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Advocate for aerospace power and STEM education.

Support the Total Air Force family and promote aerospace education.

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NORTHROP GRUMMAN

Losing Altitude

THE Air Force came out of the Gulf War and other conflicts of the 1990s flying high, having demonstrated what modern airpower could accomplish. The Quadrennial Defense Review in 1997 said that a "Revolution in Military Affairs" had taken place, and a vision statement from the Joint Chiefs of Staff in 1996 acknowledged the emerging capability to achieve the effects of mass without the actual massing of forces.

There was no indication of the nose-dive to come, but over the next 10 years the status of the Air Force sank to dead last among the armed forces and it was relegated to supporting low-intensity ground operations of marginal strategic value.

The success of airpower in the 1990s was a threat to the roles and budgets of ground forces. The Army struck back to regain its accustomed priority and discredit airpower. "Wars are won on the ground," said the Army annual report in 1996. "The Army has paid a high price for the unfulfilled promises of airpower since World War II," said retired Gen. Frederick J. Kroesen, former US Army commander in Europe.

The ground power campaign had some success. A revised joint vision statement in 2000 restored the traditional concept of massed forces. Retired Gen. Gordon R. Sullivan, former Army Chief of Staff, complained that land power had been "cavalierly discounted" to "support or finance untested technological solutions and theories for the distant future."

The big change began six months after the terrorist attacks on the United States in September 2001. In a decision still subject to question, US counterterrorism strategy shifted to operations on the ground in Iraq and Afghanistan. A consensus developed among politicians in and out of the Pentagon that the Air Force's main job was supporting boots on the ground. The QDR in 2005 declared "irregular warfare" the dominant form of warfare. Funding was realigned and the Air Force and the Navy became bill payers for the ground forces.

If there was any doubt about the direction of momentum, it became fully clear when Robert M. Gates became Secretary of Defense in 2006. He increased the concentration on current operations and ridiculed concerns about the future and

force modernization as "next-war-itis." In June 2008, Gates fired the Secretary of the Air Force and the Chief of Staff, supposedly for lax control of nuclear weapons. However, it was widely believed that at least part of the reason was his displeasure with their strong advocacy of airpower.

The net effect was "a national security environment in which an informed airman's perspective is not only not missed but actually discouraged," said retired Air Force Maj. Gen. Charles D. Link. Through

The nation is endangered by the weakening of airpower.

the next four years, the new leaders of the Air Force made a "conscious choice" not to promote airpower.

Air Force fighter and bomber programs were choked off and the diminished status of the force was made obvious to all. "Our most important air and space mission is supporting our troops and those of our allies on the front lines," said Deputy Secretary of Defense William J. Lynn III.

With the war in Iraq supposedly won, the United States shifted focus to Afghanistan, where the most lethal combat measures were curtailed in an effort to gain acceptance and support of the local population. The counterinsurgency strategy, said National War College professor Richard B. Andres, "requires the United States to engage in a relatively low-tech, manpower-intensive form of warfare that pits one of its greatest weaknesses against one of its opponents' greatest strengths."

Meanwhile, the capability to project global power, particularly airpower, declined. As retired Air Force Maj. Gen. Charles J. Dunlap Jr. has pointed out, the Pentagon seemed unable "to distinguish sufficiently between the serious challenge of irregular wars and the need to deter truly existential threats posed by nation states."

The Air Force share of the defense budget shrank to a record low. Procurement was cut back. Aircraft were retired to save money with those remaining in the inventory mostly old, wearing out, and ever fewer in numbers. Potential adversaries narrowed the gap in capabilities for conventional and regional conflicts.

The reduced posture and vacillating resolution practically invite challenge. "Many international leaders believe the United States will be reluctant to use force again in the future," Andres said. "Ironically, then, the US commitment to this [low-intensity] form of warfare has reduced its ability to influence the actions of potential opponents."

The United States has not gotten much gain in return for this loss of strategic capability, and the meager results from the long counterinsurgency operations are not commensurate with American loss of life and limb or the heroic sacrifices of the forces engaged.

Leon E. Panetta replaced Gates as Secretary of Defense in July 2011. With Afghanistan winding down, Panetta declared a "strategic turning point" and issued new defense guidance in January 2012, reversing several elements of the Gates doctrine. Panetta said the force would "no longer be sized to conduct large-scale, prolonged stability operations" and announced a transition from "emphasis on today's wars to preparing for future challenges." The revised guidance and moderate reductions in the Army and Marine Corps were promptly denounced by ground power advocates.

The revised defense guidance is but a small step and it is too soon to guess how meaningful it will be. It does not specifically prescribe any restoration of airpower and it does not provide for additional resources. At present, all focus is on fiscal aspects of the defense program with the looming threat of a funding sequester.

In any case, the decline of airpower is still in progress, and the Air Force has already been cut so much that a bounce-back will be difficult. The land power culture in the Pentagon, strong before, has gotten much stronger. How much change it will tolerate remains to be seen.

The imbalance in strategy and forces could persist. It could get worse. But it cannot continue indefinitely without encountering a critical crisis or challenge which—for the first time—the United States may not be prepared to meet. ■

John T. Correll was Editor in Chief of Air Force Magazine for 18 years and is now a contributor.

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Guts and Ingenuity

Daniel Haulman's well-intentioned "Aberrations in Iraq and Afghanistan," (August, p. 44) has the unfortunate effect of portraying USAF as a patrimonial service seeking to fight only the kind of war it prefers, not the kind of war it may find itself in.

No doubt, the United States needs a modern fighter force. However, the wars in Iraq and Afghanistan are not aberrations. They are a clear product of the "American way of war." It was the unquestioned superiority of American fighter pilots and their aircraft that caused the Iraqi Air Force to not muster a sortie during the 2003 invasion. The world is aware of the dominance of USAF, and these results will happen more often—not less.

After the initial invasion of Iraq, the war quickly transitioned from a conventional to an irregular conflict, namely, insurgency. Airpower has great utility in insurgencies/counterinsurgencies, but air-to-air combat is not typical. Calling the protracted USAF involvement in the asymmetric wars in Iraq and Afghanistan "aberrations" in order to justify the relevance of fighter aircraft is myopic and damaging to the cause.

The root of this problem is the failure of the Air Force (and Department of Defense writ large) to understand that conflict does not fall along a spectrum from "high intensity" to "low intensity." Conventional and irregular wars are fundamentally different. A force organized, trained, and equipped for major combat operations is not well-suited for a different type of conflict (e.g., guerrilla warfare) and may, in fact, be at a serious disadvantage. Thankfully, American guts and ingenuity have staved off more serious failures in our recent wars in Asia.

Iraq and Afghanistan, consequently, are not aberrations; they are a fundamentally different type of conflict that is not dependent on aerial combat for air superiority. They cannot be brushed aside as "one-offs" with hopes to never again fight that type of war. A review of history will show that sentiment does not outlast a generation.

Instead, the American fighter force should be supported and justified by its amazing success of not having to be used. Enemies so respect its power they choose to disengage it; Sun Tzu would be envious of such a weapon. This catch-22 is difficult, however, as critics must be reminded that the powerful fighter force is not engaged precisely because it is so powerful. Few weapons can be so efficient.

It is time to stop avoiding and dismissing the unattractiveness of irregular conflicts and accept them for what they are: difficult struggles in which airpower is essential, but it is not the same type of airpower many expect (or want). Once the Air Force understands the fundamental difference in types of conflicts, it can move past its present insecurities and move forward with flying, fighting, and winning.

Brett DeAngelis
Destin, Fla.

Billy Had His Chance

In his article "The Billy Mitchell Court-Martial" (August, p. 63), John T. Correll re-examines the familiar ground of Mitchell's controversial career. However, Correll mischaracterizes and underestimates the importance of the President's Aircraft Board, generally known as the Morrow Board after its head, Mellon banker Dwight Morrow. The Morrow Board was much more than an attempt by President Calvin Coolidge to divert attention from Mitchell's court-martial, although that may have been a minor consideration. During this period, US civil aviation was in disarray and in desperate need of federal structure and regulation. Congress, through the Lambert Committee, was considering possible legislation that would combine civil, military, and naval aviation under one authority, as advocated by Mitchell. Under the guidance of Morrow, Coolidge's old friend and Amherst classmate, the Morrow Board enabled the President to guide and control the inevitable review of the country's aviation needs. During its short existence, the Morrow Board compiled a great deal of information and opinion on the status of US aviation and called

dozens of witnesses to testify, including Mitchell himself. Morrow deliberately provided Mitchell with a public forum for his views, but Mitchell failed to grasp this opportunity. He disappointed even his most loyal supporters by merely reading from his publications, rather than dynamically presenting his case.

The Morrow Board report was issued before the end of the Mitchell court-martial, probably to ensure that it appeared before the long-anticipated and more radical report of the Lambert Committee.

The Morrow Board's recommendations directly shaped two major pieces of legislation, both of which had a profound effect on the future of aviation in the United States. The first, the Civil Aviation Act of 1926, laid the foundation for the regulation and development of civilian aviation for decades to come. The second, the Army Air Corps Act of 1926, upgraded the status of Army aviation by creating the Army Air Corps. It also provided for the addition of a civilian assistant secretary for air in the War Department and implemented a number of needed measures to improve the status and influence of military airmen.

In his crusade for airpower, Mitchell felt justified in defaming the Army's hierarchy, flouting military discipline, and defying his lawful superiors. Surprisingly, his activities were largely tolerated until he antagonized Coolidge, a President who would not ignore Mitchell's willful insubordination, which Coolidge regarded as ultimately an attempt to usurp civilian control of the military. In

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GENERAL DYNAMICS

the end, Mitchell appears to have fatally miscalculated when he assumed that his public popularity and support in Congress would enable him to overcome his adversaries once again.

Ironically, despite the importance of the Morrow Board to American aviation, Dwight Morrow is probably best remembered because his daughter, Anne, married aviation icon Charles A. Lindbergh. Anne Morrow Lindbergh accompanied her husband on many of his flights and was a respected author in her own right.

Chas Downs
Glenelg, Md.

As a lawyer in the Regular and Reserve Marine Corps for a combination of 28 years and an avid advocate of Billy Mitchell's airpower views, I had some observations about your August article "The Billy Mitchell Court-Martial."

As the article noted, the Mitchell charge was violating Article of War 96, commonly called "the general article" because it comprised a variety of offenses not covered by specific numbered offenses under the Articles of War, such as murder (Article 92) and even dueling (Article 91).

Today's Uniform Code of Military Justice (UCMJ), which replaced the Articles of War, retains the general article as Article 134. The general article contains no offenses in its text, just the requirement that the offense prejudice good order and discipline or discredit the service. Also, no offense under the general article (96 or 134) could be a capital offense.

The specific offenses under today's general article can be found in *The Manual for Courts-Martial*, the manual by which the President as Commander in Chief implements the UCMJ. The courts recognize that the military has unique offenses that the President and military lawyers in the field must be able to create and to punish under the general article. One example under Article 134 today is adultery.

Also, not all military offenses can be foreseen, so a general article had to be and is available so commanders could and can create offenses to cover misconduct that ever creative service members commit, offenses not punished in by the civilian judicial system, such as a military member jumping from a warship into the water (I prosecuted two such cases).

For those interested in Mitchell's airpower views and posthumous influence on its development and use, the best reading is the 1945 congressional hearings concerning the Gold Medal awarded to Mitchell via his son in 1947.

The title: "Hearings Before Subcommittee #8 on Military Affairs, House of Representatives, 79th Congress, First Session, H.R. 2227 and other bills, 31 May 1945." The subject is the authority of the President to award Billy Mitchell a "Medal of Honor."

The reading can only be described as stunning, a complete but unfortunately posthumous vindication of Mitchell's views. It also confirms the shabby, disgraceful treatment accorded him by the old War and Navy Departments.

A Gold Medal, not a "classic" combat Medal of Honor, was awarded to Mitchell's son in 1947.

Col. Charles A. Jones,
USMCR (Ret.)
Norfolk, Va.

I, like many others (I'm sure), enjoyed reading John Correll's "The Billy Mitchell Court-Martial." Among other things, he brought to my attention that Mitchell preferred the folded-down collar over the high collar uniform—something that I hadn't noticed before, even though it's right there in the photographs. What amuses me about this is that of the two "Heritage Uniform" prototypes unveiled a few years ago, the high collar uniform was named "The Billy Mitchell Uniform."

Lt. Col. Christopher A. Bohn
Maxwell AFB, Ala.

I really enjoyed the historical articles in the July and August issues of *Air Force Magazine*. I was in grade school while the Berlin Airlift was going on. General Billy Mitchell died the year I was born. Nineteen-and-a-half years of my 20-year Army career were in Army Aviation. I firmly believe knowing where we've been will help us not get lost as we go forward!

Lawrence Cutting
New London, Ohio

Astounding Science Fiction

I read with interest the item in the August issue about the F-35 radar tracking a ballistic missile in flight [*Air Force World: F-35 in Ballistic Missile Defense*, p. 16].

Back in 1960 I came up with the idea of a manned ICBM interceptor. Instead of the head-on pass at an incoming missile that the current unmanned ABM defenses are designed to do, my idea was to utilize a tail chase. An interceptor launched from northern Canada, headed south, could match trajectories with an incoming ICBM and have about 90 seconds in which to discriminate between warhead and decoys, instead of the few seconds available in a head-on pass.

Of course, first lieutenants, as I was then, aren't supposed to propose entire weapon systems. Instead of abandon-

ing the idea, I wrote it up in a story and sold it to *Astounding Science Fiction* [magazine].

Maybe it wasn't so crazy after all.
Col. Joseph P. Martino,
USAF (Ret.)
Sidney, Ohio

Droning On

I was a bit chagrined to see the hated "d-word" used in a photo caption accompanying Rebecca Grant's otherwise technically precise RPA article ("RPAs for All," August, p. 54). I understand that the RPA operational community disdains the use of "drone" as a term for their aircraft. While the mainstream media may not know any better, *Air Force Magazine* knows what a drone is and should be setting the example, not following their misguided lead.

