraft, should they decide to do it."

The 70 or so items included in the RERP did not capture the entire list of things the Air Force wanted to improve on the C-5; some were left off to make the program more affordable. Those items not making the cut included landing gear modifications and other "low hanging fruit" that the C-5 depot, Warner Robins Air Logistics Center, Ga., is considering "as they go through their sustainment and supportability working groups with AMC," Martin noted.

The C-5s are also being fitted with the Large Aircraft Infrared Countermeasures (LAIRCM) system to give them protection against heat-seeking missiles. Without the countermeasures, they could only be flown to the most secure airfields, but the addition of the self-protection system will allow the C-5s to operate anywhere the Air Force has a runway of sufficient size. The LAIRCM is also being installed in Marietta.

The senior Air Mobility Command official said his organization has only done some preliminary planning for how the C-5M will be utilized in the force.

"Certainly, it will be able to go more places, ... more hot, high fields," though not necessarily shorter fields. He said, "It's really too early to think along those lines until we get the MCRS and know how many slots we'll have available." However, even if the C-5M is used "in just the same way" that AMC has used the C-5As and Bs, "we will be saving a whole [lot] of gas, and that will be a huge force multiplier in the years to come."

Semo, however, observed that the C-5Ms are already making a difference. Having completed the operational test, the first three C-5Ms have been "turned over to the operational force" and are flying operational missions. Given the faster time to move extremely heavy cargo—such as M-ATVs—"if it gets there a day sooner, ... it doesn't get any better than that." ■

Stiletto—Sleek, Stylish, and Slow

Photo by Douglas Aircraft Co. Text by Andrea K. Dudney

In this 1953 photo taken at Edwards AFB, Calif., admirers ogle the one and only X-3, an experimental aircraft built by Douglas Aircraft. The futuristic, needle-nosed craft—dubbed "Stiletto"—was created to test aircraft at sustained supersonic flight, but it was underpowered and could not exceed Mach 1. USAF turned it over to the National Advisory Committee for Aeronautics, which retired it in 1956. ■

Hogs of a Higher

Once, the Idaho ANG's A-10s were blunt instruments. Now they are exceedingly precise ones.

Photography by Jim Haseltine

Order

Two C-model A-10 Thunderbolt IIs, modified with high-tech precision engagement equipment, head out over the rugged Sawtooth Mountains of Idaho. The Warthogs belong to the 190th Fighter Squadron, a Boise-based outfit making the transition from heavy air assault to pinpoint attack.

The A-10C has been called "best friend to the boots on the ground." The reason is clear: Its precision engagement technology allows this heavy hitting close air support aircraft to also use a variety of laser and satellite guided weapons, in addition to its legendary 30 mm cannon, threatening more high-value targets with less risk to Blue Forces. In recent months, the Idaho Air National Guard's 190th Fighter Squadron made the shift from A-10A to C models. ***|1|*** *Two A-10s skirt the rocky peaks of the Sawtooth range—suggestive, to some, of terrain in Afghanistan.*

|2| *A pair of Cs head off on a training mission.* ***|3|*** *A heavily loaded A-10 will pack an outsize punch, when it must.* ***|4|*** *Lt. Col. Anthony Brown looks over the log books prior to the preflight walk around of his aircraft.*

|1| *Maj. Kyle Carpenter preflights his aircraft. The C model marks a significant upgrade in sophistication. Some new features seen here include a new cockpit layout with color multifunction displays, up-front controller, and head-up display. Others are digital stores management, Litening and Sniper advanced targeting pods, and variable message format.* ***|2|*** *A pilot rolls in and pulls the trigger of the A-10's GAU-8/A seven-barrel Gatling gun, a system capable of firing 3,900 30 mm rounds per minute.* ***|3|*** *A Warthog pilot releases an inert GBU-12 laser guided training bomb on a training sortie.* ***|4|*** *This A-10 unloads a pair of BDU-50 high-drag weapons, with "ballutes," at low altitude.* ***|5|*** *Two A-10Cs head toward Saylor Creek Bombing Range near Mountain Home AFB, Idaho.*

*|**1**| An A-10 pilot lines up on a target while talking to ground controllers on the range. He is tracking his target through the Litening-Advanced Targeting pod on the outside pylon of the right wing. |**2**| A pilot orbits around the range after releasing one of his inert GBU-12 LGBs, which raises some dust far below. |**3**| During the transition to the A-10C model, the 190th FS has been conducting work up exercises and weapons release tests to bring the unit to top form. |**4**| After entering the Saylor Creek range complex, one part of a two-ship peels away to prepare for weapon releases. |**5**| A four-ship of A-10s join a Utah ANG KC-135R tanker over southern Idaho. |**6**| A pilot conducts a "ripple two" release of inert GBU-12 LGBs.*

1


2

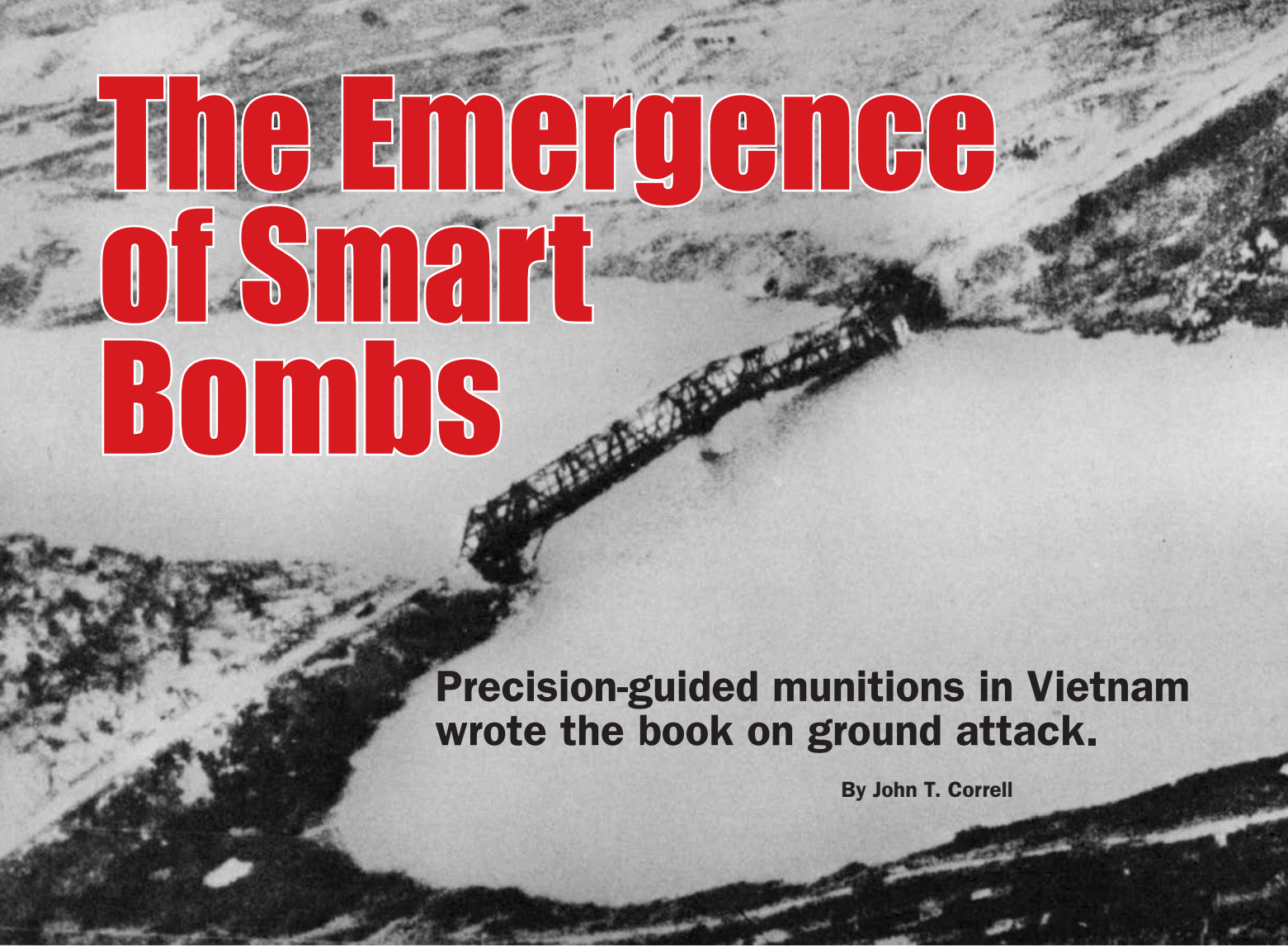

3


4


5

6

|1| *During a CAS training sortie, a pilot banks his Warthog toward the target.* ***|2|*** *Done flying, two 190th FS pilots walk back to the squadron for debrief.* ***|3|*** *One of a pair of A-10s sits in the precontact position while preparing to refuel from a KC-135.* ***|4|*** *A 173rd Fighter Wing F-15 from the Oregon Air National Guard leads a three-ship formation with two A-10Cs over mountainous central Idaho. The A-10 was already a rugged and fearsome performer, and the A-10C upgrades ensure the Hogs will remain effective fighters for years to come.* ■



The Emergence of Smart Bombs

Precision-guided munitions in Vietnam wrote the book on ground attack.