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

Unsung Heroes

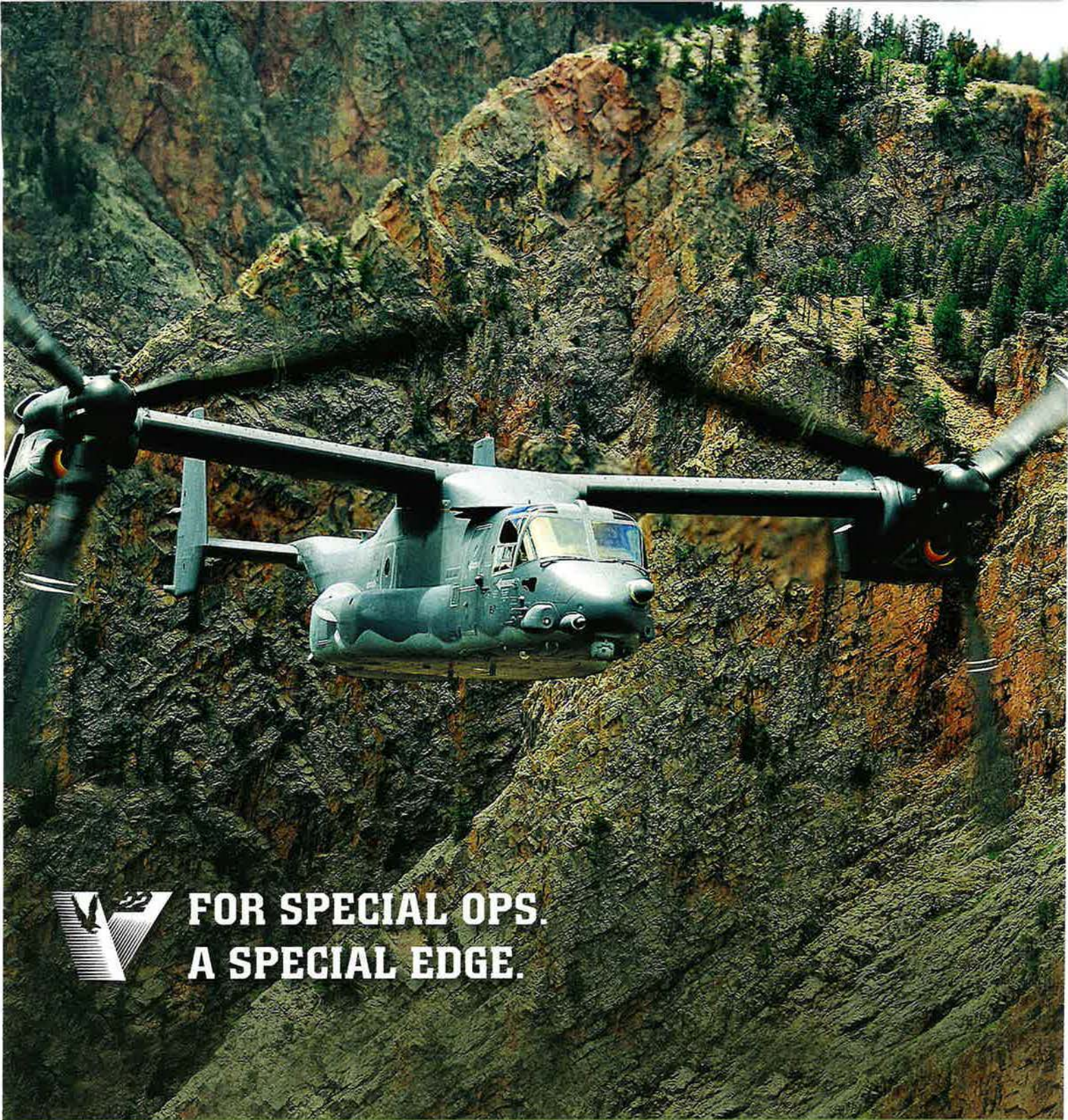
I was rereading the July 2012 issue of *Air Force Magazine* and read your editorial entitled "Long Roads to Redemption." While I understand the subject was directed at those brave warriors who are only recently being recognized for their achievements, I would like to add a bit to the annals of aviation history, which, like Gary Powers, John McKone, and Bruce Olmstead, has long been forgotten.

In 1954, while USAF and the free world awaited the deployment of the U-2, North American Aviation was asked to modify six F-100A Super Sabres, to carry the Fairchild K-17 and K-38 surveillance cameras, as substitutes until the U-2 could be fielded. Operation Slick Chick was headed by Capt. Cecil H. Rigsby and Capt. Ralph W. White as project officers. Rigsby took three of the RF-100As to Europe with Capt. Bert E. Dowdy and Capt. Edgar H. Hill. White took the remaining three to the Pacific with Captain Boone and Captain Moomaw.

The Slick Chick RF-100s were the first F-100s in Europe, stationed at Bitburg, West Germany, assigned to Det. 1, 7407th Support Squadron. In the year between arrival and deployment of the U-2, a total of six overflights of Soviet territory were made—two by each of the assigned pilots.

I am not certain of other pilots, but I know now-Colonel Rigsby was awarded Air Medals for each of his two overflights. The operation was closed down in June 1958. None of the RF-100A airframes survived.

Lt. Col. Robert Dunham,
USAF (Ret.)
Georgetown, Tex.



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 **BOEING**

Welsh checks in; Syria is tough; Libyan lessons learned; Step up, NATO

NEW BOSS, BOTTOM LINE

It's important to take care of airmen, respect the contributions of the Guard and Reserve, and take pride in the Air Force, but none of that counts as much as victory, Air Force Chief of Staff Gen. Mark A. Welsh III said in his first remarks after taking the helm of the service.

At the Aug. 10 ceremony where he succeeded Gen. Norton A. Schwartz, Welsh laid down some pragmatic markers for his tenure as USAF's top uniformed leader, offering a broad preview of what he considers important. Readiness and modernization, for example, are high on the list of things that will get close attention on his watch.

"I believe success is all about people and pride and performance, and I will insist we walk the talk when it comes to taking care of the people we're privileged to lead," Welsh said at the JB Andrews, Md., ceremony. However, "we can never afford to forget that the only bottom line in this business is performance. No one will care how well we treated our people if we lose the next war."

Welsh forecast an evenhanded approach to jointness and advocacy. He gave cooperation its due but also indicated he won't hesitate to speak up for USAF's unique capabilities and the need to sustain them. Joint operations, he said, "are the only way we will succeed on the battlefield. If you plan to criticize one of our sister services, don't let me hear you," he warned, adding that coalition operations "are the only way we can be successful on the planet. We need to be great at both."

While Welsh disavowed the idea that "any one service is more important than another," he said now that he's the Chief, "I'll tell you honestly that I believe the future of the United States of America is in large part an air, space, and cyber future, and without a well-trained, well-equipped, capable, and credible Air Force, our nation will simply not be able to project or protect its power and interests in the future. Our job is to make sure we can."

No one else, Welsh said, "can bring what we bring to the fight, and every real warfighter knows that. Don't ever doubt yourself or this service."

Sen. John Cornyn (R-Tex.) had held up Welsh's confirmation because of concerns about sexual abuse by drill instructors at JB Lackland, Tex. Cornyn lifted the hold on Welsh's confirmation after meeting with the general and pronouncing himself satisfied that Welsh would address the problem and apply every resource to prevent its recurrence.

In his Andrews speech, Welsh suggested "resiliency" issues would be a priority for him: "When it comes to airmen resiliency, to suicide prevention, to sexual assault prevention and response, I believe you're either part of the solution or you're part of the problem. There is no middle ground."

Welsh set three priorities on which the service must stay "consistently focused."

First is to "win the fight: today's fight, the one that starts next week, the one that starts next month, or the one that starts next year." Readiness and training, he said, "are not optional."

Second, USAF must do its part to "strengthen the team" at all levels: the Air Force, its families, "the joint team, the coalition team, the interagency team." Collectively, he asserted, "our mission statement is to fight and win the nation's wars," and in pursuit of that goal, the team "will never be strong enough."



USAF photo by SrA. Christina Brownlow

Welsh aims to be part of the solution.

Third, "we have to shape the future, and that will require innovative thinking and different approaches to problems, and it will require modernization."

The Air Force is and will continue to be a model of Total Force integration, Welsh said, with Guard and Reserve airmen operating seamlessly alongside Active Duty forces around the world.

"They expect us to do the same back here, and I commit myself to doing exactly that," Welsh promised. "I believe every member of our Air Force family is critically important to our success and each of them deserves to be treated that way."

SYRIA ISN'T LIBYA

The situation in Syria, though similar in many ways to Libya's last year, is different enough that intervention in Syria would be far more problematic, NATO Deputy Secretary-General Alexander R. Vershbow said in August.

A number of countries have urged a NATO move to protect Syrian civilians from their own military in a fashion similar to the steps taken in Libya: the establishment of a no-fly zone or perhaps a "protective zone" on the ground inside Syria where noncombatants could go to escape the fighting.

Vershbow, speaking with defense reporters in Washington, D.C., maintained that NATO hasn't been tasked to do any planning for a Syrian intervention—and isn't.

However, he acknowledged the many parallels between conditions in Syria now and the conditions in Libya in March of 2011: A dictator who supports terrorism is killing his own

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people, and beleaguered citizens are imploring the world to step in to protect them. The oppressed citizenry has taken up arms, but is grossly outmatched by government forces.

"Clearly the scale of the brutality" by the Syrian military "has surpassed that in Libya," Vershbow acknowledged.

However, whereas it was clear in Libya where the opposition forces were—under siege in Benghazi—and where the loyalist forces were, no such clear boundaries exist in Syria, Vershbow said.

There is "no clear sort of division" between the loyalist and opposition forces in Syria, Vershbow said. "This is predominantly an urban conflict. ... You could do more collateral damage than good" if NATO attempted to strike Syrian forces from the air in protection of civilians.

Just as with Libya, establishing a no-fly zone would require a preliminary round of air strikes against command and control sites, surface-to-air missile and anti-aircraft artillery positions, and other elements of Syria's air defense network. This, as well as any effort to establish a safe zone on the ground, would be a de facto declaration of war on Syria.

Syria's defenses are "more formidable" than Libya's, Vershbow said, though they're nothing NATO "couldn't handle."

There's also no UN mandate to go into Syria, Vershbow pointed out. While the Arab League and the Gulf Cooperation Council were "actively requesting outside military intervention" in Libya and contributed forces to action there, there's been no such request regarding Syria, he said.

At the end of August, NATO's chief concern regarding Syria, Vershbow said, was the protection of its member, Turkey, which saw one of its aircraft shot down near the Syrian border and which continues to be swarmed with refugees from the conflict.

Even setting aside whether there is political will to act in Syria, NATO is still in the process of recuperating from the Libyan campaign, Vershbow said. NATO forces "began to see their stocks of precision guided munitions rapidly being depleted" during the Libyan action, he said, but he declined to comment directly on whether the stocks of air weapons had been replenished.

Rather, Vershbow offered that NATO members "recognize their responsibility" to have enough munitions on hand for "the next one, whatever it might be." Stocks are supposed to be refilled "even within the budgetary constraints that most allies are operating under," he said.

NATO is to report to its defense ministers this month with a "lessons learned" report about the Libyan campaign, Vershbow revealed, and among the issues it will address are the proper levels of munitions to have on hand, as well as their "qualitative characteristics," he said. The shortfalls in Libya centered around precision guided weapons; the US was compelled to draw on its own stocks to equip NATO partners.

LOOKING TO SHARE

The lessons learned—or at least "lessons identified," if not learned—from Libya also include a need for a better harmonized NATO intelligence, surveillance, and reconnaissance network, Vershbow said, as well as the need for a more robust aerial refueling capability among NATO's European partners.

The European Union is already looking into creating a tanker consortium to address this requirement, he noted. During the Libyan campaign, the US carried "the lion's share of the load" with regard to aerial tanking, using assets it could barely



NATO's E-3 AWACS program has set an example for future collaborations.

USAF photo by TSgt. Mike Rice

spare given the ongoing operations in Iraq and Afghanistan at the time.

There are two precedents for shared NATO resources; one is the NATO E-3 AWACS program, in which the Alliance owns the aircraft and member countries provide the crew. The other is a consortium of both NATO and non-NATO countries that have collectively purchased three C-17s.

The multinational C-17 consortium works "kind of like a time-share arrangement," Vershbow said, in which members get to use the aircraft for a number of hours each month proportionate to their investment or contribution. He didn't know if such an agreement would work for aerial refueling, but it could be "similar," he allowed. Since an aerial refueling consortium would likely remain an EU initiative, the resulting tanker fleet could be used for "EU-led" or "NATO-led" operations.

Knitting NATO's ISR efforts more closely together would be a tougher nut to crack, given the varied systems in use—some of which are incompatible with others—and the national restraints on what is releasable and who would have access.

Vershbow said the US and France are spearheading the ISR initiative, which aims to build up "both the network infrastructure to integrate national ISR capabilities, plus NATO-owned capabilities like the AWACS." NATO will acquire an Alliance Ground Surveillance aircraft to perform its own ground moving target capability in the form of Global Hawk aircraft, and Britain and France have pledged use of their own remotely piloted aircraft as a "contribution in kind" rather than cash, Vershbow said. This would be "sort of a new example of NATO common funding."

Broadly, though, Vershbow said "this is a case where the allies have recognized the need to pool their resources and build both the hardware and the software" needed to genuinely integrate their operations and knowledge.

Vershbow said European allies aren't terribly distressed about the US's much ballyhooed "strategic pivot" to the Pacific theater. While they were initially dismayed by the US rhetoric, they have since grown more comfortable with US plans, he said. For one thing, he said, the NATO allies are confident the US "can walk and chew gum at the same time," meaning it can manage both theaters. Furthermore, a beefed-up US presence in the Pacific helps NATO allies that also depend on the region for commerce.

"They know ... it benefits them, too," he said. Reductions of US forces from Europe also will be somewhat gradual, not immediate.

A greater US involvement in the Pacific could bode well for NATO. Innovations such as rotational schemes, where US forces deploy to Europe for periodic visits and more relevant exercises, mean "we can potentially do more with less," he said. ■

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NORTHROP GRUMMAN

Airman Killed in Afghanistan

Maj. Walter D. Gray, 38, of Conyers, Ga., died from injuries suffered during a suicide bomb attack in Kunar province, Afghanistan, Aug. 8, the Pentagon announced.

Gray was assigned to the 13th Air Support Operations Squadron at Fort Carson, Colo., a detached element of the 93rd Air Ground Operations Wing at Moody AFB, Ga.

"Major Gray's ultimate sacrifice is a tragic loss for the 93rd Air Ground Operations Wing," said Col. Samuel Milam, wing commander.

Milam added, "[Gray] was a tremendous officer and leader. Our most heartfelt sympathies are with the Gray family and the airmen of the 13th Air Support Operations Squadron during this difficult time."

Army Maj. Thomas E. Kennedy and Command Sgt. Maj. Kevin J. Griffin also died in the attack.

JASSM-ER Good To Go

The AGM-158B Joint Air-to-Surface Standoff Missile-Extended Range successfully completed operational flight testing, launching from a B-1B bomber Aug. 30.

The final test shot from a 337th Test and Evaluation Squadron B-1B Lancer was a "significant step" toward the stealthy cruise missile's operational employment, according to a Dyess AFB, Tex., spokesperson.

USAF's B-1B will be the lead type to employ the JASSM-ER operationally, starting next year, according to the Air Force.

"As we shift our emphasis from the Middle East to the Pacific, as heavily defended as that region is, the JASSM, combined with the B-1, presents a top choice for combatant commanders," said Capt. Philip Atkinson of the 337th TES.

The B-1B—as well as the B-2, B-52, F-15E, and F-16—are already cleared to carry the baseline JASSM, which is nearly identical, externally, to the ER model. The Lancer is capable of carrying 24 of the missiles in its three internal bays—twice the number carried by the next largest platform, the B-52.

The extended-range JASSM can strike targets from more than 575 miles away, greatly expanding on the baseline JASSM's 230-mile flight radius.

Lackland BMT Commander Fired

The training commander at JBASA-Lackland, Tex., relieved the head of basic military training operations at Lackland in the wake of rampant sexual misconduct by military training instructors under his charge.

Col. Eric Axelbank sacked BMT commander Col. Glenn E. Palmer, citing "lost confidence" in his ability "to maintain a safe and secure training environment for our newest airmen," the *Los Angeles Times* reported, citing a 37th Training Wing spokeswoman Aug. 10. The Air Force appointed Col. Deborah J. Liddick as Palmer's replacement.

Axelbank commands the 37th TRW; Palmer had led the 737th Training Group since July 2011.

Despite the firing, the spokeswoman emphasized, "Palmer did not create the environment that resulted in the misconduct."

The Air Force is investigating 15 former MTIs for alleged sexual misconduct with trainees dating back to fall 2009. As of August, it had convicted and sentenced three of them.

Axelbank also removed the commander of the 331st Training Squadron, which oversaw most of the accused MTIs, in June.

BUFFs To Visit Russia

An Air Force Global Strike Command delegation from Barksdale AFB, La., visited Engels Air Base in Saratov, Russia, in July, paving the way for a long-range bomber exchange program with the Russian Air Force.

"We're going to fly B-52s to Russia and they're going to fly Tu-95 Bears to Barksdale," said 2nd Bomb Wing Commander Col. Andrew J. Gebara, who led the Barksdale group, in an Aug. 8 AFGSC news release.

"It's a tremendous opportunity for our two nations to learn from each other to improve aviation technology and skills in our respective air forces," he added.

The seven-member US delegation, including a US Embassy attaché and interpreter, evaluated Engels airfield's suitability to host B-52H operations.