By John T. Correll

The Dragon's Jaw bridge at Thanh Hoa was the toughest target in North Vietnam. It was 540 feet long and crossed the Song Ma, a river 70 miles south of Hanoi. A railroad track ran down the middle, with a highway lane on either side. The bridge rested on a massive center pillar of reinforced concrete, 16 feet in diameter. The abutments were solidly anchored in the hills on both sides of the river.

This bridge was a replacement for the original one built by the French before World War II. Viet Minh insurgents managed to destroy the first bridge in 1945 by staging a collision in the center of it by two locomotives loaded with explosives. North Vietnamese leader Ho Chi Minh presided at the opening of the new—and stronger—bridge in 1964.

At the outset of the Vietnam War, the US Joint Chiefs of Staff rated the Dragon's Jaw as No. 14 on the list of the most important targets in North Vietnam. It carried the only railroad in the North Vietnamese panhandle and was a key link in the supply route supporting the war in the south. When the Rolling Thunder air campaign began in 1965, the bridge was selected for early attack.

On April 3, 1965, Lt. Col. Robinson Risner led a strike force of almost 80 aircraft from bases in Vietnam and Thailand against the Dragon's Jaw. The actual attack was conducted by 31 F-105s from Korat Air Base in Thailand, half of them carrying Bullpup missiles and half with 750-pound general-purpose bombs.

Planners had expected the attack to drop the bridge. However, neither the missiles nor the bombs caused any appreciable damage. One pilot said the Bullpups, which had lightweight 250-pound warheads, simply "bounced off" the target.

The next day, Risner led a restrike by 46 F-105s. This time, they left the Bullpups at home and hit the bridge with some 300 bombs, but the results were no better than before. Two further strikes in May closed the bridge briefly for repairs. Large mines, dropped upriver by transport aircraft, floated into the bridge abutments but they had little effect.

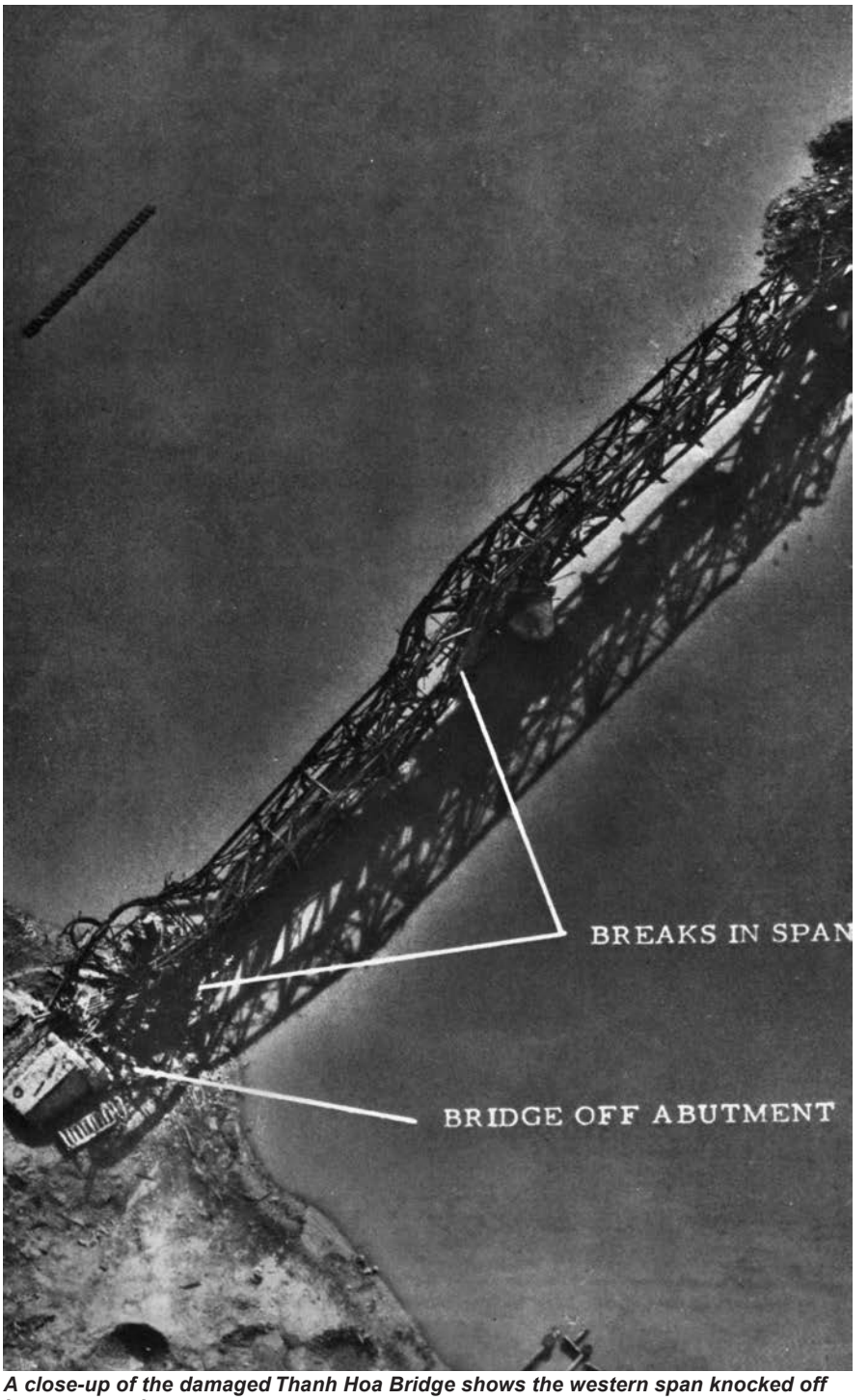
By 1972, the Air Force and the Navy had sent 871 sorties against the Dragon's Jaw, losing 11 aircraft but failing to knock out the bridge.

In 1965, the Air Force did not have any conventional weapons with a sufficient combination of accuracy and power to destroy such targets as the Thanh Hoa bridge. The standard munitions were iron bombs, similar to those used in World War II. The Air Force had only two guided air-to-surface missiles: the Bullpup, which was controlled by radio and a joystick, and the Shrike, which homed on electronic emissions and was used against surface-to-air missile sites.

The Problem of Precision

The quest for bombing accuracy was an old story for the Air Force. The spot where an unguided gravity bomb hits the ground is a function of the direction and speed of the airplane at the point of release, the aerodynamics of the pro-

Above: The Dragon's Jaw following the successful laser-guided missile strikes of May 13, 1972.



A close-up of the damaged Thanh Hoa Bridge shows the western span knocked off its concrete abutment.

jectile, and the wind and atmospheric conditions while the bomb is in flight. A bomb dropped half a second too late can miss its target by hundreds of feet.

During World War II, it was popular to claim that Air Force bombardiers, equipped with the fabled Norden bombsight, could hit a pickle barrel from high altitude. In actuality, the average accuracy for bombers in 1943 was 1,200 feet, as measured by the standard circular error probable, or CEP. Accuracy improved to about 1,000 feet by the end of the war as aircrews gained proficiency.

For real precision, aiming was not enough. The munition had to be steered.

Both the Germans and the Americans experimented with radio-controlled weapons in World War II.

In the Korean War, the Air Force mated its Razon guidance system, which controlled range and azimuth, to the 12,000-pound British Tallboy bomb for a blockbuster called the Tarzon. B-29 bombers dropped 30 Tarzons in Korea with an average accuracy of 273 feet. Tarzon was devastating to bridges but it was unreliable and unstable, which made it hazardous to use.

By the 1960s, the technology of terminal guidance for air-launched missiles had been well established. The Sidewinder air-to-air missile was a heat seeker. The Sparrow rode along a radar beam directed at enemy aircraft. The Shrike, the weapon of the Wild Weasels, locked onto radar emissions from SAM sites. The stage was set for the emergence of precision-guided bombs.

However, "smart" bombs, unlike missiles, have no propulsion systems of their own. They are propelled only by gravity and the momentum of the launching aircraft. A seeker head locks onto the target and the flight path is adjusted by varying control fins and canards on the bomb.

Capt. Thomas Messett checks a 2,000-pound laser-guided bomb on his F-4.

The first smart bomb was the Navy Walleye in 1967. It was a free-fall bomb with a television tracking system. It required sharp contrast to lock on to the target, and was often foiled by weather and the nature of targets in Vietnam. At $35,000 a copy, it was fairly expensive. The Air Force developed its own electro-optical glide bomb, called the Hobo (for Homing Bomb System). It had a larger warhead than Walleye, and was more accurate.

The Laser Solution

The big breakthrough in precision-guided munitions came with the laser-guided bomb. Numerous individuals and agencies had a hand in its development, but the key players were Col. Joseph Davis Jr., vice commander of the Air Proving Ground at Eglin AFB, Fla., and Weldon Word, an engineer at Texas Instruments.