"One of the big takeaways from our trip is that while we fly different aircraft and are from opposite ends of the globe, our

ANG photo by A1C John D. Pharr III



objective is the same," said Lt. Col. Michael Thompson, 2nd Bomb Wing director of staff, who was with the delegation. "We all want to have a safe and credible deterrent force," he said.

MALD Cleared for Combat

Air Combat Command chief Gen. G. Michael Hostage III has declared the Miniature Air Launched Decoy operational on the F-16 and B-52, ACC revealed in August.

The declaration of initial operational capability means USAF now has enough MALDs in stock for wartime use, and enough pilots and maintainers trained to operate and support it in combat operations.

MALD is a small jet-powered decoy that the B-52H bomber and F-16 fighter can use for self-defense or strike augmentation. After launch, the decoy is designed to fool enemy air defenses by mimicking the flight characteristics of strike aircraft.

An ACC spokesman said Hostage declared the baseline MALD variant operational on July 26.

Raytheon builds the MALD.

So Shall Ye Reap

The first class of remotely piloted aircraft operators trained from scratch to fly the MQ-9 Reaper received their wings at Holloman AFB, N.M., Aug. 16.

Most pilots cross-train to operate RPAs, but the new graduates of the RPA basic



09.05.2012

A California Air National Guard MC-130P Combat Shadow refuels two HH-60G Pave Hawks during a rescue operation for two seriously ill fishermen off the coast of Mexico. Airmen from the 129th Rescue Wing parachuted into the Pacific on Sept. 3, boarded the Ecuadoran fishing vessel, and treated the sick men. The next day, the rescue airmen and the sick fishermen were transferred to a US Coast Guard vessel, where on Sept. 5 they were picked up by 129th crews and transported to a hospital in Cabo San Lucas.

Senior Staff Changes

RETIREMENTS: Gen. Gary L. North, Gen. Norton A. Schwartz.

PROMOTIONS: To General: Mark A Welsh III.

NOMINATIONS: To be Lieutenant General: Christopher C. Bogdan. **To be Major General:** Richard M. Clark, Andrew M. Mueller. **To be ANG Brigadier General:** Edward E. Metzgar. **To be AFRC Brigadier General:** Jon A. Weeks.

CHANGES: Brig. Gen. Balan R. Ayyar, from Cmdr., AF Recruiting Svc., AETC, JBSA-Randolph, Tex., to Rule of Law Dep., US Forces-Afghanistan, CENTCOM, Kabul, Afghanistan ... Lt. Gen. (sel.) Christopher C. Bogdan, from Dep. Dir., Jt. Strike Fighter Prgm., OSD, Arlington, Va., to Dir., Jt. Strike Fighter Prgm., OSD, Arlington, Va. ... Brig. Gen. Richard M. Clark, from Commandant of Cadets, USAF Academy, Colorado Springs, Colo., to Defense Attaché, DIA, Cairo, Egypt ... Brig. Gen. John L. Dolan, from Dep. Dir., LL, OSAF, Pentagon, to Cmdr., 451st AEW, ACC, Kandahar, Afghanistan ... Brig. Gen. John P. Horner, from Dir., Intel., Surveillance, & Recon Capabilities, DCS, Intel., Surveillance, & Recon, USAF, Pentagon, to Cmdr., AF Recruiting Svc., AETC, JBSA-Randolph, Tex. ... Lt. Gen. Stanley T. Kresge, from Cmdr., 13th AF, PACAF, JB Pearl Harbor-Hickam, Hawaii, to Vice Cmdr., PACAF, JB Pearl Harbor-Hickam, Hawaii ... Lt. Gen. Michael R. Moeller, from US Security Coordinator, Israel-Palestinian Authority, Tel Aviv, Israel, to DCS, Strat. Plans & Prgms., USAF, Pentagon ... Maj. Gen. Stephen D. Schmidt, from Cmdr., NATO, Airborne Early Warning and Control Force Command, Casteau, Belgium, to Spec. Asst. to the Cmdr., USAF, Ramstein AB, Germany ... Gen. (sel.) Paul J. Selva, from Vice Cmdr., PACAF, JB Pearl Harbor-Hickam, Hawaii, to Cmdr., AMC, Scott AFB, Ill. ... Gen. Mark A. Welsh III, from Cmdr., USAF, Ramstein AB, Germany, to C/S, USAF, Pentagon.

COMMAND CHIEF MASTER SERGEANT CHANGE: CMSgt. Craig A. Adams, to Command Chief Master Sergeant, USAF, Ramstein AB, Germany.

SENIOR EXECUTIVE SERVICE RETIREMENT: Marlin U. Thomas.

SES CHANGES: Timothy K. Bridges, to Dep. Asst. SECAF, Instl., Office of the Asst. SECAF, Instl., Environment, & Log., Pentagon ... Terry G. Edwards, to Dir., Comm., Instl., & Mission Spt., AFMC, Wright-Patterson AFB, Ohio ... Gerald F. Pease Jr., to Dep. Asst. SECAF, Environment, Safety, & Occupational Health, Office of the Asst. SECAF, Instl., Environment, & Log., Pentagon ... Anthony P. Reardon, to Dep. Dir., LL, OSAF, Pentagon ... Joe Sciabica, to Dir., AF Civil Engineer Ctr., DCS, Log., Instl., & Mission Spt., JBSA-Lackland, Tex. ... Stephen H. Walker, to Dir., Tactical Tech. Office, Defense Advanced Research Projects Agency, Arlington, Va. ... Kathy L. Watern, to Dep. Dir., Financial Mgmt., AFMC, Wright-Patterson AFB, Ohio. •

course had no prior experience flying manned aircraft.

"There's extra time built into the syllabus to allow the students to get more practice, because they have to learn techniques they've never used before," said Lt. Col. Nathan Hansen, commander of the 29th Attack Squadron, charged with training operators.

Candidates underwent rudimentary screening in light aircraft at Pueblo, Colo., before progressing to simulators at JBSA-Randolph, Tex., during the six-month basic course.

Because the curriculum trains operators to fly RPAs over the target zone—but not take off or land—the course is significantly shorter than manned undergraduate flight training.

The operators designated under USAF's new 18X specialty code advanced to mission qualification training, where they will integrate with sensor operators for the first time to train for the operational mission.

Vertigo Fatal in F-15E Crash

Air Combat Command investigators determined that spatial disorientation was the principal cause of a fatal F-15E accident during a training exercise in Southwest Asia March 28.

The pilot in the accident lost his bearings on a nighttime descent to the runway at the crew's deployed base. As a result, the pilot executed a series of erratic maneuvers, inverting the aircraft at approximately 1,800 feet altitude, according to the accident investigation board report, Aug. 21.

The aircraft's weapon systems officer perceived the pilot was disoriented and seized control of the aircraft, initiating an 11G leveling maneuver before ejecting both himself and the pilot roughly 88 feet above the desert floor.

The pilot was killed, striking a 377-foot radio tower during ejection, but the WSO suffered only minor injuries.

The Strike Eagle was completely destroyed in its collision with the tower and subsequent impact on the ground, totaling an estimated \$47.1 million in losses on top of damage to foreign infrastructure.

The F-15E was deployed from the 366th Fighter Wing at Mountain Home AFB, Idaho.

Resurgent Russian Air

By 2020, Russia plans to spend \$625 billion to rebuild and modernize its air force, which President Vladimir Putin said had languished since the collapse of the Soviet Union.

Putin aims to re-equip the air force with 600 new fixed wing aircraft, such as the Sukhoi T-50 stealth fighter, and 1,000 new rotary wing platforms, with

USAF photo by Capt. Raymond Geofroy



You Say Goodbye, I Say Hello: Airmen and soldiers load an Army AH-64 Apache helicopter onto a USAF C-5 at Bagram Airfield, Afghanistan, during a Relief in Place/Transfer of Authority. The 101st Combat Aviation Brigade replaced the 82nd Combat Aviation Brigade.



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Neil A. Armstrong, 1930-2012

Neil Alden Armstrong—engineer, Navy fighter pilot, NASA test pilot, and iconic astronaut known for his modesty and public shyness, who was the first human being to set foot on the moon—died Aug. 25 at the age of 82.

Born in Wapakoneta, Ohio, Armstrong caught the flying bug early, receiving his pilot's license at the age of 16.

He attended Purdue University on a Navy scholarship to become an engineer, but the demands of the Korean War caused the service to pull him out of school and into jet fighter training. During the war, Armstrong flew 78 combat missions as part of the squadron author James A. Michener wrote about in his book, *The Bridges at Toko-Ri*. On one bombing mission in his F9F Panther, Armstrong caught a booby-trap wire strung to thwart low-level attacks and was forced to eject. He did so safely.

After Korea, Armstrong finished his engineering degree and soon landed a job with the National Advisory Committee for Aeronautics, the forerunner of NASA. He rapidly progressed from flying "drop" missions supporting rocket-plane testing to becoming a prime test pilot in his own right, flying the hottest jets of the Century Series, as well as big bombers such as the B-47. He then joined the elite group flying research X-planes such as the X-1B and X-5 and ultimately flew the hypersonic X-15.

NASA leaders considered Armstrong a top choice for the second group of astronauts selected in 1962.

He became the first civilian astronaut and was picked to command Gemini 8, which would explore orbital rendezvous with the Agena docking vehicle. During the mission, a stuck thruster caused the docked vehicles to rotate wildly. Armstrong managed to separate the two, then got the Gemini craft—spinning so violently that Armstrong and crewmate David R. Scott nearly blacked out—under control, performed a de-orbit and managed a safe splashdown. Armstrong was credited with saving the mission and his and Scott's lives.

Armstrong then went into the rotation for one of the Apollo missions. He served on the backup crew for Apollo 8, then was assigned to command Apollo 11, to make the first attempt at landing on the moon.

Descending to the lunar surface on July 20, 1969, with crew mate Buzz Aldrin, Armstrong was forced to pass over the planned landing site, strewn with boulders and craters that made it too dangerous to set down. Pressing on, Armstrong located a safe spot and landed the Eagle module with just seconds of fuel remaining.

On the moon, Armstrong uttered two iconic phrases. Upon landing, he radioed, "Houston, Tranquility Base, here. The Eagle has landed." Then, about six hours later, when he stepped off the lunar module's landing pad, he said, "That's one small step for man, one giant leap for mankind." He and Aldrin spent about two hours outside the module on the moon, setting up equipment for experiments. Armstrong took nearly all the photos taken on the lunar surface during Apollo 11; only four actually show him there.



The rest of the mission passed without incident, and after a world goodwill tour, Armstrong returned to NASA duties. NASA wouldn't risk letting Armstrong fly in space again, so he was made head of its aeronautics program. However, he soon left NASA and began teaching at the University of Cincinnati. He divided his time between teaching, a farm he bought in Ohio, and serving on several corporate boards.

He served on several commissions and panels to investigate space shuttle accidents and America's future plans in space. Generally, though, he refrained from public appearances, discouraged autograph-seekers, and declined to cash in on his fame. Armstrong steadfastly credited the hundreds of thousands of engineers and technicians who made Apollo possible as the true heroes of the program.

In 2011, Armstrong uncharacteristically wrote opinion pieces, criticizing the Obama Administration for its plans to rely on commercial entities to launch astronauts to the International Space Station. He also took issue with the Administration's abandonment of plans to return to the moon and to aim instead for a cheaper, deep-space asteroid landing program. He offered congressional testimony urging NASA and Congress to find ways to restore morale and confidence at NASA.

Armstrong died after suffering complications from heart surgery. He was buried at sea Sept. 14.

—John A. Tirpak

deliveries starting this year, according to the Associated Press.

"I'm sure, each of us will feel pride for the country, for the people who build such aircraft and pilot them," said Putin, announcing the plan at the Moscow Air Show Aug. 11.

"I want to thank those who helped our air force survive during a difficult period in the 1990s and the early 2000s ... when the planes were grounded," he added

at the event celebrating the Russian Air Force's 100th anniversary.

F-35's First Free-fall Drop

An F-35B test aircraft released a free-fall weapon for the first time during a flight test over the Atlantic Ocean from NAS Patuxent River, Md., in early August.

"While this weapons separation test is just one event in a series of hundreds of flights and thousands of test points

that we are executing this year, it does represent a significant entry into a new phase of testing for the F-35 program," said Navy F-35 test director Capt. Erik Etz.

The short takeoff and vertical landing model of the F-35, designated BF-3, successfully released a 1,000-pound GBU-32 Joint Direct Attack Munition from an internal weapons bay at an over-water training range near Pax River Aug. 8.



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We Brake for Martians

Air Force engineers at Arnold Engineering Development Complex in Tennessee and elsewhere around the US played a crucial role in landing NASA's \$2.5 billion Curiosity rover on Mars Aug. 5. AEDC teams tested the parachute designed to slow the rover's supersonic descent to the Martian surface, as well as the aeroshell and heat shield that protected it upon entering Mars' atmosphere.

"In the first attempts, the parachute was actually destroyed," said David Duesterhaus, an AEDC engineer involved in the tests at the National Full-Scale Aerodynamic Complex at Moffett Field, Calif.

During testing, technicians packed the parachute into a specially designed cartridge which was fired 225 feet back into the wind tunnel's 70-knot (81 mph) slipstream—shredding the chute in initial trials. Technicians estimated it would experience an initial shock of 65,000 pounds and tested at forces upward of 94,000 pounds as a safety margin.

"We learned as we went along," said Duesterhaus, noting that after the first series of tests, they installed lights and cameras farther back in the tunnel.

Over the course of two years, AEDC, NASA, and the Pioneer Aerospace parachute company examined the photographic data and adjusted the packing of the parachute and the composition of the materials.

Engineers realized the parachute would cycle through inflation and deflation jellyfish-style on descent and developed a means of simulating such undulation in testing, he said. Testers physically held the parachute open as it inflated, then cleared the tunnel and turned up the speed. After five rounds of testing, engineers certified the parachute was ready.

"The work we do on the ground paves the way," said Duesterhaus. Engineers at AEDC's facility at Arnold AFB, Tenn., evaluated the heat shield that protected Curiosity from the 3,500 degrees Fahrenheit entry temperatures.

Curiosity's aeroshell underwent aerodynamic testing at AEDC's Hypervelocity Wind Tunnel 9 in White Oak, Md.

Several hours before dawn on Aug. 5, Curiosity punched into Mars' atmosphere at roughly 13,000 mph. Atmospheric friction slowed it to 1,200 mph before its parachute deployed, further decelerating the craft to 200 mph. At that point it shed its protective aeroshell, firing rockets to cushion its landing. In the last seconds, the rover was lowered to the surface on a tether from a rocket-powered "sky crane." Once it set down on its wheels, the tether was cut and the sky crane flew away, to crash at a safe distance from the rover.

Except for slight damage to Curiosity's wind sensor, the vehicle arrived intact after its 352 million mile journey and unprecedented landing method.

—Seth J. Miller

BF-3 released the inert JDAM from an altitude of 4,200 feet, traveling at 400 knots (460 mph) airspeed. The drop was the first step toward validating the F-35's ability to operationally employ precision weapons.

SBSS Up and Running

Air Force Space Command cleared the Space Based Space Surveillance Block 10 satellite for initial operations Aug. 17,

almost two years after it launched from Vandenberg AFB, Calif.

The SBSS spacecraft will now deliver US Strategic Command "timely revisit of high-interest objects and increased capacity to meet current and future" situational awareness needs from space, said AFSPC space superiority chief Robert Davidson.

SBSS' taskable sensor is the only space-based link in the US space-surveil-

lance network. "It's an agile sensor, so it can be tasked to look at high-interest objects on a more frequent basis," he added.

The satellite is capable of monitoring man-made objects from a geostationary perch without disruption from weather or atmospheric disturbances that can hamper ground-based systems.

Boeing and Ball Aerospace Technologies supplied the satellite.