Davis had come to Eglin initially as head of a detachment from USAF's Aeronautical Systems Division, exploring for technologies that promised immediate improvements to air combat in Vietnam. Average CEP bombing accuracy at the beginning of the Vietnam War was 420 feet. In 1965, Davis was looking for a weapon with the accuracy to hit routinely within 30 feet of a target and powerful enough to destroy it. He saw promise in a concept suggested by Word, who drew on earlier research by the Army for laser guidance of missiles.

Word's idea—proposed under a streamlined program for small, fast-track projects developed for less than $100,000—was a laser kit, consisting of seeker and guidance components that could be "bolted on" to standard gravity bombs.

The laser-guided bomb required two airplanes. The designator airplane would focus a tight laser beam on the target, painting it continuously and reflecting back outward a cone of laser energy called the basket.

A second airplane, the shooter, would drop a bomb into the basket. The bomb's seeker head locked onto the laser illumination and homed on the target.

Except for the seeker head, all of the components of Word's laser kit were off-the-shelf items. The "bang-bang" guidance system and control fins were adapted from the Shrike missile. The fins, mounted on the bomb casing in a cruciform configuration, could be switched back and forth between two positions, neutral and control. The bang-bang name came from the noise made by the switch from one position to the other. The bomb flew a zigzag course to the target as the fins made a corrective switch every few seconds to bring the laser reflection back to the center of the seeker head's field of view. The bomb rotated slightly in flight to take some of the edge off the undulations.

The seeker head was in the nose of the bomb, inside an airflow test probe. "The probe resembled a badminton birdie, and so from then on it was dubbed the 'birdie head,'" Word said. He proposed to build a dozen prototypes for $99,000.

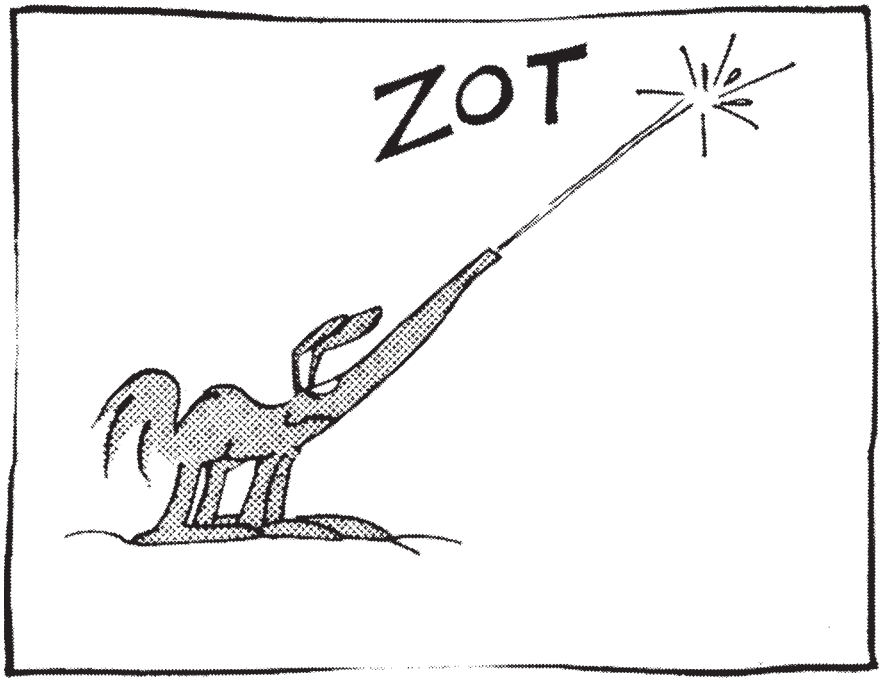
Air Force procurement officials had doubts about the Texas Instruments concept and solicited a competing offer from North American's Autonetics division. North American's design was more complex and included a gyroscope that gave the bomb a smoother flight path than the bang-bang course. However, the weapon cost three times more than the Texas Instruments PGM and it did not do as well in testing.

The contract was awarded to Texas Instruments in 1967.

From Zot to Pave Knife

The Air Force designated the initial version of the LGB as Paveway and combat-tested it in Vietnam from May to August 1968 with the 8th Tactical Fighter Wing, flying from Ubon Air Base in Thailand.

The original device used to sight and steer the laser beam was fabricated by



The Zot laser designator was named after the sound effect attributed to the lightning-fast tongue thrust of the anteater in Johnny Hart's popular comic strip "B.C."

two Air Force officers at Eglin and was mounted on the left canopy rail of the rear cockpit of an F-4 fighter. It was called the "Zot," after the sound effect for the lightning-fast thrust of the anteater's tongue in the comic strip "B.C."

The designator F-4 orbited the target in a pylon turn, a left bank of almost 40 degrees at an altitude of 12,000 feet, and fixed its laser beam on the target. The beam remained sharp and accurate for a distance of more than five miles. At bombing altitude, the cone of laser energy radiating outward was almost a mile in diameter. Any number of shooter aircraft could drop their bombs into the basket. The designator F-4 had to hold its illumination of the target until the bombs hit the target about 30 seconds after release.

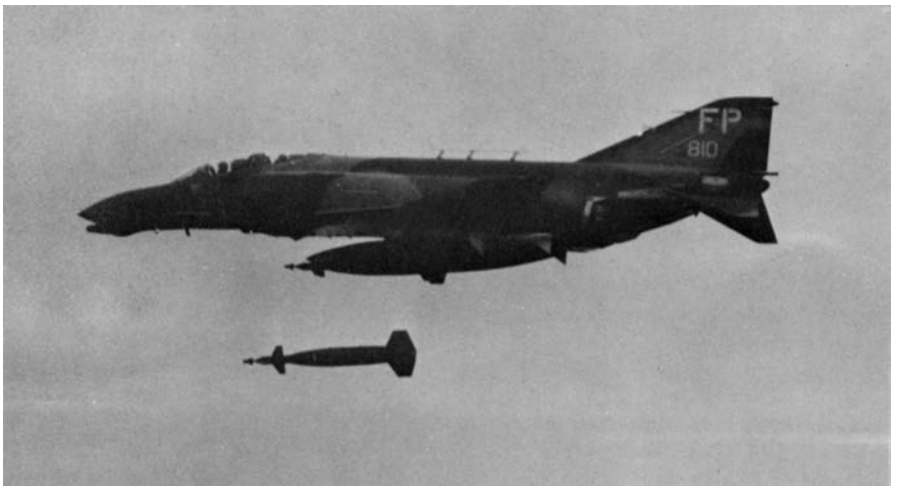
Two Paveway variants were used in the combat testing. One bolted the laser kit onto a Mk 117 750-pound bomb, placing the control fins in the rear because of the bomb's bulbous shape. The other variant used a Mk 84 2,000-pound bomb, which had a more dynamic shape, allowing placement of the control fins toward the front.

The Mk 117 variant had a disappointing accuracy of 75 feet in the combat testing, but the results from the Mk 84 version were spectacular. Average accuracy was 20 feet—fully a third better than Davis and Eglin had hoped for—with one in every four bombs scoring a direct hit.

And at $3,000 each, Paveway bombs were cheap compared to the $35,000 Walleyes.

However, before the Paveway LGB could be put into action, the White House had ordered a halt of bombing of North Vietnam. For the next four years, the new smart bombs were used only in South Vietnam and Laos, where there were not many good targets but where the Air Force gained valuable experience in training, testing, and development of tactics. In some instances, accuracy was better than 10 feet. In areas where the air defense threat was not too severe, AC-130 and OV-10 aircraft also employed LGBs.

The Air Force made considerable progress on laser-guided bombs during the bombing hiatus. A Pave Knife laser designator pod was hung from the wing of the F-4 and began to replace the Zot box for steering the laser. The pod was on a gimbal which swiveled around to keep the laser beam on the target, freeing the airplane to maneuver at will. The necessity of flying a fixed orbit was eliminated. Furthermore, the designator airplane could now drop bombs as well as illuminate the target.



An F-4 drops a Mk 84 laser-guided bomb. F-4s such as this one loaded with precision weapons took down the Dragon's Jaw bridge.

In the first part of the war, F-4s had been flown by two pilots. Eventually, the rear seat pilots were replaced by weapon systems officers, who were generally regarded as more skillful at lasing. They guided the laser beam with a small TV screen mounted on the instrument panel rather than with a Zot box.

The Dragon Goes Down

In 1972, "Vietnamization" of the war was in full swing. Nearly all US ground forces had been withdrawn from Southeast Asia and half of the 7th Air Force aircraft had departed.

North Vietnam saw an opportunity to win the war with a conventional attack, and on March 30 crossed the Demilitarized Zone with a large infantry and armored force in the so-called "Easter invasion."

American airpower returned quickly to the theater and the bombing of North Vietnam resumed. The North Vietnamese supply lines were disrupted and the invasion force, unable to withstand the air assault, retreated back across the DMZ in June. The air campaign, designated Linebacker, evolved into Linebacker II.

US bombing of North Vietnam did not stop until the end of the year, having set up the peace agreement and cease-fire in January 1973.