ANG's First F-35 Instructor

Florida Air National Guard pilot Maj. Jay Spohn qualified as the Guard's first F-35 instructor pilot, flying with the 33rd Fighter Wing at Eglin AFB, Fla., this summer.

Spohn concluded the last of his six qualification flights Aug. 3, certifying him to teach pilots to fly the F-35A model, according to Eglin officials. Spohn is serving as assistant director of operations for Eglin's 58th Fighter Squadron and chief of standards and evaluation for the 33rd Operations Group. He was selected to join the initial F-35A pilot cadre to help develop the strike fighter's flight syllabus in November 2009.

The 33rd Fighter Wing began allowing non-test pilots to fly the F-35 at Eglin in May, clearing the way for Spohn to begin qualification flights late this spring.

F-22s Drop SDBs ...

F-22s from JB Elmendorf-Richardson, Alaska, became the first Raptors to operationally employ the GBU-39 Small Diameter Bomb during a Combat Hammer evaluation at Hill AFB, Utah, this summer.

"The Utah Test and Training Range is the only location in the United States where the F-22s can employ SDBs at speeds and altitudes unique to the Raptor," said Maj. Wade Bridges, an Air Force Reserve Command F-22 pilot with the 302nd Fighter Squadron. "The employment of the GBU-39s was very successful," he said.

Active Duty and Reserve pilots and maintainers from Elmendorf were evaluated top-to-bottom on their ability to maintain, load, and launch their weapons in an operational environment in August.

Previously, F-22 pilots had only dropped the SDB in testing. The Elmendorf F-22s deployed to Hill incorporated the new Increment 3.1 software, allowing them to drop the 250-pound precision guided weapons outside the range of many enemy air defenses.

The SDB sharply increases the number of ground targets an F-22 can strike in a stealth configuration. The aircraft can carry just two 1,000-pound Joint Direct Attack Munitions inside its weapon bays, but eight SDBs can be carried internally.

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William W. Momyer, 1916-2012

Gen. William Wallace Momyer, a World War II fighter ace who later commanded much of the air war in Vietnam and served as head of Tactical Air Command, died Aug. 10 at the age of 95.

Gen. John P. McConnell, who was Chief of Staff during Momyer's Vietnam service, once said he was "the greatest tactical air technician" and more knowledgeable about tactical air operations "than anyone the Air Force has ever produced."

Born in Muskogee, Okla., Momyer entered the military in 1938, shortly after receiving a bachelor's degree from the University of Washington. He earned his wings at Kelly Field, Tex., in 1939 and soon thereafter was posted as an air attaché in Cairo, Egypt. When World War II erupted, he provided technical advice to the British Royal Air Force, equipping its Africa forces with American Curtiss P-40 Warhawks.

By 1942, Momyer was commanding the 33rd Fighter Group, operating in North Africa and Italy. He was an aggressive pilot—in one battle singlehandedly engaging 18 Luftwaffe Stukas protected by German and Italian fighters, destroying four of them. He eventually became an ace and scored eight wartime kills. However, his aggressiveness in taking on much larger forces led to heavy losses for the 33rd, which had to be stood down and reconstituted.

Momyer infamously accused one unit attached to his group—the 99th Fighter Squadron—of laziness and cowardice, in spite of the all-black squadron being awarded a Distinguished Unit Citation. He also criticized the 99th for avoiding air combat, even though he'd ordered it to focus on ground attack. Congress investigated and found Momyer's claims baseless. The Tuskegee Airmen went on to build a distinguished war record, despite Momyer's recommendation they be disbanded.

Soon after that incident, Momyer returned to Washington, serving as chief of combined operations on the Army Air Forces Board. While there, he helped build service ground-attack doctrine.

After World War II, Momyer served as assistant chief of staff of the nascent Tactical Air Command and taught at the Air War College. He was then posted to Korea, where he commanded the 8th Fighter-Bomber Wing after the cease-fire, supervising the unit's move to Japan.

In 1955, he commanded all USAF units in Korea, then became head of the 832nd Air Division at what is now Cannon AFB, N.M.

From August 1958 to October 1961, Momyer was director of plans for TAC, then moved back to Washington to serve as head of USAF operational requirements until early 1964, when he became assistant deputy chief of staff for programs and requirements. From August 1964 to July 1966, Momyer headed Air Training Command.

Now a three-star general, he was tapped to go to Vietnam, as the dual-hatted head of 7th Air Force and Military Assistance Command Vietnam's deputy commander for air operations, reporting directly to Army Gen. William C. Westmoreland. In that role he ran the Vietnam air war, coordinating the air activities of the Air Force, Navy, and Marine Corps from a bunker near



Saigon. His forces attacked supply routes, industrial facilities, ammo dumps, and massed enemy forces when they could be found. The effort was gargantuan. Westmoreland called Momyer "nonemotional, logical, and pragmatic."

Within a year, US forces had largely eliminated the air-to-air threat posed by MiG fighters supplied to North Vietnam by Russia. Momyer also prosecuted carpet-bombing campaigns, one of which, code-named Niagara, dropped more than 100,000 tons of bombs on North Vietnamese troops laying siege to Khe Sanh. Momyer wanted to broaden the list of targets to include Hanoi's Haiphong harbor and rail lines into China, but President Lyndon B. Johnson nixed these plans, fearing the war would broaden into a conflict with China and Russia.

Momyer personally flew many combat missions in Vietnam and was dogged in his efforts to find and rescue downed airmen.

Johnson promoted Momyer to four-star rank in late 1967 but asked him to stay on in Vietnam another six months.

After that, Momyer became head of Tactical Air Command, a post he held for five years, until his retirement in 1973. In 1972, Momyer responded to the North Vietnam "Easter Offensive" with a short-notice deployment of 250 aircraft and 7,000 airmen to South Vietnam.

He amassed more than 4,000 hours of flight time over his Air Force career, earning numerous Air Force and Army decorations, including the Distinguished Service Cross, two Distinguished Service Medals, three awards of the Silver Star, and the Distinguished Flying Cross.

In 1978, Momyer authored the book *Airpower in Three Wars* about the progression of airpower development through World War II, Korea, and Vietnam.

—John A. Tirpak

... But Senate Nixes SDB II Funds

Senate appropriators blocked procurement funding for the Small Diameter Bomb II next fiscal year, declaring it "premature" for USAF to begin production since "significant testing" remains in the bomb's development program.

Senate Appropriations Committee members noted that SDB II still needs to clear F-15E and F-35 integration—scheduled for Fiscal 2017—before full-rate production begins. As such, it makes no sense to fund production in Fiscal 2013, lawmakers wrote in a

report accompanying their version of the Fiscal 2013 defense appropriations bill, which the committee approved Aug. 2.

Senate appropriations leaders called on the Air Force to "modify its acquisition strategy to align with F-15E and [F-35] integration and consider an optimal production rate that minimizes individual unit costs."

Lawmakers cut \$40 million from the Air Force's overall funding request by cutting the production funds, but fully funded SDB II research and development next fiscal year.

AEHF-2 Reporting on Station

USAF's second Advanced Extremely High Frequency military communications satellite reached its assigned geostationary orbit Aug. 10, after three months of maneuvering.

Controllers at Schriever AFB, Colo., activated the satellite's payload four days later, beginning a two-month performance validation before joining DOD's combined Milstar and AEHF operational communications constellation.

"During payload activation, the payload wings and antennas were deployed, and

USAF photo by SrA. Eithan Morgan



Thar She Blows: SrA. Andrew Leal, a fuels technician with the 100th Logistics Readiness Squadron, shuts off a valve on a fuel truck as liquid spews into the air during a major accident response exercise at RAF Mildenhall, UK. The MARE simulated an accident due to a cracked flange connection during a fuel transfer.

the payload processors were initialized and verified in preparation for on-orbit test," stated space officials at Los Angeles AFB, Calif.

The AEHF constellation is designed to provide survivable, secure, and jam-resistant communications for the US military and national leadership. These spacecraft will eventually replace the Milstar satellites.

The Air Force and industry partners launched AEHF-2 into space from Cape Canaveral AFS, Fla., May 4.

The service's first satellite, AEHF-1, completed on-orbit testing earlier this year.

RQ-4 Flies From Grand Forks

The 69th Reconnaissance Group launched its first RQ-4 Global Hawk remotely piloted aircraft sortie from its home base at Grand Forks AFB, N.D., on Aug. 7.

The unit has been remotely operating Global Hawks flying over Southwest Asia, but had not flown a sortie locally since receiving its first Global Hawk Block 40 variant last September.

"Our pilots are already flying daily Afghanistan missions remotely from [Grand Forks] and are well-trained," said Col. J. Scott Winstead, 69th Reconnaissance Group commander.

At the same time, though, "we need to work on developing and exercising local process and procedure for the local area so the local flying community gets used to our operation." The unit's pilots are fully operational, but its Global Hawks have yet to receive their sophisticated MP-RTIP ground-surveillance radar payloads.

As a result, unit sensor operators haven't yet qualified on the radar. Prime contractor Northrop Grumman is working with the University of North Dakota to develop the training curriculum.

Tale of Two Tankers

A KC-135 and Royal Air Force L-1011 TriStar tanker took off together from RAF Mildenhall, England, practicing formation refueling over the North Sea, address-

ing a training shortfall identified during operations over Libya last year.

"Instead of using three tankers and taking up 9,000 feet, we could ... take up about half that amount of airspace" in future air campaigns, as a result of this combined training, said Capt. Mark Berthelotte of Mildenhall's 351st Air Refueling Squadron.

By training together, the allied tankers aim to avoid the poorly integrated multinational refueling efforts, during Operation Unified Protector, that consumed vast tracts of airspace, causing congestion for NATO aircraft en route to, or returning from, the target area.

Flying from Mildenhall gave the RAF 216 Squadron crews a taste of coalition operations "from somewhere different than our home base" at RAF Brize Norton, added 216 Squadron Leader Phil McConnell.

The sorties Aug. 16 and 17 were part of Mildenhall's ongoing cooperation with NATO tankers units from Britain and across Europe.

Mistake Felled CV-22

Pilot error downed a CV-22B Osprey tilt-rotor that crashed during a routine two-ship training mission on the Eglin Range, north of Navarre, Fla., June 13.

The accident investigation board found clear and convincing evidence that "the cause of the mishap was the crew's failure to keep the aircraft clear of the lead aircraft's wake," according to Air Force Special Operations Command.

X-51A Falls Short in Third Flight

The third experimental X-51A Waverider hypersonic vehicle fell into the Pacific Ocean without achieving test goals after a control fin malfunctioned during a test shot off the California coast on Aug. 14.

The malfunction prevented the vehicle's supersonic combustion ramjet engine from igniting. The vehicle was to have flown for upward of five minutes at speeds of about Mach 6, Air Force Research Laboratory officials said.

"It is unfortunate that a problem with this subsystem caused a termination before we could light the scramjet engine," said Charlie Brink, the AFRL's X-51A program manager in a press release following the flight.

The Waverider dropped from the B-52 mothership and successfully boosted through its rocket-propelled first stage. Fifteen seconds after booster separation the X-51 departed controlled flight due to the anomaly and plummeted into the ocean below.

"All our data showed we had created the right conditions for engine ignition and we were very hopeful to meet our test objectives," said Brink.

The first X-51 shot in May 2010 achieved limited success, flying under its own propulsion for more than three minutes, accelerating to Mach 5 before a malfunctioning engine seal terminated the flight.

After a successful launch atop its rocket booster in June 2011, the second Waverider vehicle's ramjet failed to ignite, possibly due to a shockwave from excessive boost-speed blocking the engine inlet, AFRL engineers conjectured at the time.

Though engineers built four test vehicles, as of August AFRL officials were uncertain if or when they will test the fourth and final X-51. None of the vehicles were designed to be used for more than one test flight.

"This resulted in an uncommanded roll to the left, rapid loss of altitude, and impact with the terrain," stated AFSOC's news release. The AIB released its findings Aug. 30.

The CV-22, assigned to the 1st Special Operations Wing at Hurlburt Field, Fla., was destroyed upon impact, resulting in an estimated \$78 million loss to the service.

All five aircrew members sustained injuries, none life-threatening, according to AFSOC.

The aircraft and crew were assigned to Hurlburt's 8th Special Operations Squadron at the time of the incident.

Felled by Vibration-Induced Fatigue

Investigators ruled that an engine compressor blade that broke loose in flight caused the crash of an F-16 on a training flight northeast of Kunsan AB, South Korea, in March.

The pilot's actions to recover the engine were "focused, precise, and appropriate," but engine performance continued to degrade, according to Pacific Air Forces investigators.

The accident investigation board determined that two of the engine compressor's fifth-stage blades snapped due to vibration-induced fatigue, according to the report's executive summary released Aug. 16.

The pilot ejected without injury, but the F-16 was destroyed. The fighter was assigned to the 36th Fighter Squadron at Osan AB, South Korea.

First Nuclear Course Graduates

The first class graduated from Air Force Global Strike Command's new graduate-level nuclear weapons certification program this summer, command officials announced Aug. 17.

"To determine or define nuclear experts, we have to first get them the education ... so that they understand all the nuances of being a professional in the nuclear enterprise," said AFGSC Command CMSgt. Brian S. Hornback, who graduated with the initial class of 15.

The program is a distance-learning initiative that consists of three 10-week classes that students have up to two years to complete.

It is designed to provide them with a solid understanding of nuclear weapon effects, nuclear weapon proliferation, and nuclear strategy and policy.

New Flying Enlisted Career Field

The Air Force is merging enlisted special operations fixed and rotary wing flight crews into a single career field, service officials announced Aug. 6.

Rotary wing and tilt-rotor flight engineers and aerial gunners along with AC-130 gunship loadmasters and other

Operation Enduring Freedom

Casualties

By Sept. 14, a total of 2,108 Americans had died in Operation Enduring Freedom. The total includes 2,105 troops and three Department of Defense Civilian. Of these deaths, 1,666 were killed in action with the enemy while 442 died in noncombat incidents.

There have been 17,568 troops wounded in action during OEF.

Bulldogs Deploy to Kandahar

Duluth-based F-16s of the Minnesota Air National Guard's 148th Fighter Wing deployed in August to Kandahar Airfield, Afghanistan, on a two-month close air support rotation.

The deployment is the unit's first since completing a two-year conversion from older F-16s to newer F-16 Block 50 airplanes in April, according to wing officials.

In the deployment workup, the wing "completed an intense, focused training program," said 148th Fighter Wing commander Col. Frank H. Stokes. "The Bulldogs are the most prepared, best equipped, and most highly trained unit I have ever had the privilege to witness."

Pilots and support personnel rotated to Nellis AFB, Nev., for training three times in 2011 and 2012, flying suppression of enemy air defense sorties at Red Flag there early this year.

The 300-airman contingent left Duluth for Afghanistan between Aug. 5 and Aug. 11.

C-17 Damaged at Bagram

Insurgent rockets damaged a C-17 Globemaster III airlifter on the tarmac at Bagram Airfield, Afghanistan, during an early morning raid Aug. 21, base officials said.

The aircraft, which was on the ground at Bagram supporting Joint Chiefs of Staff Chairman Gen. Martin E. Dempsey's official visit, sustained damage to its forward fuselage and one engine, according to official reports.

The incident mimicked previous attacks, but officials said Dempsey "was never in any danger" and there was no indication that the insurgents were targeting him.

Two maintainers who were working on the aircraft at the time suffered minor injuries but no one was seriously wounded in the attack.

Halting Green on Blue

Afghan leaders have begun to recognize the seriousness of Afghan troops turning to assault their coalition partners in "green on blue" attacks, said Joint Chiefs Chairman Gen. Martin E. Dempsey.

Afghan soldiers and police attacked coalition troops 32 times during 2012, resulting in 40 coalition deaths and 69 wounded as of August, Pentagon officials said.

These figures are a significant spike from 16 attacks in 2011, which resulted in 28 deaths over the same period last year, they said.