Most of the munitions dropped by fighters and B-52s in the Linebacker campaigns were regular iron bombs, but smart bombs, including Paveway LGBs and television-guided Hobo, had an extraordinary impact. The Air Force's Paveway capability was concentrated at Ubon, which had only seven F-4s with Pave Knife pods and another 12 with Zot boxes. Pave Knife was essential for targets around Hanoi and Haiphong, where it was too dangerous to fly the continuous pylon turn with the Zot system. The available smart bomb aircraft were judiciously assigned to the most important targets, where they made a difference, even in small numbers.

The new precision made it possible to strike closer than before to civilian areas. Thus the Air Force could bomb the port facilities at Haiphong without danger to third country ships in the harbor. The largest power plant in North Vietnam was bombed without collateral damage to the nearby dam at the Lang Chi Reservoir. Smart bombs multiplied the effectiveness of strike sorties and took out targets that were previously too difficult—including the Dragon's Jaw bridge at Thanh Hoa.

The Ubon F-4s attacked the Dragon's Jaw on April 27, but heavy cloud cover prevented the use of the laser illuminators. The strike force had to employ TV-guided bombs instead of LGBs. They damaged the highway sections but failed to take down any of the spans of the bridge. The weather was better on May 13, and the invulnerability of the Dragon's Jaw finally came to an end.

The F-4s hit the bridge with 26 laser-guided bombs, several of them heavy 3,000-pounders, and did what all of the previous attacks had not been able to do. According to an Air Force review of the action, "The western span of the bridge had been knocked completely off its 40 foot thick concrete abutment and the bridge superstructure was so critically disfigured and twisted that

rail traffic would come to a standstill for at least several months."

The Dragon's Jaw was still in a state of disrepair when Operation Linebacker ended in December 1972.

Laser-guided bombs also knocked down a span of the mile-long Paul Doumer Bridge across the Red River on the outskirts of Hanoi.

This bridge—longer and more famous than the Dragon's Jaw, but a less difficult target—had been bombed often and sometimes closed for brief periods, but never for long. The smart bombs did a proper job of it. This time, the Doumer Bridge did not reopen until March 1973, when the first train in 10 months rolled across it.

Confirmation

The results from the Linebacker campaigns made an overwhelming case for smart bombs, especially laser-guided bombs. Between February 1972 and February 1973, the Air Force dropped more than 10,500 LGBs. Of these, about 5,100 were direct hits, and another 4,000 had CEP of 25 feet.

"For point targets and in good weather conditions, these weapons had nearly a single-shot kill probability," said Gen. William W. Momyer, former commander of 7th Air Force, in his book *Airpower in Three Wars*. "If the target could be seen and the target was vulnerable to the explosive power of the weapon, the probability of damage with a single weapon was 80 to 90 percent."

In the first three months of Linebacker, the Air Force destroyed more than 100 bridges with precision-guided munitions. An Air Force study found that LGBs were "100 to 200 times as effective as conventional bombs against very hard targets and 20 to 40 times more effective against soft and area targets." Laser-guided bombs were used in about 10 percent of the attacks on enemy tanks but accounted for 22 percent of the tanks destroyed.

The Air Force also used Walleye and Hobo electro-optical guided bombs, but they cost more—an average of $17,000 compared to about $4,000 for a laser-guided bomb—and the results were not as good.

In a July 1972 message to Pacific Air Forces, Gen. John W. Vogt, 7th Air Force commander, said that "we will continue to make every effort to optimize the use of the EOGB. Nonetheless, it is apparent that in the current state of the art, the LGB is a far superior weapon system."

Despite the record in Vietnam, the Air Force did not go all-out for laser-guided bombs. Critics argued for standoff range and launch-and-leave options, so research and development continued on several fronts. Among the weapons subsequently fielded was the excellent GBU-15, a follow-on to Hobo that mated television guidance to a Mk 84 bomb.

Unlike laser-guided bombs, the GBU-15 could be used in bad weather. The Air Force also stuck with Maverick missiles, in both television-guided and infrared variants, for use by A-10 attack aircraft against tanks.

Before the Air Force went to war again, it had made considerable progress with laser-guided bombs, fielding Paveway II (also known as the GBU-10 and GBU-12) in 1976 and Paveway III (aka GBU-24) in 1986.

The biggest visible change with Paveway II was that the tail fins folded up when carried under the airplane's wing, then popped when the bomb was released. Two bombs could be loaded on each wing weapons station. Paveway II also had enhanced performance and more range.

New Era of Accuracy

Of greater significance was the Pave Tack targeting pod, which boresighted the laser designator to an infrared sensor for a nighttime attack capability. Paveway II and Pave Tack made their combat debut in Operation El Dorado Canyon in 1986 when F-111s employed laser-guided bombs in the raid on Libya.

Paveway III redesigned the LGB for low-level attack. The bomb could be dropped outside the basket and a scanning seeker would find the laser signal. The old bang-bang system gave way to "proportional guidance," which adjusted the control fins to correct for small deviations detected by the seeker, resulting in a smoother flight path. The low-level GBU-24 was modified for delivery by the F-117 and designated GBU-27.

The Gulf War in 1991 marked the first extensive use of precision-guided munitions in warfare. Eight percent of the munitions dropped were PGMs, compared to less than one percent in Vietnam. The smart weapons most widely used were Paveway IIs and IIIs, and they achieved some of the most spectacular hits. New LANTIRN targeting pods allowed additional kinds of fighters to use infrared sensors to deliver LGBs.

PGMs in the Gulf War had an average accuracy of 10 feet. The *New York Times* called the laser-guided bomb the "invention that shaped the Gulf War."

The *Gulf War Airpower Survey* said that "Desert Storm reconfirmed that LGBs possessed a near single-bomb target-destruction capability, an unprecedented if not revolutionary development in aerial warfare."

Operation Allied Force, the air war in Kosovo in 1999, introduced the Joint Direct Attack Munition (JDAM), which quickly became the smart bomb of choice. Like Paveway, it was a kit bomb that bolted a guidance package onto a general-purpose bomb. However, JDAM took its cues from a GPS signal from space. There was no seeker head for guidance, and no laser illumination was required. Target coordinates were loaded into the airplane's computer before takeoff, or they could be entered or updated in flight.

Accuracy with JDAM was not as good as with Paveway, but any kind of airplane could use it 24-hours-a-day, in any kind of weather, and regardless of whether the target was obscured by smoke, camouflage, or concealment. In Allied Force, B-2 bombers put 90 percent of their JDAMs within 10 meters—or about 33 feet—of the target. Guided bombs were 35 percent of the total used, but accounted for 74 percent of the targets destroyed.

Use of smart weapons reached a new high in Operation Iraqi Freedom in 2003, when 68 percent of the munitions were guided. Of these, 22.4 percent were JDAMs and 29.5 percent were laser-guided bombs.

The new era of accuracy led to a redefinition of precision-guided munitions. To qualify as a "precision" weapon, a munition must be capable of hitting within three meters, or less than 10 feet, of the aim point. Thus JDAM is rated as "near precision."

For targets that call for better accuracy than that, the Air Force weapons inventory has a range of electro-optical and laser-guided munitions—including the GBU-15 and numerous variants of Paveway II and III.

The classic smart bomb is still on the job, 40 years after it rewrote the book on ground attack in Vietnam. ■

John T. Correll was editor in chief of Air Force *Magazine for 18 years and is now a contributing editor. His most recent article, "The Cost of Schweinfurt," appeared in the January issue.*

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AFA's 2009 Teacher of the Year, William Austin, helps fifth-graders jump on the science bandwagon.

Science Right From the Start

By Peter Grier

In 1986, William L. Austin, then an Air Force noncommissioned officer, was posted to Shaw AFB, S.C. Friends advised him to put his children in private school, but Austin and his wife instead chose the local public school, and they have never regretted the decision.

Austin started volunteering, and rose to head the PTA. One day in the late 1980s, he stopped by his daughter's middle school to see the principal on PTA business. The principal was in a panic: A substitute for a science class had not arrived, and she needed an adult to sit in the class for an hour, until she could find another teacher. Would Austin oblige? He was tired and had other duties, but agreed to help out.

The decision changed his life.

Those few minutes of exposure to kids in a classroom convinced Austin that he wanted to be a teacher in his post-Air Force career. The excitement of the discovery has not left him. "Once in a while in your life, you find something you've been missing," says Austin. "After that I knew how I wanted to spend my life after the Air Force."

Decades later, the retired senior master sergeant has been as successful at teaching fifth-graders as he was at leading airmen. He is now a curriculum expert in charge of the science program at Pocalla Springs Elementary School, in Sumter, S.C.

Along the way, Austin has instilled a love of science and math in thousands of students, and trained hundreds of teachers to do the same. He has led the charge to acquire more than 30 acres of land behind the school and obtain corporate funds and state grants to turn the space into an environmental science learning area.

And in 2009, the 21-year Air Force veteran and former munitions system specialist won the Air Force Association's National Aerospace Teacher of the Year award. "William Austin is making a difference in many young lives, and we're proud to recognize his dedication," said Michael M. Dunn, President and Chief Executive Officer of AFA, when the award was announced.

Austin has spent his career trying to point out how important technology is. The first caveman who stuck raw meat into the fire and cooked it kept bacteria from growing. This was using technology, Austin says. Today's schoolkids need to lead the way toward similar advances.