Dempsey said the key to dealing with the Afghans on this issue "might not be to pull back and isolate ourselves, but [to] reach out and embrace them even more."

nonstandard special operations aircrew will consolidate under the new specialty code: 1A9X1 Special Missions Aviation.

"The new career field was created to balance and sustain the career enlisted aviator force and to create a larger pool of qualified personnel to perform the duties required to meet the needs of current and future Air Force missions," said CMSgt. Douglas Massingill, career field manager for career enlisted aviators.

In the past, aerial gunner career fields have overflowed with applicants,

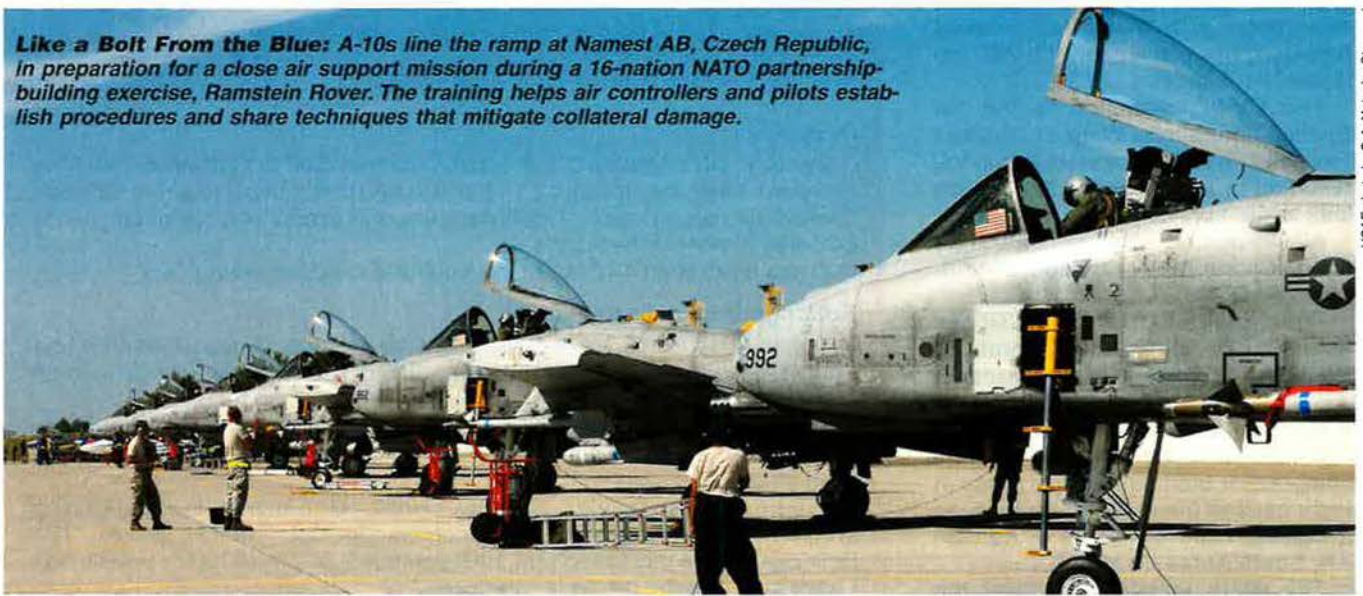
while certain loadmaster and flight engineer roles have suffered manning shortages, explained MSgt. Matthew Ardis, enlisted in-service aviation recruiter.

The new specialty code specifically aims to rectify this imbalance and will affect roughly 920 enlisted aviators effective Oct. 31.

Spartans in the Firefight

The Senate is considering legislation that could transfer to the US Forest Service 14 of the C-27J airlifters the Air

Like a Bolt From the Blue: A-10s line the ramp at Namest AB, Czech Republic, in preparation for a close air support mission during a 16-nation NATO partnership-building exercise, Ramstein Rover. The training helps air controllers and pilots establish procedures and share techniques that mitigate collateral damage.



USAF photo by S/A. Natasha Starnard

Force wants to shed, for use as dedicated firefighting assets.

"The Forest Service needs to modernize its entire air tanker fleet," said Sen. John McCain (R-Ariz.), introducing the Wildfire Suppression Aircraft Transfer Act in a statement at the end of July.

"We have an opportunity to take the C-27J, an aircraft the Pentagon no longer wants, and give it to the Forest Service to enhance aircraft safety and lower existing maintenance costs," he said.

Pressing the aircraft into service to fill an urgent need is much better than leaving the aircraft to "sit in an airplane boneyard," McCain said.

Sen. Diane Feinstein (D-Calif.) and Sen. Bill Nelson (D-Fla.) co-sponsored the bill, and local lawmakers in southern California expressed support, California's Southwest Riverside News Network reported Aug. 7.

The Air Force leadership proposed divesting the C-27J fleet in Fiscal 2013 as part of cost-cutting measures in its budget submission, a move that congressional defense overseers have rejected to date.

McCain presented his bill to the Senate July 25.

Down the Pike

The Colorado space tracking station known as "Pike" this summer ceased frontline operations and transitioned to a backup tracking and test role at Schriever AFB, Colo.

Since opening in 1988, the Air Force Satellite Control Network site tracked more than 300 US military and NASA space launches, including space shuttles, making more than 180,000 contacts with orbiting satellites during its career, according to Schriever officials.

"As we go forward, Pike is going to continue to be important ... for testing, troubleshooting, and contingency opera-

tions," said Lt. Col. Scott Angerman, 22nd Space Operations Squadron commander, at Pike's Aug. 3 cessation-of-operations ceremony.

The space telemetry radar station made its final operational contact with a satellite—a GPS spacecraft—on July 9.

The Air Force is removing Pike's radar for reuse at the Thule tracking station in Greenland.

DFC for B-17 Pilot

The Air Force belatedly awarded 87-year-old Samuel Smith the Distinguished Flying Cross for his heroism landing a crippled B-17 after a bombing mission over Europe during World War II.

On the March 1, 1945, mission, striking targets in Hopston, Germany, then-Army Air Forces second lieutenant Smith's aircraft was severely damaged by anti-aircraft fire, mangling the bomber's landing gear.

Despite the damage, Smith managed to turn the aircraft off the runway on landing at RAF Molesworth, England, clearing it so other returning aircraft could land behind him.

His actions were credited with sparing the lives of his crew and the crews of several other returning bombers, according to officials at JBSA-Randolph, Tex.

Air Education and Training Command intelligence director Maj. Gen. Timothy M. Zadalis presented Smith with the cross in a ceremony at Randolph on Aug. 24. According to the *San Antonio Express News*, Smith's commander "refused to sign off" on the award but later apologized and helped Smith get the medal.

Baghdad Express Debuts at Shaw

An F-111 Aardvark that once served with the 20th Fighter Wing took its place on display at Shaw AFB, S.C., this sum-

mer, following a refurbishment by wing technicians.

Airmen reassembled and painted the F-111E, nicknamed "Baghdad Express," in the markings it wore during Operation Desert Storm in 1991, according to a wing official.

Maintainers towed the medium bomber to the base airpark for display alongside the 20th Fighter Wing's four other heritage jets, fixing it in place Aug. 14.

The aircraft flew with the 20th from 1970 to 1993 before the unit moved from RAF Upper Heyford, England, to Shaw in 1994.

The Aardvark was stored at Davis-Monthan AFB, Ariz., prior to its arrival at Shaw in February.

Emblem Officially Recognized

The Air Force has officially recognized the insignia of the 477th Bombardment Group, a Tuskegee Airmen unit that flew B-25 medium bombers during World War II.

"The presentation of this patch is a long overdue recognition of the service and sacrifice of these great men," said Col. Bryan P. Radliff, Air Force Reserve Command 477th Fighter Group commander, in a release Aug. 2.

During World War II, the Army Air Corps never recognized the emblem because the African-American unit was never declared mission-ready. It was relocated several times during the war, according to 477th officials.

The Air Force added the insignia to its official record of heraldry, recognizing the wartime bomb group's "rightful place in airpower history," said Radliff.

Since the 477th Fighter Group traces its heritage to the Second World War bombardment group, Radliff announced the news to veterans gathered for the Tuskegee Airmen Convention that ran July 31 to Aug. 3 in Las Vegas. ■

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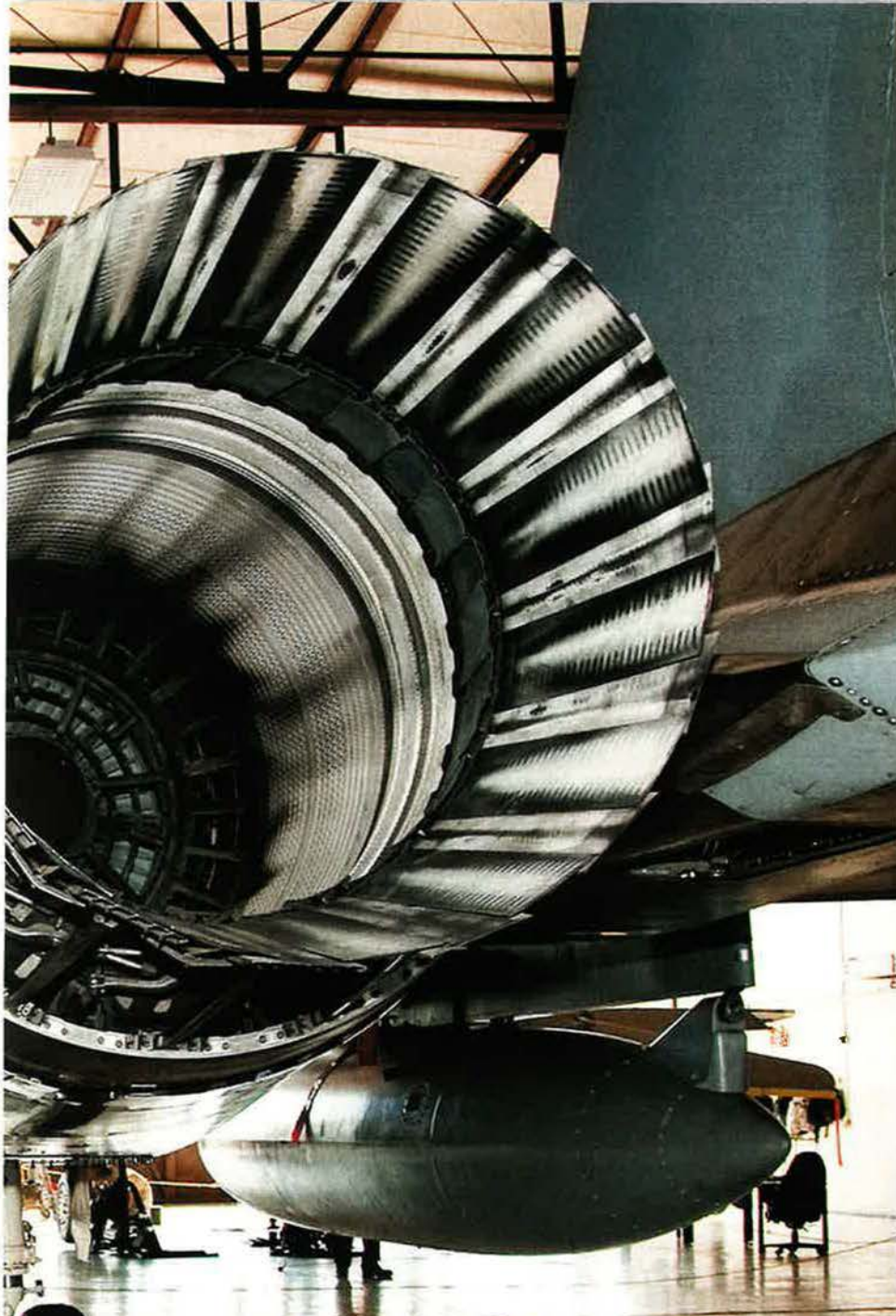
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Amn. Basic Jonathan Sanchez (with laptop) coordinates with Amn. Dalvin Troublefield as they work on an F-15 at Sheppard AFB, Tex.



The Air Force must determine exactly how much time and money to invest in its aging fleet of A-10, F-15, and F-16 fighters.

By Marc V. Schanz, Senior Editor

THE Air Force faces a daunting sustainment challenge with its legacy fighters. At a time when national strategy has changed and budgets are imploding, USAF must find a way to stretch the useful service lives of its older fighters, yet not invest too much in them because of their growing obsolescence against modern threats.

Despite fresh amputations of the Air Force fleet being debated in the Fiscal 2013 budget, the cornerstone of the combat air forces modernization plan remains largely untouched: the eventual purchase of 1,763 F-35A strike fighters. Delays in F-35 production due to test and development issues, however, are pushing the Air Force and Congress to consider the effect on the rest of the tactical fleet.

While waiting for the F-35, the Navy and Air Force must still meet combatant commander needs for adequate numbers of strike fighters, a situation that compels service life extensions and upgrades on existing aircraft. Three of the Air Force's four legacy fighter types will soon undergo structural durability testing, an intensive multiyear regime during which select F-16s, F-15Cs, and F-15Es will undergo what Air Combat Command's Deputy Chief of Combat Aircraft Requirements Wayne C. Fisher calls a "shake and stretch" process. The testing involves stripping down a representative aircraft and putting it on an elaborate hydraulic rig that will bend, pull, and compress various parts of the airframes to simulate years of operations under various flight regimes. Sensors collect data on how the airframe bears up, which Air Force Materiel Command engineers will evaluate as the test progresses.

The structural testing should establish just how much life ACC can extract from these fighters in the coming years. The majority of the legacy combat fleet is approaching the original factory-warranted number of flight hours, and the stress testing will be key to sorting out an efficient service life extension program, or SLEP, for them.

"If we have to fly our aircraft much longer, given their current age, we

CAF Redo



SSgt. Douglas Brown checks the alignment of an F-16 trainer aircraft's M61A1 Vulcan cannon through a boresight telescope at Misawa AB, Japan.

have to make sure they are structurally [sound]," said Fisher. While many of these platforms are creeping closer to the end of their originally projected life cycles (ranging from 8,000 flight hours to 10,000 hours), the planners expect them to "last as long as we need them into the future."

The stress testing isn't meant to uncover defects or flaws, but rather to certify engineering assumptions in order to keep some aircraft in service anywhere from 12,000 to 16,000 flight hours.

Age Is Just a Number

"The expectation is ... these aircraft are going to prove to have a service life that goes much beyond what they were initially intended to fly," Fisher said.

The number of flight hours legacy aircraft have racked up varies significantly. According to ACC figures:

- The oldest A-10 has around 9,000 equivalent flight hours, while the median aircraft in the fleet has flown just 7,000 hours.

- For the F-15C fleet, the highest

flight hour mark goes up to around 13,000 hours, while the median is 8,400.