Calling on USAF

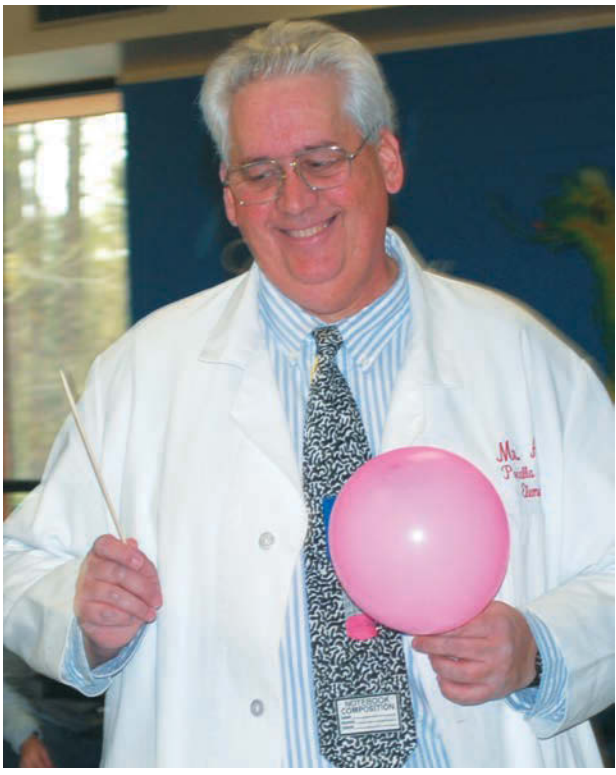
Instead of just getting children to repeat the order of the planets, over and over, teachers should point out that right now mankind is looking for other planets which can host a human population. What are the parameters for a planet like that, in temperature and atmosphere, for instance? Instead of fighting to get kids to leave their iPods and cell phones at home, schools should embrace such technologies for their learning potential, Austin says.

"We should be encouraging them to bring those things into the classroom," he says.

Besides his work at Pocalla Springs, Austin has also worked as an adjunct professor for The Citadel military college and for the College of Charleston, teaching courses on elementary science for middle school educators. He is working on his next master's degree, with the goal of some day moving into school administration.

Every now and then, Austin calls upon Shaw Air Force Base resources for help. And he urges those still in the Air Force to take advantage of the training and technology available to them.

"The stuff they get to see, like stealth technologies, they should be thinking about how that can spill over into the civilian world," he says.



William Austin discovered what his post-USAF career would be when he was asked to be an emergency substitute teacher.

When he was growing up, no one in Austin's family had a college education. His father went off to fight World War II before he had finished high school. His mother was a high school graduate.

"We weren't expected to go much further than that," Austin recalls.

He finished high school in San Jose, Calif., and won a full scholarship to San Jose State University. After he came up with a low draft number, he decided to enlist in the Air Force so he would have some control over where he ended up.

"That was one of the best things that ever happened to me," he says. The Air Force gave him a college education in life experiences. He met and married his wife of 35 years while in uniform, had children,

and moved around the country, eventually landing in South Carolina.

Following his late '80s epiphany about his desire to teach, Austin enrolled at the University of South Carolina and started taking as many classes as his workload allowed.

Austin praises his military supervisors who allowed him to pursue his education. When he was deployed to the Gulf for the Persian Gulf War, his professors forwarded assignments to the Middle East.

In 1991, Austin earned an associate degree from the Community College of the Air Force.

In 1994, he received a Bachelor of Art's degree in education from the University of South Carolina and, shortly thereafter, retired from the Air Force. He stepped right into a teaching job at Pocalla Springs, a public school in a nearby South Carolina community, where he remains today.

Pocalla Springs and Sumter are just a few miles from Shaw. A number of Air Force and Army families have children in the school. Today, Pocalla Springs Elementary has 900 students and goes up to fifth grade. In 1994, it was still new, and only went up to third grade.

Austin started out teaching third grade. He taught in the grade a while, then moved up as Pocalla Springs expanded.

Early on, Austin discovered there were few male teachers in elementary school, which gave him the opportunity to act as a male role model. He thrived in the classroom, handling all subjects, as most elementary school teachers do. He learned if you catch kids in the first five years of their education, you can affect their entire life.

But he was particularly drawn to science, an area in which he had always had an interest. He wanted his students to see how elements of science and math are threaded through every subject, from English to art. "Math and science are so important to us, and so important to our national security," he says.

One way to reach kids is to reach their parents, so Austin started holding "Wild and Wacky Science Night," a back-to-school evening at which, among other things, he uses a Van de Graaff generator to stand parental hairs on end. Wild and Wacky Science Night now draws 300 to 400 participants annually, and has become a prototype at Pocalla Springs for back-to-school events in the other main subjects.

Austin's move to help preserve the acreage as an environmental education research area for his school may be an even larger accomplishment. In early 2000, Austin and others discovered that the farmer who owned the property behind the school could not raise crops on it, due to state environmental regulations.

Austin points out features on a model of the ocean floor to Takoda Spann (center) and Cameron Tomlin. The students were studying landforms.

"We convinced him to donate the land to the state," says Austin. The state comes out to check the property once a year. Outside of this, Austin says, the land is his responsibility.

Statewide Awards

He raises money to maintain it, from both nonprofit grants and corporate donations. Students found a pre-Civil War graveyard on the acreage, which the school is prepping for use in the social studies curriculum. The environmental study center on the land even has night vision cameras, so children can watch tapes of nocturnal wildlife in the area. Since the property is next to the school, getting kids there requires no buses, Austin says. "Very few schools have that kind of resource," he says.

Over the years, Austin's students have won 16 statewide science fair awards. Science fairs are interesting, Austin says, because they can be about more than just experiments. Teachers have to prep kids to present their projects to judges, too.

"They have to teach them how to meet and greet, how to keep talking," he says. "It's all those great tips we learned in NCO Academy."

Today, Austin is the science and math curriculum coach for Pocalla Springs. He gets to teach when and where he wants.

"You can have a bigger impact," he says. "I teach first grade one day, fourth grade the next."

He has taught each one of his thousands of students his three guiding principles: Education is the key to success; if you're not here, you can't learn; and if you love someone, don't forget to tell them. Austin has had T-shirts printed with these words, in an effort to affix them permanently in students'—and parents'—minds. "As a result, the students in his school not only have significantly improved their science skills and test scores, but have developed enhanced life skills, better preparing them to be productive citizens," noted Rodgers K. Greenawalt, AFA South Carolina state president, in nominating Austin as AFA National Teacher of the Year.

Austin is passionate about the role of science, technology, and invention in American life. "We've been a nation of innovators and inventors all our life, but we're losing that," he says.

Austin runs an honor guard at Pocalla Springs as well. It is the only elementary school honor guard in South Carolina, as far as he knows. The members are in charge of raising and lowering the flag, and presenting the colors at PTA meetings. Last Veterans Day, as part of Pocalla Springs' annual fifth-grade trip to Washington, D.C., honor guard members had the privilege of laying a wreath at the Air Force Memorial.

"In addition to running an award-winning science program, Austin instills a sense of pride and ownership in the school. ... He is a great asset to our students," wrote Pocalla Springs principal Lucille McQuilla in her letter recommending Austin for the AFA National Teacher award. ■

Peter Grier, a Washington, D.C., editor for the Christian Science Monitor, *is a long-time defense correspondent and a contributing editor to* Air Force *Magazine. His most recent article, "STRAT-X," appeared in the January issue.*

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AFA National Report

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By Frances McKenney, Assistant Managing Editor

Symposium Success Story

With the **Alamo Chapter** as a partner, the fourth annual 2010 Air Education and Training Command Symposium drew 3,700 people to San Antonio in January. It was the largest turnout to date.

The two-day symposium took place at a downtown convention center and featured nearly 100 seminars on Air Force topics.

A seminar track on leadership, communication, and culture featured a panel discussion with USAF's five living Medal of Honor recipients: Leo K. Thorsness, Bernard F. Fisher, George E. "Bud" Day, Joe M. Jackson, and James P. Fleming. All of them, now retired colonels, had received Medals of Honor for actions in the Vietnam War.

Another symposium highlight: the AFA Technology Exposition, organized and managed by the Alamo Chapter. Expo visitors took in more than 130 vendor and military unit demonstrations, including a medical operating room display and simulators. There was even a TH-1H helicopter, flown in from Ft. Rucker, Ala. It landed right on the street outside the convention center, with San Antonio police stopping traffic for it.

A black-tie ball, described as AETC's largest annual formal, highlighted the Medal of Honor recipients.

More than 1,000 guests at the ball—funded with help from the Alamo Chapter—listened as Gen. Norton A. Schwartz, USAF Chief of Staff, delivered the keynote address. He noted how rare it was for all five Medal of Honor recipients to gather in one place.

Other keynote speakers for symposium events were Gen. Stephen R. Lorenz, the AETC commander; Gen. Raymond E. Johns Jr., Air Mobility Command's new commander; and Maj. Gen. Mary Kay Hertog, 2nd Air Force commander at Keesler AFB, Miss.

Alamo Chapter President Gary L. Copsey pointed out that the chapter also hosted an Executive Dinner and two Executive Receptions for the many general officers attending the events.

USAF photo by Don Lindsey

AFA Board Chairman Joe Sutter and Alamo Chapter President Gary Copsey (back row, l-r) joined Medal of Honor recipients for a photo at the AETC symposium. Front row, l-r: Leo Thorsness, Bernie Fisher, Bud Day, Joe Jackson, and Jim Fleming.

Update From AMC

Maj. Gen. Susan Y. Desjardins described Air Mobility Command's objectives and plans to a **Carl Vinson Memorial Chapter** luncheon audience at Robins AFB, Ga., in January.

Desjardins is AMC's director of strategic plans, requirements, and programs.

The local macon.com news reported that in her remarks, Desjardins covered tactical and strategic airlift, air refueling, and aeromedical evacuation.

She spoke about AMC's newest airlifter, the C-27J Spartan, a topic of interest to the audience since the schoolhouse for it opened at Robins this past September.

Originally a KC-135 pilot, Desjardins said that AMC's main acquisition focus is a replacement for that 1950s-era tanker. She told the audience she could also recall when the KC-10—USAF's younger aerial refueling aircraft—was introduced in 1985 at Seymour Johnson AFB, N.C., where she was stationed.

Timothy Callahan, chapter president, said that his group invited Desjardins to be their guest speaker after they learned that she was visiting Warner Robins Air Logistics Center and headquarters, Air Force Reserve Command, also located at Robins.

During the luncheon, chapter officials presented Melissa G. Spaulding, director of education from the Museum of Aviation at Robins Air Force Base, with an award for her work in community education.

French Legion of Honor

A recipient of the French Legion of Honor spoke to New Jersey's **Shooting Star Chapter** in January about the World War II experiences that led to his receiving France's highest honor.

Frank Wiswall, from Boonton, N.J., flew over France during the war, as a B-17 crew member. This past Veteran's Day, he was presented with the Legion of Honor at the French Consulate in New York City.

Wiswall told his local newspaper that the award probably came about because of a 2008 chat with a French cadet. Wiswall figures the cadet began the process of nominating him for the award.

The French Legion of Honor was established by Napoleon in 1802 to inspire both soldiers and the general

public. It is bestowed for achievements in all fields. Past foreign recipients have ranged from the Gen. of the Army Omar N. Bradley to Thomas Edison. The 2009 list included not only Wiswall but also J. K. Rowling, author of the Harry Potter book series, and Gen. James T. Conway, the Marine Corps Commandant.

Honor Flight: Hoosier State

In Bloomington, Ind., the **Southern Indiana Chapter** meeting in November spotlighted Honor Flight in the Hoosier state.

Retired Army Col. John Tilford, who founded Hoosier Honor Flight in 2008, spoke to more than 40 chapter members about the Honor Flight project. It involves flying World War II veterans to Washington, D.C., for a day, to visit the World War II Memorial.

Southern Indiana Chapter President James E. Fultz said that Tilford enlisted as a marine, serving in Vietnam in 1965. He retired from the Army Reserve in 2009. Tilford has so far organized three flights for some 200 veterans. Another is scheduled for this month.

According to its Web site, the Honor Flight program began with Earl Morse, a retired Air Force captain and physician assistant at a Department of Veterans Affairs clinic in Springfield, Ohio. Morse learned that many World War II veterans wanted to see the memorial but couldn't make the trip because of financial and physical limitations. Morse rounded up fellow members of an aero club at Wright-Patterson AFB, Ohio, and the inaugural Honor Flight took place in 2005 with six small airplanes and a dozen veterans.

The number of vets wanting to make the flights quickly led to transitioning the program to commercial airlines. Last year, just under 18,000 veterans, including those from the Korean War and Vietnam War, were flown to Washington, D.C.

From the P-47 and P-51 Cockpit

A World War II fighter pilot addressed the quarterly meeting of the **Dobbins Chapter (Ga.)** in January.

Bob Powell, now an 89-year-old Decatur resident, described his experiences both dramatic and comical in flying 87 missions over Europe in P-47 Thunderbolt and P-51 Mustang aircraft.

Chapter President Arthur Johnson wrote that guest speaker Powell's missions spanned air battles over the Ardennes, the Battle of the Bulge, and the D-Day invasion.

Powell, who joined the Army Air Corps after leaving West Virginia University, had named his P-51 *The West by Gawd Virginian.* He recounted to the chapter how he had to be lifted out of its cockpit because he'd become so stiff after flying three sorties from England in 24 hours, just after the Normandy invasion.

Johnson said that in the audience, enjoying Powell's presentation, were Maj. Gen. James T. Rubeor, 22nd Air Force commander, and Gerald R. Murray, the retired Chief Master Sergeant of the Air Force.

Visions in Chicago

One of the newest high schools in Chicago has two classrooms in the Visions of Exploration program, thanks to the **Chicagoland-O'Hare Chapter.**

Air Force Academy High School began classes for the first time this past September, but the chapter first became aware of it about two years ago, when a city official mentioned it to Chapter President Russell A. Klatt. It is the sixth public military academy—and the first oriented toward Air Force JROTC—in the area.

Last summer, school principal Yashika N. Tippett-Eggleston spoke at a chapter meeting about the high school. Klatt brought up the idea of providing some classrooms with the Visions of Exploration program. A joint AFA-*USA Today* endeavor, it brings newspapers into classrooms to encourage students' interest in science, technology, engineering, and math.

The school jumped at the opportunity, and the chapter sponsored the Visions program for a social studies and science classroom at the school that, for now, has some 130 students enrolled.

Honorary Wing Commander

AFA was front page news again in *The Niles (Ohio) Times* when the local AFRC wing named **Steel Valley Chapter** Vice President Fred Kubli Jr. as its honorary commander.

The December ceremony took place at the commander's call for the 910th Airlift Wing, Youngstown ARS, Ohio.

In front of hundreds of people, Col. Udo K. McGregor, head of the Reserve unit, "promoted" Kubli—an Army enlisted medic in World War II—to full colonel.

This was the second time in two months that Kubli had made headlines. In November, he represented veterans at an NFL football game, conducting the coin toss for the nationally televised Monday Night Football game between the Cleveland Browns and the Baltimore Ravens.

Kubli, at age 90, earned these honors through his many community volunteer projects. Foremost among them: guiding the Steel Valley Chapter, as its president, through more than two decades of activities supporting the Air Reserve Station.

The chapter, now headed by Carolyn Milkovich, later held a dinner to recognize Kubli's newest role as wing commander.

More Chapter News

■ The **Leigh Wade Chapter** in Petersburg, Va., featured an Army

For a Dobbins Chapter meeting, fighter pilot Bob Powell (second from left) recalled his World War II combat missions. At left is Chapter VP Maj. Jacqueline Jackson. Chapter Events VP Army Col. Brent Bracewell is at right.

Reservist as guest speaker for the January meeting. Maj. Steven J. Lacy, an attorney, spoke about his year in Afghanistan with the US Army and Marines. He led a Marine Corps team that interacted frequently with Afghan villagers to build rapport, gather information, and gain an understanding of the people. Lacy's audience at Ft. Lee included Jeffrey Platte, Central East Region president; John J. Murphy Jr., president of the **Langley Chapter (Va.);** Army Col. Shelley A. Richardson, president of Ft. Lee's Army Logistics University; and members of several veterans organizations.

■ In January, the **Gold Coast Chapter (Fla.)** hosted a visit to Pompano Beach, Fla., by three World War II-vintage aircraft. The B-17 Flying Fortress, B-24 Liberator, and P-51 Mustang were flown to the Pompano Beach Air Park by the Collings Foundation, an educational organization based in Stow, Mass. The group conducts living history events spotlighting old-time transportation and, in particular, restored warbirds. Gold Coast Chapter President Virginia S. Montalvo said the Collings Foundation's three-day visit gave chapter members an opportunity to talk to a "steady stream of visitors" about AFA.

■ The **Northern Shenandoah Valley Chapter (Va.)** sponsored a field trip in December by a group of students to the National Air and Space Museum's annex. The eighth-graders from Sacred Heart Academy in Winchester, Va., were met by docent Buz Carpenter when they arrived at the Steven F. Udvar-Hazy Center in Dulles, Va. The chapter had arranged for a tour specifically guided by Carpenter, who has more than 700 hours flying the SR-71 Blackbird, a featured exhibit at the museum. The students also spent classroom time at the museum, learning about the Wright brothers. ■

Have AFA News?

Contributions to "AFA National Report" should be sent to *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Phone: (703) 247-5828. Fax: (703) 247-5855. E-mail: natrep@afa.org. Digital images submitted for consideration should have a minimum pixel count of 900 by 1,500 pixels.

More photos at http://www.airforce-magazine.com, in "AFA National Report"

Reunions

reunions@afa.org

11th CDS (Air Police). June 4-6 in Las Vegas. **Contacts:** Richard Lindbeck (262-334-9753) (thunderbird14@charter.net) or Richard Phelan (714-893-5649) (wfo426@msn.com).

57th MAS. May 28-30 at Altus, OK. **Contact:** Woodie Hall (407-498-1020) (wwhallii@yahoo.com).