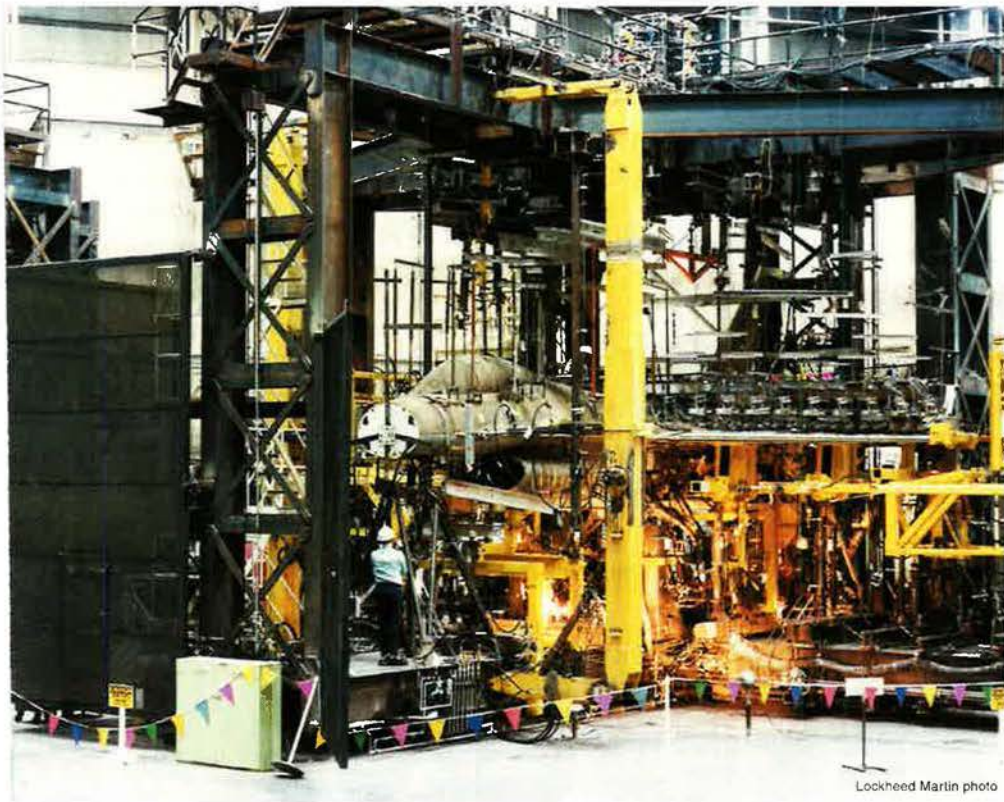
- The "new" F-15E Strike Eagles, by comparison, have flown quite a bit in the last decade, with the highest-use aircraft in the fleet at 15,000 hours. The median is 9,000.

- The so-called "pre-Block" F-16s—the Block 25s, 30s, and 32s—largely in the Air National Guard, have accumulated a median of 7,000 flight hours—not too far short of the highest-time aircraft, at 8,500.

USAF will have to track closely many factors as it tries to get more life out of its older combat fleet. The type of flying an aircraft does matters more than simply the number of hours it has accumulated, Fisher said. Some aircraft will fly 1,000 hours, but this may only equate to about 800 hours worth of stress on the aircraft. Causes can range from frequent deployments to structural wear—and this will be considered when the Air Force proceeds with its planned pre-SLEP stress testing.

The "F-16 SLEP is being designed right now," Fisher said, and the results of the analysis and reporting from the stress testing at Ogden Air Logistics Complex at Hill AFB, Utah, will influence just what will be done to the Block 40 through Block 52 aircraft to safely extend their service lives. Stress

F-16s go through testing at a Lockheed Martin facility in Fort Worth, Tex. AFMC is performing tests on legacy fighters to determine how much longer they can stay in the fleet.



Lockheed Martin photo



USAF photo by A1C Kim Atkins

testing will wrap up by Fiscal 2014 or 2015, he said. The first contract for SLEP kits is tentatively planned for early 2016, with follow-on kits in early 2017, and will comprise a depot-level upgrade. The first SLEP F-16s will join the fleet in 2017, with Combat Avionics Programmed Extension Suite (CAPES) aircraft coming the year after. While the engineering assumptions need to be validated for much of these older aircraft, Fisher

maintains optimism—but notes that when it comes to sustaining aircraft, everything has a price.

“We have expectations, as old as they are, we will be able to keep our airplanes structurally sound far into the future, as long as we need them,” he said. “It’s not at no cost, but we can do it.”

A Hard Sell

With no change in plans, legacy aircraft retirements—beyond force structure cuts already announced—will begin around 2017 and accelerate into the early 2020s. The aircraft will retire faster only if F-35 procurement increases dramatically. No one anticipates that happening.

The size and relevance of the legacy CAF in the future force structure is still being debated. Most Air Force estimates show a shortfall of some 800 fighters by 2025 due to delays, retirements, and updated projections for beddown of the F-35.

“How do you evaluate risk?” asked Sen. Joseph I. Lieberman (I-Conn.), chairman of the Senate Armed Services airland subcommittee, in a May 18 hearing with USAF and Navy officials.

The new defense strategic guidance emphasizes the ability of US forces to operate in anti-access, area-denial (A2/AD) environments, meaning adversary

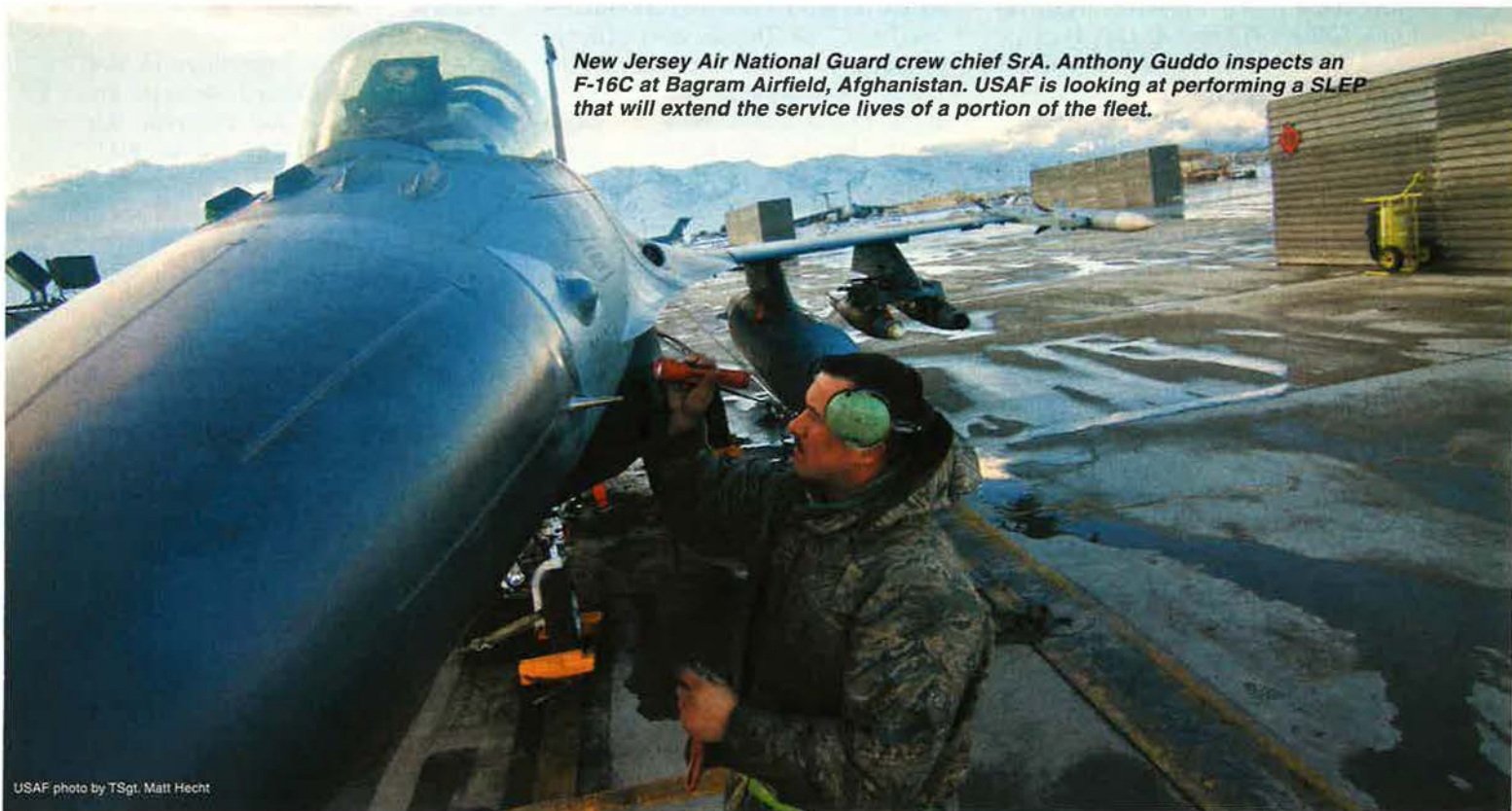
territory defended by the latest fighters, anti-aircraft systems, and electronic warfare. Consequently, almost all force planning scenarios for the CAF emphasize fifth generation assets that can overcome A2/AD and long-range strike aircraft able to penetrate heavy defenses from a distance.

Budget uncertainty beyond the five-year plan, however, dictates that whatever assets are retained in the inventory must be multipurpose, multimission platforms able to offer utility across a broad spectrum of conflicts. For that reason, modernizing the F-16 is getting a lot of attention.

In the posture statement accompanying its Fiscal 2013 budget proposal, Air Force leaders cited the “difficult choice” of divesting 227 additional aircraft from its combat and combat support fleets. For the CAF, this meant the total number of combat-coded fighter squadrons would dip from 60 to 54—31 active and 23 reserve component squadrons.

“As part of a broader strategy to reshape the Air Force into a smaller, yet capable, force, we divested 21 F-16 Block 30 aircraft in the reserve component and 102 A-10s ... from the total aircraft inventory,” USAF leaders said in the statement.

That proposal is a hard sell with Congress, especially because USAF



New Jersey Air National Guard crew chief SrA. Anthony Guddo inspects an F-16C at Bagram Airfield, Afghanistan. USAF is looking at performing a SLEP that will extend the service lives of a portion of the fleet.

USAF photo by TSgt. Matt Hecht



has already heavily cut its fighter force and is struggling with gaps in capability, exacerbated by the F-35 delays.

While some in Congress and even former USAF officials have suggested supplementing the force with new buys of fourth generation fighters, ACC boss Gen. G. Michael Hostage III has categorically rejected such a move. Any investment in brand-new fourth generation fighters “is just dumb,” Hostage said. Even if these new-old assets could be ordered immediately, it would take years to field them in effective numbers. That’s just about the time future threat planning scenarios project fourth gen types will no longer be able to survive the projected A2/AD threat.

Rather, USAF has stuck with a plan of reducing force structure in favor of a smaller number of highly capable assets. The retirement of 250 fighters in the last round of force structure cuts was meant to free up \$3.5 billion so critical upgrade and munitions programs could be preserved. USAF reasoned that a smaller but high-quality force can keep USAF highly capable and credible. Air Force leaders have acknowledged, however, that numbers can only be drawn down so far, and the same aircraft can’t be in more than one place at a time.

MSgt. Turner Fowks fills in maintenance information on an F-15 at JB Elmendorf-Richardson, Alaska. There are some 250 F-15C/Ds still in the fleet—about half with the ANG.

Accepting Moderate Risk

The “CAF Redux,” as it was known at the time, also made available thousands of billets that could be shifted from fighter operation and maintenance to shorthanded specialties in the nuclear enterprise and intelligence, surveillance, and reconnaissance.

USAF readily admitted during the 2010 CAF Redux that the plan entailed “moderate” risk. The idea was that things would get better in the out-years. By the 2020s, it was argued, a larger portion of the fleet would be fifth generation assets. This calculus has not changed

A maintenance crew from the 455th Expeditionary Aircraft Maintenance Squadron works on an A-10 at Bagram Airfield. A major upgrade just completed is to keep the A-10s flying into the 2030s.

materially, at least pertaining to investment and sustainment of the CAF. USAF later pegged the fighter force structure at around 1,200 primary mission aircraft and 2,000 total airframes.

A shortfall of some three to five percent would persist through the Future Years Defense Program, Air Force leaders told Congress in 2011.



Any capacity shortfall would be alleviated through improved F-35 production management, close monitoring of the health of the legacy CAF, SLEPs, and selective upgrades.

The new defense strategic guidance calls for more firepower than the legacy CAF can offer, however. According to DOD's latest 30-year aircraft procurement plan, submitted with its Fiscal 2012 budget, "The age and capability limitations of manned legacy aircraft make them less valuable in the future—hence the department's emphasis on fifth generation and unmanned aircraft."

By Fiscal 2021, about a third of DOD's manned fighter and attack aircraft will be fifth generation aircraft, embodying stealth, sensor fusion, and a high capability in electronic warfare. Only seven percent of the current force structure is fifth gen.

"Although the Air Force is downsizing, we must still provide the force structure and capability and be prepared to respond to a dynamic environment," Air Force Secretary Michael B. Donley said in March.

At the May SASC subcommittee hearing, Lieberman asked, "How do we minimize risk in aircraft that we're attempting to keep going longer than they were originally intended to?"

Lt. Gen. (now Gen.) Janet C. Wolfenbarger, then the military deputy in USAF's acquisition shop and now head of AFMC, said the Air Force is looking at a "bridge capability" of dual approaches: a SLEP extending the F-16 fleet to about 10,000 hours and a suite of selective improvements, with avionics and other capabilities. The Fiscal 2013 budget request includes the F-16 stress and durability test and the CAPES, she noted. The F-16 CAPES will add active electronically scanned array (AESA) radar and new cockpit displays, along with data link enhancements and improved defensive suites.

For the remaining F-15 fleet—about 250 airframes, mostly in the Air National Guard—a program called the Eagle Passive/Active Warning Survivability System is now on the books. EPAWSS will replace the obsolete self-protection system, called the Tactical Electronic Warfare System (TEWS). Risk reduction and technology development for the new system will proceed in 2013, Fisher said. The F-15's older electronic systems are rapidly becoming unsupported and, along with the F-16 EW, upgrades will be installed in the field over the next seven to eight years.

USAF photo by S/A. Larry E. Reid Jr.



A maintainer conducts an afterburner test on an F-15E during Exercise Maple Leaf in Canada. The median flight hours for the younger F-15E fleet is 9,000.

"[That] brings a large portion of [both] our F-15E and -C fleet as well as a portion of our F-16 fleet to AESA capability," Fisher said.

The F-15E fleet, slightly younger overall than the F-15C, will have AESA radars installed on all aircraft by the end of Fiscal 2013, said Brian Dillon, deputy program element monitor for the Strike Eagle at ACC headquarters. While the two aircraft have very different missions—the Strike Eagle is a multirole platform, while the F-15C is exclusively used for air superiority—the Air Force is trying to take advantage of their similarities.

The Pod Mod

The F-15Es and F-15Cs are a combined modernization program, as far as EPAWSS is concerned, Dillon noted. Moreover, the Air Force wants to develop a common solution for an Infrared Search and Track (IRST) system, which can be "podded" on either the Eagle or Strike Eagle. When developed, a new pod would be able to fast scan air-to-air threats, track targets, and get range data in the infrared spectrum.

"We are going to a common core processor for [the F-15]C and E," Dillon said. Having different processors makes it difficult to develop a common pod, but once USAF develops a common code for them, it will open the door to a pod and other peripheral that can be fitted on both. The common processor is about "five to seven years down the road," Dillon said.

Due to the range of flight hours on the F-15E, ACC's calculations will vary when it comes to modernizing certain pieces over time. Aircraft "that only have [4,000 or 5,000 flight hours] still have many years of service left," Dillon said. For example, the Air Force may not have to buy 200 AESA radars if, in the next three or four years, 80 aircraft are selected for early retirement to the "Boneyard" at Davis-Monthan AFB, Ariz. This situation applies to a swath of the legacy CAF as well, especially as funding remains fluid and threat scenarios evolve.

"Fifteen years down the road, someone may come to us and say, 'It's no longer effective to put a new widget on a Strike Eagle,'" Dillon said. "But we're nowhere near that point right now."

The Air Force recently completed a major upgrade of the A-10C that can keep the fleet flying into the 2030s, but questions remain as to how much of the Warthog inventory will remain in service, due to budget pressures.

As the service trades "size for quality," readiness and sustainment will be critical. So will programs such as the KC-46 tanker, space assets, and advanced ISR systems.

"Modernization remains a key concern, especially as our fleets age and new technologies drive new investment needs," Donley said. As a result, in this budget—and likely going forward—modernization will be slowed to protect crucial future programs. ■



Fifty years ago this month, the Cuban Missile Crisis veered perilously close to nuclear war.

A U-2 flies an ISR mission over the Caribbean. The spyplanes were used to obtain proof that the Soviets were installing nuclear missiles in Cuba.