84th ATS/MAS. May 14-15 at the Hampton Inn in Vacaville, CA. **Contact:** John Burnett, 3013 Red Maple Ct., Vacaville, CA 95687 (jnburnet@cwnet.com).

90th TFS. June 27-29 at the Gaylord Texan Resort in Grapevine, TX. **Contact:** Jack Doub (229-259-9399) (jack.doub@gmail.com).

353rd TFS, Myrtle Beach AFB, SC. June 10-13 in Tucson, AZ. **Contact:** Dave Culbertson (520-370-6769) (dlculbertson@comcast.net) (www.radisson.com/353tacticalfighter).

377 Security Police Sq, Tan Son Nhut AB, RVN. April 28–May 1, 2011 in Branson, MO. **Contact:** James Stewart (810-639-5755) (jstewart@centurytel.net).

Army Air Corps Pilot Classes of WWII. Sept. 9-12 in Nashville, TN. **Contact:** Stan Yost, 13671 Ovenbird Dr., Fort Myers, FL 33908 (239-466-1473).

C-123s in Southeast Asia. May 17-22 in Hampton, VA. **Contact:** Ray Merritt (757-851-1305) (pilotrlm@gmail.com) (www.c123sinsea.org).

Hardened Intersite Cable Sys. & Minuteman Comm. personnel. June 23-26 in Rapid City, SD. **Contact:** Rick French, (509-435-5839) (rd_draft@comcast.net).

Jolly Green Assoc. April 29-May 1 at the Ramada Plaza Beach Resort in Fort Walton Beach, FL. **Contact:** Lee Massey (850-863-3131) (leetmassey@earthlink.net).

Nagoya/Komaki Air Base. May 23-26 at the Radisson Woodlands Hotel in Flagstaff, AZ. **Contact:** John Campo (816-407-0055) (jaymcee@aol.com).

Pilot Tng Class 52-B. May 3-6 at the Doubletree Hotel in Austin, TX. **Contact:** Frank Hense, 618 Golfcrest Dr., San Antonio, TX 78239 (210-655-5411) (fhense@earthlink.net).

Pilot Tng Class 52-C. May 2-6 at the Best Western in Charleston, SC. **Contact:** Steve Sheedy (843-215-1257) (ssheedy@mac.com).

USAF Airborne Missile Maintenance Sq. April 12-16 at the Boomtown Hotel in Bossier City, LA. **Contacts:** Tom Hudson, 3223 Caroline Dr., Bossier City, LA 71112 (318-747-1836) (twhhah@suddenlink.net) or Buck Leach, 4805 Birdwell Ln., Bossier City, LA 71111 (318-747-7779). ▪

E-mail unit reunion notices four months ahead of the event to reunions@afa.org, or mail notices to "Reunions," *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Please designate the unit holding the reunion, time, location, and a contact for more information. We reserve the right to condense notices.

Keeper File

Wynne Raises Cyber Battle Flag

On Dec. 7, 2005, the Air Force released a mission statement which, for the first time, referred to "cyberspace." The concept of USAF fighting in cyberspace was an odd one, and it didn't catch on for nearly a year. Then, Secretary of the Air Force Michael W. Wynne raised the battle flag in a speech given not far from the Pentagon. He announced that the Air Force was forming an offensive and defensive cyberspace unit to deal with growing threats and opportunities in the cyberspace area. The idea of the Air Force dominating the cyber "domain," however, proved too much for other service leaders, who mounted resistance. Eventually, DOD chose to go with a unified cyber command, but Wynne had made the point about the emergence of a new military "domain."

"Cyberspace as a Domain in Which the Air Force Flies and Flights"

Michael W. Wynne, Secretary of the Air Force
Address to C4ISR Integration Conference
Arlington, Va.
Nov. 2, 2006

Find the full text on the *Air Force* Magazine's Web site www.airforce-magazine.com "Keeper File"

All the [military's command and control] information flow moves in the cyber domain, meaning the entire flow can be vulnerable to a cyberspace attack. ... How shall we defend the communication net on which all our capabilities depend? This question is critical. Our ability to fight in ground, sea, air, and space depends on communications that could be attacked through cyberspace. The capital cost of entry into the cyberspace domain is low. The threat is that a foe can mass forces to weaken the network that supports our operations in any battle domain. The other side of the coin of netcentric operations is cyber vulnerability. The answer is that defending and fighting in the cyber domain is absolutely critical to maintain operations in ground, sea, air, and space. ...

What new habits of thought do we need in order to create and develop technology, and to fight in the 21st century? ... Our operations in each of our services all rely on trust. That is, the pilot can trust information that a target is the foe, not innocent inhabitants of a school building or hospital or embassy. The ground fighter with a communication device can trust that the device is not being tracked by a foe, potentially exposing the ground force unnecessarily. This new way of war is data-dependent. So we need to think in terms of trust and securing trust. ...

What we are seeing is that the cyberspace domain contains the same seeds for criminal, pirate, transnational, and government-sponsored mischief as we have contended with in the domains of land, sea, air, and now contemplate as space continues to mature. ...

In cyberspace, our military, America, and indeed all of world commerce face the challenge of modern day pirates, of many stripes and kinds, stealing money, harassing our families, and threatening our ability to fight on ground, air, land, and in space. ...

Now, my duty, as the Secretary of the Air Force is to put the nation's most technologically capable force on a path to do our share of the task of presenting to our combatant commanders, and so to the President and the nation, the trained and ready forces they may need to ensure the same security and freedom of cyberspace that Americans and indeed many in the world already enjoy in the oceans, in the air, and also in space.

This duty is joint, and, as I have noted, it is interdependent. The duty is to bring to the fight what the Air Force has to offer, and to exercise good stewardship of the Air Force personnel and resources that are in some cases already devoted to operations in cyberspace.

This does not mean "control" of cyberspace, any more than the other domains of ground or maritime. It does mean making our contribution to securing the benefits of cyberspace for our military and, indirectly, for our national and even world commerce.

This means recognizing that the idea of freedom of cyberspace may in time be the same kind of principle as freedom of the seas and freedom of the skies. This means that cyberspace is a domain on which many rely and in which warfighting can, and, actually by some definitions already, takes place. ...

Just as the air domain is governed by aerodynamic forces, and the space domain by orbital mechanics, cyberspace has mathematical and electromagnetic principles at work. Due to the size of the global information grid and easy access to the electromagnetic spectrum, effects in cyberspace can take place nearly simultaneously at many places. Effects can be massive or precise, lasting or transitory, kinetic or nonkinetic, lethal or nonlethal. ...

Today I am announcing the steps the Air Force is taking towards establishing an Air Force Cyberspace Command. The aim is to develop ultimately a major command that stands alongside Air Force Space Command and Air Combat Command as the providers of forces on whom the President, combatant commanders, and the American people can rely for preserving freedom of access and commerce in air, space, and, now, cyberspace. ■

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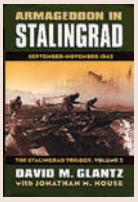
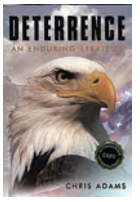
Books

Compiled by Chequita Wood, Media Research Editor

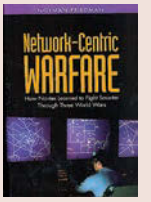
Armageddon in Stalingrad: September-November 1942. David M. Glantz, with Jonathan M. House. University Press of Kansas, Lawrence, KS (785-864-4155). 896 pages. $39.95.

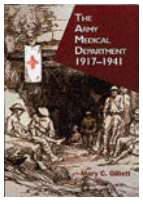


Deterrence: An Enduring Strategy. Chris Adams. Order from: iUniverse, Bloomington, IN (800-288-4677). 267 pages. $20.95.



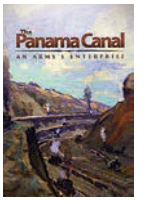
Network-Centric Warfare: How Navies Learned to Fight Smarter Through Three World Wars. Norman Friedman. Naval Institute Press, Annapolis, MD (800-233-8764). 360 pages. $32.95.





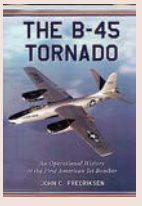
The Army Medical Department, 1917-1941. Mary C. Gillett. GPO, Supt. of Documents, Washington, DC (866-512-1800). 644 pages. $54.00.

Hell in An Loc: The 1972 Easter Invasion and the Battle That Saved South Viet Nam. Lam Quang Thi. University of North Texas Press, Denton, TX (800-826-8911). 282 pages. $29.95.



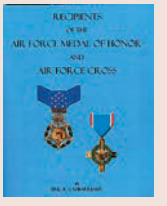
The Panama Canal: An Army's Enterprise. Jon T. Hoffman, Michael J. Brodhead, Carol R. Byerly, and Glenn F. Williams. GPO, Supt. of Documents, Washington, DC (866-512-1800). 97 pages. $12.00.

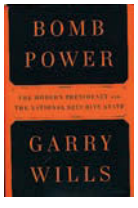
The B-45 Tornado: An Operational History of the First American Jet Bomber. John C. Fredericksen. McFarland & Co., Jefferson, NC (800-253-2187). 264 pages. $45.00.