USAF photo

HIGH NOON

By John T. Correll



In the 1960 presidential election campaign, Democratic candidate John F. Kennedy raised the alarm about a “missile gap” in which he said the United States trailed dangerously behind the Soviet Union.

Kennedy’s claims were later revealed to be in error. There indeed was a missile gap, but it was in favor of the United States, which had four or five times as many ICBMs as the Soviets did. The US Polaris submarine-launched ballistic missile was newly operational, whereas the Soviet Union did not yet have any SLBMs.

Kennedy knew this all along. At the direction of President Dwight D. Eisenhower, the Democratic candidates had been briefed by the CIA, Strategic Air Command, and the Joint Chiefs of Staff.

The notion of a missile gap also was promoted by Soviet Premier Nikita Khrushchev, who was often carried away by his own bluster, exaggeration, and boasting. Khrushchev was well aware of the true situation but he fed the impression of superior Soviet strength at every opportunity. He said the USSR was turning out missiles “like sausages” and added, “We have rockets capable of landing in a particular square at a distance of 13,000 kilometers.”

In actuality, Khrushchev was deeply worried about the Soviet disadvantage in long-range missiles, which was about to become the critical factor in both the beginning and the end of what history would call the Cuban Missile Crisis.

“I had the idea of installing missiles with nuclear warheads in Cuba without letting the United States find out they were there until it was too late to do anything about them,” Khrushchev said.

On a trip to Bulgaria in May 1962, Khrushchev took a brief holiday at the Black Sea resort of Varna. As he strolled along the beach, he thought about his problems. The most serious of these was the disparity in strategic military power, but Cuba—the USSR’s first and only ally in the Western Hemisphere—also was on his mind.

The United States had been embarrassed the previous year by the failure of the Bay of Pigs invasion, but US efforts to overthrow Fidel Castro’s regime in Cuba continued. Lately, Castro’s allegiance to Soviet leadership had weakened as he drifted toward the Chinese, who espoused a more aggressive brand of Communism. Khrushchev needed a dramatic demonstration of his commitment to Cuba.

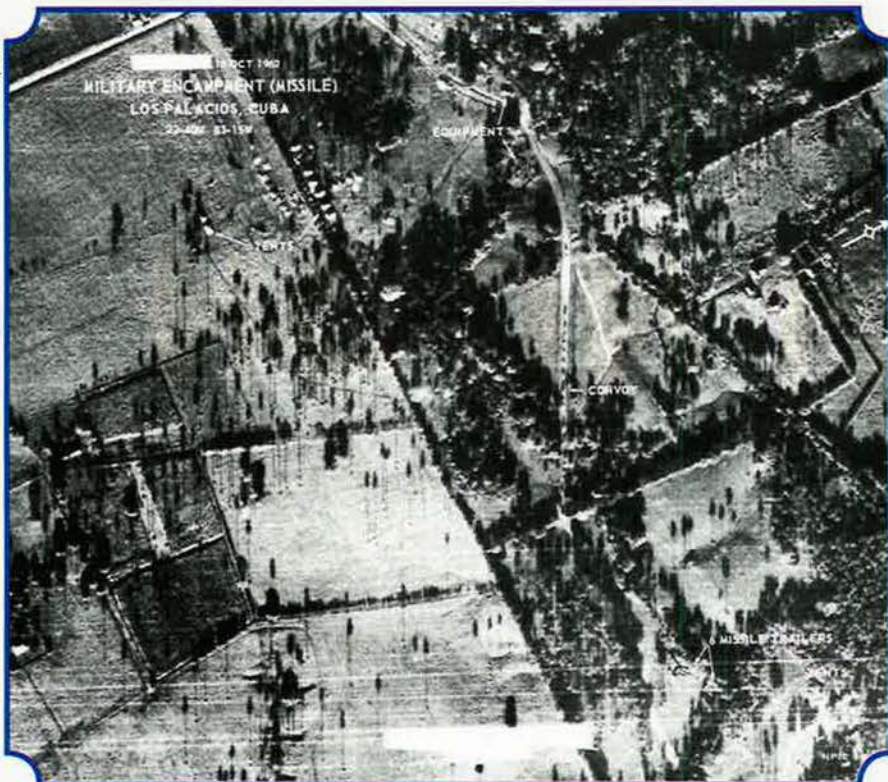
Walking alongside Khrushchev on the beach was Defense Minister Rodion Malinovsky, who pointed toward the opposite shore of the Black Sea, where the Americans were deploying intermediate-range Jupiter missiles in Turkey. “Why then can we not have bases close to America?” Malinovsky asked.

Indeed, putting missiles in Cuba would address several problems. “In addition to protecting Cuba, our missiles would have equalized what the West likes to call ‘the balance of power,’” Khrushchev said. The USSR had plenty of medium- and intermediate-range missiles. From Cuba, they would have the range to strike targets in the United States as easily as ICBMs could from launch sites in the Soviet Union.

The trick was to get it done before the Americans caught on and took preventive measures.

The plan as fleshed out by the Soviet armed forces was to send 24 SS-4 medium-range ballistic missiles and 16 SS-5 intermediate-range missiles to Cuba. From there, the SS-4s could reach as far as SAC headquarters in Omaha and the SS-5s could cover the entire continental United States. The deployment also would include four combat regiments, advanced SA-2 surface-to-air missiles, MiG-21 interceptors, and Il-28 light bombers.

Castro was not enthusiastic about the idea at first but agreed to it as an act of solidarity with the socialist bloc. He also welcomed the opportunity to stand up to the United States.



Marshal Sergei Biryuzov, head of the Soviet rocket forces, visited Cuba prior to the deployments and assured Khrushchev that the missiles could be disguised as coconut palm trees, which had the same straight barrel trunk. "Only the warhead would have to be crowned with a cap of leaves," said Khrushchev's son Sergei, a missile engineer in whom the premier confided. "To this day I can't understand how father believed such primitive reasoning."

Fundamental to Khrushchev's decision was his belief that Kennedy was weak and could be bulldozed. He formed this impression on the basis of Kennedy's fumbling in the Bay of Pigs operation in 1961 and on the Vienna summit that summer, where Khrushchev had pushed Kennedy around at will. Kennedy also vacillated at several points in the Berlin Wall confrontation that fall.

At the end of 1961, Khrushchev told a group of Soviet officials that Kennedy would do anything to prevent nuclear war. "Kennedy doesn't have a strong background, nor generally speaking,

does he have the courage to stand up to a serious challenge," he said.

The Kennedys—the President and his brother and closest advisor, Attorney General Robert Kennedy—had not lost interest in Cuba after the Bay of Pigs

fiasco. In November 1961, the President authorized Operation Mongoose to foment an uprising in Cuba and overthrow Castro. The project was overseen by Bobby Kennedy with the flamboyant Edward G. Lansdale, the Administration's favorite insurgency specialist, as operations chief.

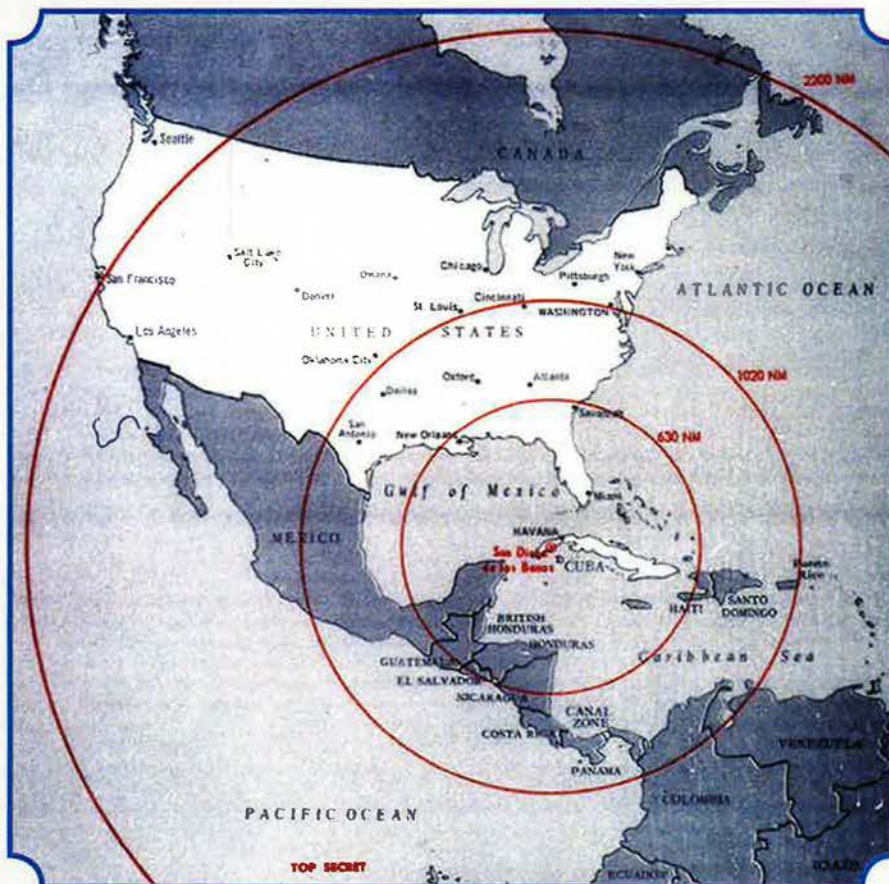
Mongoose endorsed sabotage, psychological warfare, propaganda, infiltration by guerillas, disinformation, and much more. Not revealed until much later were half-baked schemes to assassinate Castro with exploding cigars or to use depilatories to make his hair and beard fall out.

Cuban-Soviet fears of an invasion were not totally unfounded. In early 1962, as part of Mongoose, the US military developed contingency operation plans for the invasion and occupation of Cuba. A wargame in August 1962 featured a mock assault on the Puerto Rican island of Vieques and the simulated overthrow of a leader named "Ortsac," or Castro spelled backward.

The Big Deployment

Never before in its history had the Soviet Union undertaken such a massive sealoift. Ships loaded at a dozen Baltic and Black Sea ports and began moving out in July 1962. Until the ship captains opened their sealed orders at sea, they did not know their destination was Cuba.

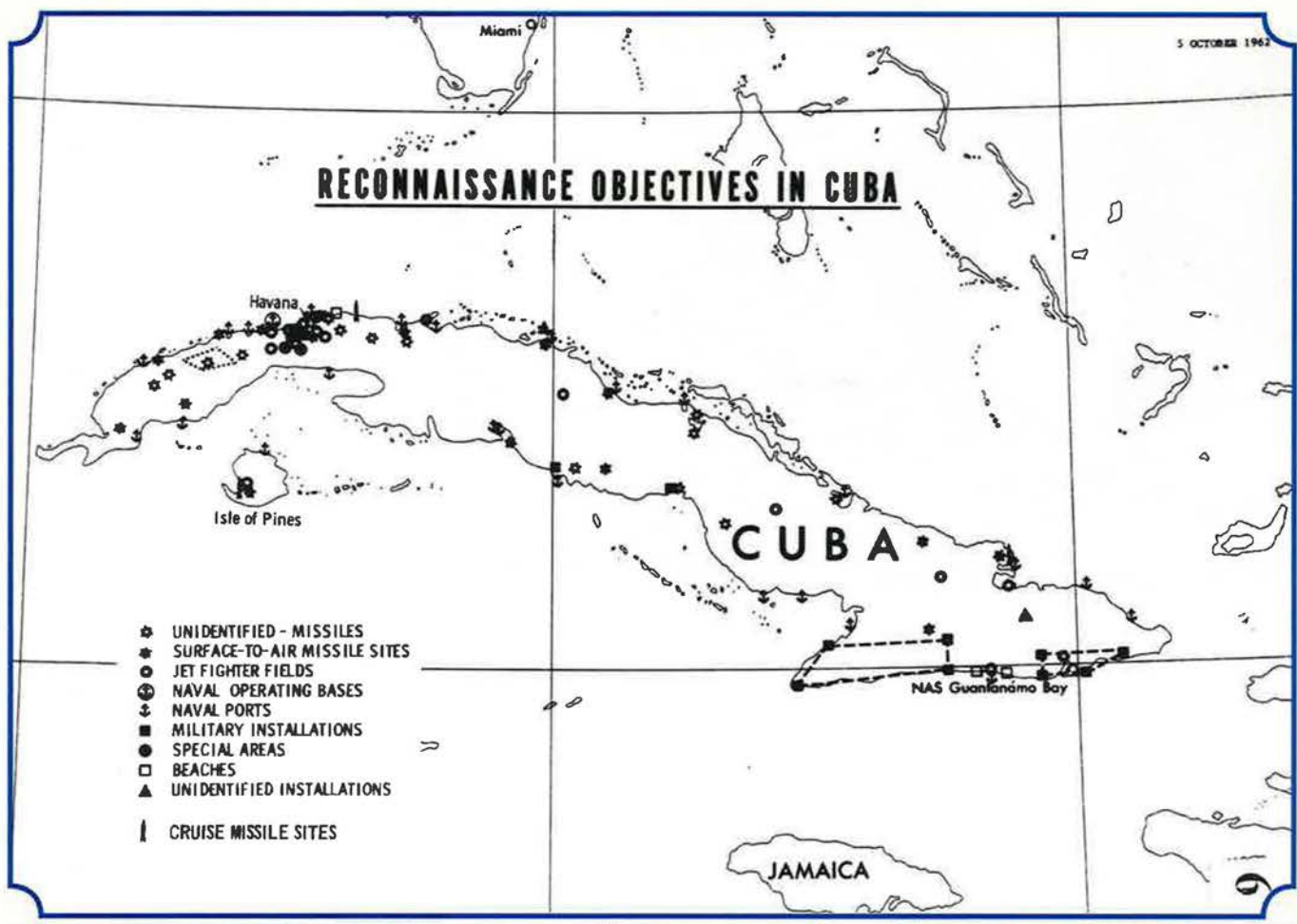
Top: This photo, taken from a U-2 by USAF Maj. Richard Heyser, clearly shows a convoy of Soviet trucks snaking toward San Cristobal, Cuba, on Oct. 14, 1962. This image convinced the CIA that the Soviets were placing nuclear weapons in Cuba. Right: A map of the Western Hemisphere shows the range of the nuclear missiles placed in Cuba.



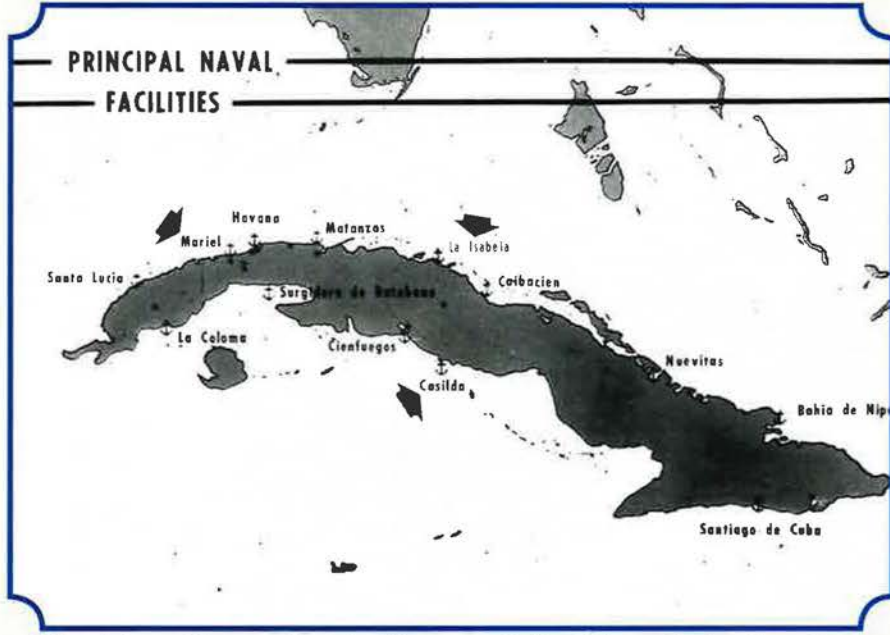
CIA map via The John F. Kennedy Presidential Library and Museum

5 OCTOBER 1962

RECONNAISSANCE OBJECTIVES IN CUBA



PRINCIPAL NAVAL FACILITIES



Two maps used by USAF and the government during the Cuban Missile Crisis. The top one shows the locations of valuable reconnaissance targets, the bottom Cuba's naval bases.

about the missile deployment. On Sept. 4, he relayed a message from Khrushchev assuring Kennedy that no offensive weapons would be placed in Cuba. This was one of the several lies by Khrushchev during the Cuban Missile Crisis. In his opinion, US duplicity during the U-2 overflights of the Soviet Union in the 1950s entitled him to use whatever deceptions he wished.