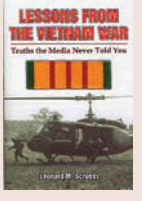
A History of Air Warfare. John Andreas Olsen, ed. Potomac Books, Herndon, VA (800-775-2518). 488 pages. $55.00.

Recipients of the Air Force Medal of Honor and Air Force Cross. Eric R. Caubarreaux. Order from: www.amazon.com. 357 pages. $29.95.

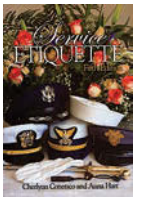




Bomb Power: The Modern Presidency and the National Security State. Garry Wills. Penguin Press, New York (800-631-8571). 278 pages. $27.95.

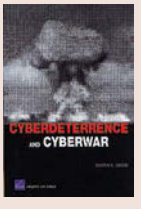


Lessons From the Vietnam War: Truths the Media Never Told You. Leonard M. Scruggs. Warren Publishing, Cornelius, NC (704-892-8376). 247 pages. $24.95.



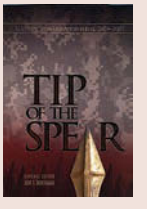
Service Etiquette. Fifth ed. Cherlynn Conetsco and Anna Hart. Naval Institute Press, Annapolis, MD (800-233-8764). 530 pages. $40.95.

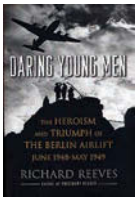
Cyberdeterrence and Cyberwar. Martin C. Libicki. RAND, Santa Monica, CA (800-462-6420). 214 pages. $33.00 (download at http://www.rand.org/pubs/monographs/2009/RAND_MG877.pdf).



Memoirs of A Cold Warrior: The Struggle for Nuclear Parity. Lee C. Carpenter. Algora Publishing, New York (212-678-0232). 230 pages. $23.95.

Tip of the Spear: US Army Small-Unit Action in Iraq, 2004-2007. Jon T. Hoffman, ed. Supt. of Documents, Washington, DC (866-512-1800). 201 pages. $22.00.





Daring Young Men: The Heroism and Triumph of the Berlin Airlift, June 1948-May 1949. Richard Reeves. Simon & Schuster, New York (800-223-2336). 316 pages. $28.00.

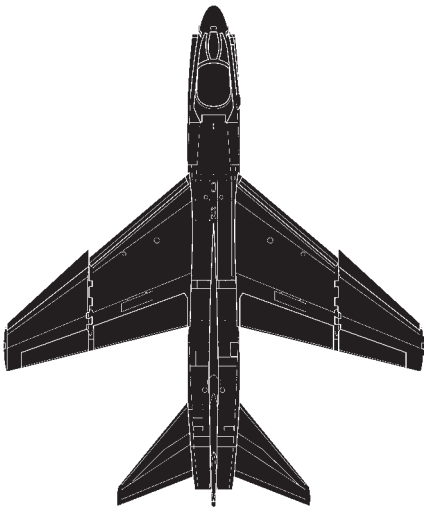
NASA Historical Data Book, Vol. VII: NASA Launch Systems, Space Transportation, Human Spaceflight, and Space Science 1989-1998. Judy A. Rumerman. GPO, Supt. of Documents, Washington, DC (866-512-1800). 1,050 pages. $59.00.

US Marine Corps Aviation Since 1912. Fourth ed. Peter B. Mersky. Naval Institute Press, Annapolis, MD (800-233-8764). 405 pages. $49.95.

Airpower Classics

Artwork by Zaur Eylanbekov

A-7 Corsair II



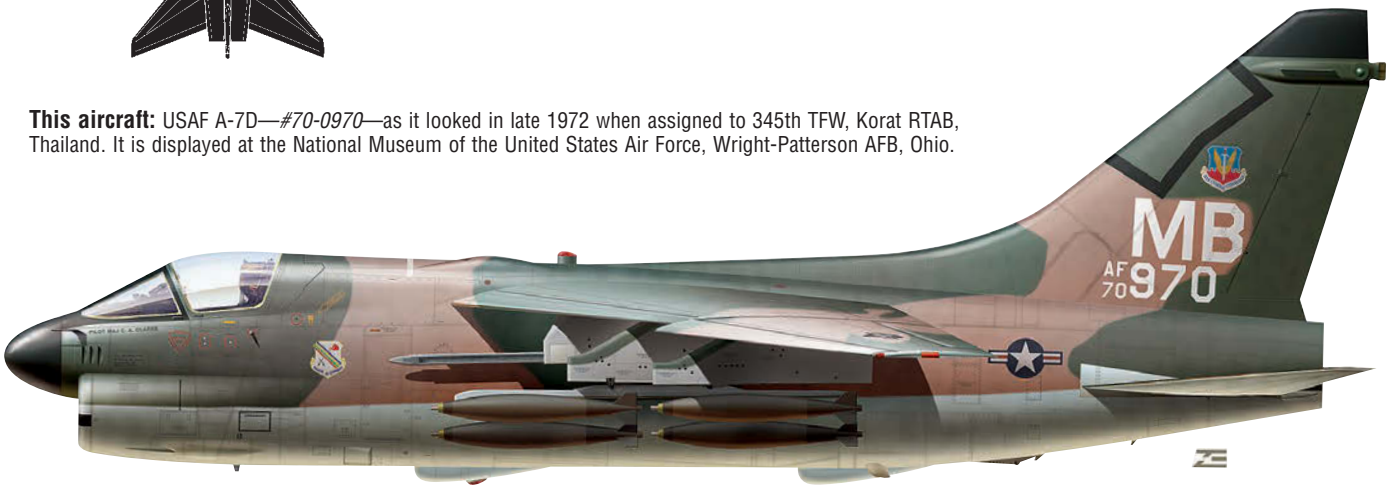
The Air Force A-7 Corsair II was derived from the Corsair developed for the Navy in the early 1960s, and was more or less ordered off-the-shelf. The first USAF prototype flew on April 6, 1968. The only significant changes to the LTV-built Navy version were use of a different engine and addition of a 20 mm cannon (which the Navy later adopted). Somewhat less than beautiful, the A-7—in both the Air Force and Navy versions—proved to be both effective and highly adaptable.

The A-7 was intended to replace the A-4 Skyhawk, and it sprang from a requirement to be developed from an existing type. LTV won with a highly modified version of its F-8 Crusader, a fact which helped speed A-7 development. The Corsair II had a shorter fuselage and larger air intake, but its wings were roughly the same size, and it used both leading edge and trailing edge flaps, as well as upper surface spoilers, as did the F-8. The A-7's main strength was payload; it could carry up to 15,000 pounds of ordnance. USAF expressed interest in 1966, ordering an A-7D with a more powerful engine.

The Navy A-7 entered combat in Vietnam in December 1967 and flew more than 90,000 combat missions there. The Air Force A-7s pulled heavy combat duty late in the war, flying close air support missions and serving with search and rescue operators. The type achieved high accuracy with bomb drops by the aid of an automatic electronic navigation and weapons delivery system. In 1973, the Air Force began assigning A-7Ds to Air National Guard units.

—Walter J. Boyne

This aircraft: USAF A-7D—*#70-0970*—as it looked in late 1972 when assigned to 345th TFW, Korat RTAB, Thailand. It is displayed at the National Museum of the United States Air Force, Wright-Patterson AFB, Ohio.



A-7s left Vietnam for the Air Guard.

In Brief

Designed, built by LTV Aerospace ★ first flight Sept. 27, 1965 ★ crew of one (two in trainer) ★ number built 1,545 (484 USAF) ★ one Rolls Royce/Allison TF41-A-1 turbofan engine ★ **Specific to A-7D:** armament one M-61A 20 mm Vulcan cannon ★ max load 15,000 lb of bombs, missiles, mines, rockets, gun pods ★ max speed 698 mph ★ cruise speed 545 mph ★ max range 1,780 mi ★ weight (loaded) 42,000 lb ★ span 38 ft 9 in ★ length 46 ft 2 in ★ height 16 ft.

Famous Fliers

Air Force Cross: Colin Clarke. **Notables:** Jim Allen, Tom Crawford, Howell Estes III, Gregory Feest, Thomas Goselin, Craig Gourley, John Hoskins, William Lake, Dennis Larsen, Chuck McClarren, David McCloud, Thomas McKee, John Miller Jr., Wally Moorhead, Lonnie Ratley, Robin Scott, Sandy Sharpe, Michael Short, Leighton Smith Jr., Anthony Tolin, Robert Yates.

Interesting Facts

Nicknamed "SLUF" (for Short Little Ugly Feller) ★ performed (on Aug. 15, 1973) last official bombing in SEA War ★ saw combat in South Vietnam, North Vietnam, Cambodia, Lebanon, Libya, Grenada, Panama, Kuwait, and Iraq ★ used for close air support, search and rescue, reconnaissance, interdiction, surveillance ★ in Vietnam, suffered only six losses in 13,000 sorties—lowest ratio for any USAF type ★ provided air cover in battle for *Mayaguez* ★ used as surrogate to train F-117 stealth fighter pilots in 1980s.

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