Khrushchev planned to announce the presence of the missiles in a speech at the United Nations in November, when his entire force was in place. At the end of September, he told an aide, "Soon, hell will break loose."

A U-2 made a regular run over Cuba on Sept. 5, but owing to events halfway around the world, that was the last overflight for five critical weeks.

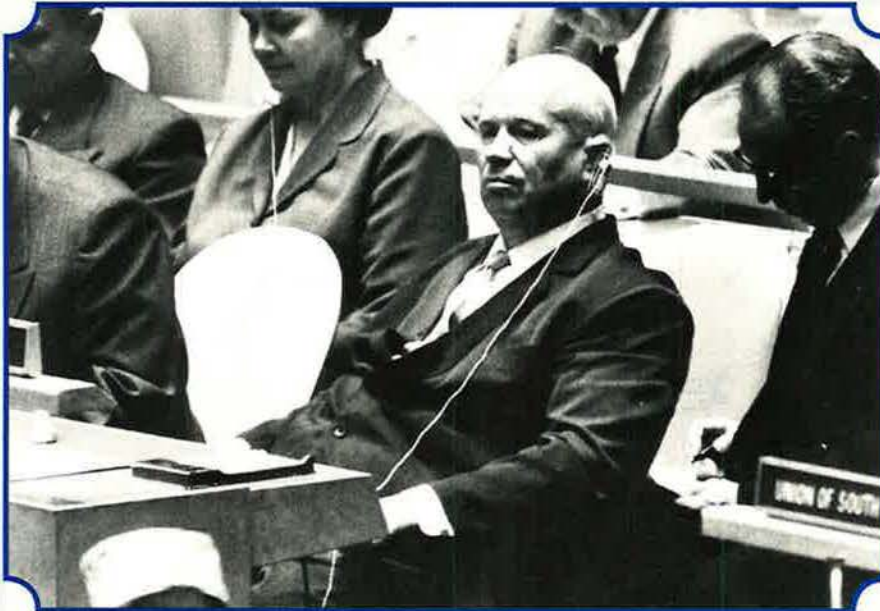
On Aug. 30, a Strategic Air Command U-2 on a mission unrelated to Cuba overflew Sakhalin island in the Far East by mistake. The Soviets protested and the US apologized. On Sept. 9, another U-2, flown by a pilot of the Taiwanese Air

US aerial surveillance noticed the ships under way and reported that they were riding high in the water, indicative of military cargo such as missiles, which are large in relation to their weight.

Khrushchev continued his bluster. "You don't have to worry," he told Cuba's Che Guevara in July. "There will be no big reaction from the US side. And if there is a problem, we will send the Baltic Fleet."

By late July, two Soviet ships a day were arriving in Cuba. US intelligence spotted the MiG-21s and Il-28s and watched the buildup of troops. In August, Central Intelligence Agency U-2 spyplanes overflying Cuba found SA-2 SAM sites at eight locations. The White House judged the SAMs to be purely defensive and not a threat.

Anatoly Dobrynin, the Soviet ambassador to the United States, was not told



Force, was lost, probably to a SAM, on a mission over western China.

Tass, the Soviet news agency, published a warning against interference with the ships bound for Cuba, which in any case carried only farm machinery and industrial equipment, along with “agronomists, machine operators, tractor drivers, and livestock experts” sent to help the Cubans.

Secretary of State Dean Rusk and National Security Advisor McGeorge Bundy stirred up enough concern about the political consequences if a U-2 were to be shot down over Cuba that there were no overflights from Sept. 5 to Oct. 14.

Unseen by the United States, the Soviet cargo ship *Poltava* docked at Mariel Sept. 15, carrying the first of the SS-4s. On Oct. 4, *Indigirka* arrived at Mariel with 90 nuclear warheads to arm the missiles, bombers, and the battlefield nuclear weapons code-named Frog and Salish by NATO.

During this interval, the Cuba overflight mission was reassigned—over CIA objections—to Air Force U-2 pilots. Various reasons were given for the change, among them the rising prospect of armed conflict.

When overflights resumed Oct. 14, Air Force Maj. Richard S. Heyser flew the first mission. He approached Cuba from the south an hour after sunrise, crossed the

Isle of Pines, and turned on his cameras at 7:41 a.m. He passed over San Cristobal west of Havana, exited Cuban airspace 12 minutes after he entered it, and headed for McCoy AFB, Fla., where a courier airplane was waiting. Heyser’s film was soon in the hands of the CIA’s photo interpretation center in Washington, D.C., which on Oct. 15 confirmed components of SS-4 missile batteries at San Cristobal.

Showdown

President Kennedy was notified at 8:45 a.m. Oct. 16, marking the beginning of

the famous “Thirteen Days” of the Cuban Missile Crisis, also remembered as “High Noon of the Cold War”—when the danger of nuclear war reached its peak.

In a White House meeting the afternoon of Oct. 18, Soviet Foreign Minister Andrei Gromyko—who, unlike Dobrynin, did know the details of the missile deployment—assured Kennedy that no offensive weapons were being delivered to Cuba. Kennedy knew that Gromyko was lying but did not say so.

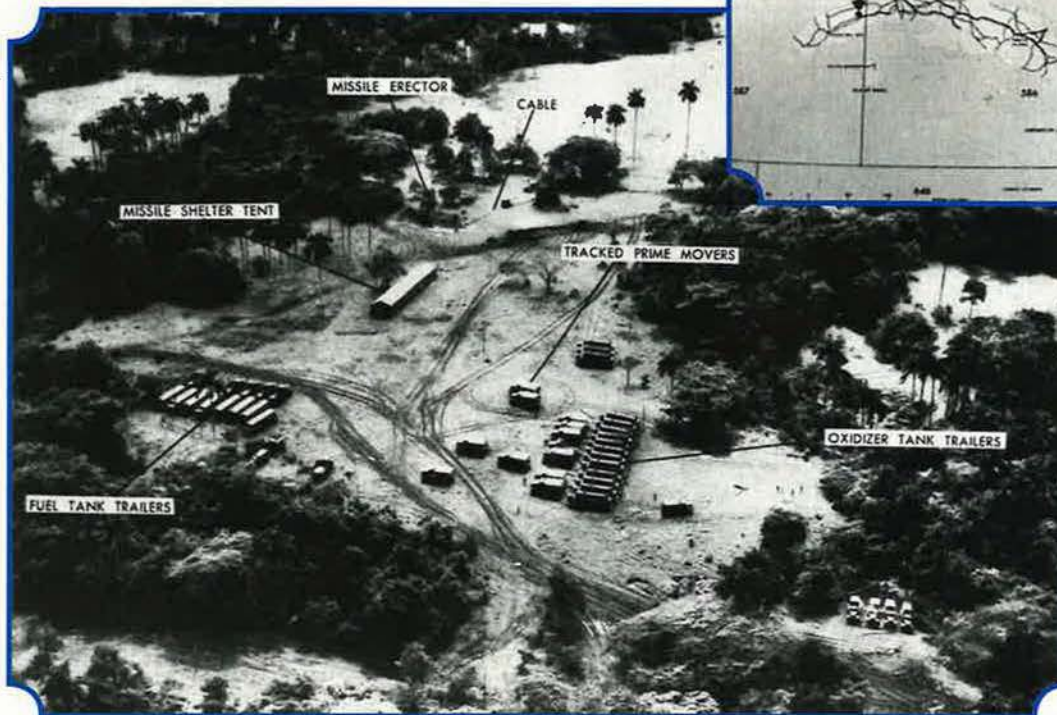
U-2 flights increased and the CIA reported on Oct. 20 that four SS-4 sites were in place with 16 operational launchers, and that two SS-5 sites and at least one nuclear warhead storage bunker were under construction.

Recalling it years later when he wrote his memoirs, Khrushchev still had not shed his braggadocio. “We hadn’t had time to deliver all our shipments to Cuba, but we had installed enough missiles already to destroy New York, Chicago, and the other huge industrial cities, not to mention the little village of Washington,” he said. However, Khrushchev had seriously miscalculated the American response and Kennedy’s determination.

The cockpit from which Kennedy would work the crisis was “ExComm,” the executive committee of the National Security Council. Rusk regarded it as a device to give Bobby Kennedy a prominent role and marginalize the State



Top: Soviet Premier Nikita Khrushchev at a meeting of the United Nations in 1960. Despite his bombast, he was deeply worried about the “missile gap”—which favored the US. Right: The shadow of a US RF-101 aircraft passes a Soviet cargo ship during a November reconnaissance mission over Cuba. The vessel was loaded with missile transporters.



An enlarged, low-level photo of the San Cristobal site reveals in detail the nuclear nature of the Soviet presence on Cuba. Note the missile erector under a tarp at top. Inset: The arrow points to San Cristobal.

Department. ExComm struggled with the missile crisis for a week before the public was informed.

A nuclear missile threat 90 miles from Florida could not be tolerated. The Joint Chiefs of Staff advised an air strike, but when told it might take several hundred bombing sorties to get 90 percent of the missiles, Kennedy decided instead on a "quarantine," a euphemism avoiding the term "blockade," which would be an act of war. Strategic Air Command went on airborne alert.

In an electrifying speech to the nation Oct. 22, Kennedy said there was "unmistakable evidence" of Soviet missiles and bombers in Cuba. He announced the quarantine and said the US would "regard any nuclear missile launched from Cuba against any nation in the Western Hemisphere as an attack by the Soviet Union on the United States, requiring a full retaliatory response against the Soviet Union."

For the first time in history, SAC advanced its alert posture to DEFCON 2, one step short of nuclear war, and North American Air Defense Command sent interceptors and anti-aircraft batteries to the southeastern United States.

"We moved into Florida," said Gen. David A. Burchinal, who was director of plans on the Air Staff at the time. "I thought it would sink in terms of tactical air forces that we moved in to Florida—airplanes, bombs, and rockets." Air Force and Navy fighters began low-level reconnaissance of Cuba to supplement the high-altitude surveillance by the U-2s.

On Oct. 22, SAC activated its first 10 Minutemen ICBMs and placed them on alert.

Khrushchev had two regiments of SS-4s operational but he understood right away that his plan had failed. "We missed our chance," he said later. He had assumed that Kennedy would back down rather than risk war over the missiles in Cuba. "It turned out that we had no carefully thought-out plan in case our missiles were discovered prematurely," Sergei Khrushchev said. "Now we would have to improvise."

Bait and Switch

For a while on Friday evening, Oct. 26, it seemed that the crisis had broken when the State Department received a long, rambling letter from Khrushchev to Kennedy, hinting at a possible basis for settlement.

"We, for our part, will declare that our ships bound for Cuba are not carrying any armaments," Khrushchev proposed. "You will declare that the United States will not invade Cuba with its troops and will not support any other forces which might intend to invade Cuba. Then the necessity for our military specialists in Cuba will be obviated."

The letter contained more lies. "I assure you that the vessels which are now headed for Cuba are carrying the most innocuous peaceful cargoes," Khrushchev said. "The ships bound for Cuba are carrying no armaments at all. The armaments needed for the defense of Cuba are already there." Among the ships en route to Cuba was *Poltava* with 24 SS-5 ballistic missiles aboard.

Before Kennedy could respond to the proposal, Radio Moscow broadcast a new message from Khrushchev at 9 a.m. Saturday changing the offer. The Soviets now said they would remove their missiles from Cuba only if the United States withdrew its Jupiters from Turkey.

The Jupiters were essentially obsolete and not regarded as all that important. Had they been included in Khrushchev's original proposal, Kennedy might have agreed. As it was, Khrushchev appeared to be engaging in bait-and-switch tactics, which aroused US suspicions.

Saturday would be the longest day of the crisis, when three separate incidents propelled the United States and Cuba to their closest brush with nuclear war.

That morning, Air Force U-2 pilot Maj. Rudolf Anderson Jr. took off from McCoy, crossed the Cuban coastline at 9:15, and was soon picked up by the SAM site at Banes in eastern Cuba. Castro—who had no control over the Soviet weapons—had been clamoring for the U-2s to be shot down but Moscow would not give permission.

On Oct. 27, however, the Soviet commander, Gen. Issa Pliyev, could not be found and his deputy gave the order to fire, in violation of orders. The batteries launched three SAMs, two of which hit the U-2 and knocked it out of the sky at 10:19 a.m. Anderson was killed. The Air Force wanted to launch an F-100 air strike on Banes, but Kennedy would not authorize it.

Khrushchev denied responsibility but Sergei Khrushchev later said, "Father was inwardly pleased that another U-2, which had inflicted such humiliation



President John Kennedy (l) and Secretary of Defense Robert McNamara in a National Security Council Excomm meeting.

on our country, had been downed by a Soviet missile.”

Meanwhile, another Air Force U-2 had gone missing in the far north. It had taken off from Alaska on a mission to collect air samples at high altitude to monitor Soviet missile testing. The pilot, his navigation confused by the northern lights, drifted into Soviet airspace around noon, Washington time.

Six Soviet fighters took off to intercept the U-2, and American F-102s, armed with tactical nuclear rockets because DEFCON 2 was in effect, scrambled to protect the aircraft, which managed to return to US airspace before a confrontation occurred.

Tensions were running high at 5:59 p.m. when US destroyers, enforcing the quarantine, dropped practice depth charges about the size of hand grenades in an attempt to force a Soviet submarine to surface. Unknown to the US Navy, the submarine was armed with a nuclear torpedo and had orders to use it if the submarine was hulled by depth charges or surface fire. The submarine had to surface for air at 9:52 p.m. The captain was angry but made a radio check with Moscow and was told to hold his fire.

Three incidents were thus defused, but that evening, Secretary of Defense Robert S. McNamara wondered if he would “live to see another Saturday night.”

Khrushchev Blinks

Around 8 p.m. Saturday, ExComm hit upon the stratagem that brought the crisis to a close. Kennedy would respond to and accept Khrushchev’s offer of Friday night and ignore the Saturday morning addition about the Jupiters.

Bobby Kennedy, who had held several back-channel sessions with the Soviets during the crisis, met with Dobrynin and told him that unless Khrushchev made a commitment by the next day to dismantle the missiles, the United States would begin military action against Cuba. If the Soviets removed the missiles, the Jupiters would be taken out of Turkey, although there would be no public announcement of that.

“We could see that we had to reorient our position swiftly,” Khrushchev said. He knew that the USSR was years away from achieving strategic parity. At the time, according to McNamara, the US had 5,100 nuclear weapons it could deliver on the Soviet Union compared to 300 the Soviets could deliver on the United States. Khrushchev feared that a nuclear exchange would wipe his country off the face of the map, whereas the US would sustain millions of casualties but survive.

At 9 a.m. Sunday Washington time, Khrushchev broadcast a message on Radio Moscow saying that he had ordered “the dismantling of the weapons you describe as ‘offensive’ and their crating and return to the Soviet Union.” The missile crisis was effectively over. “Eyeball to eyeball, they blinked first,” Rusk said.

Castro was not informed in advance. “Father decided to present Havana with a fait accompli,” said Sergei Khrushchev. In a rage, Castro peppered Khrushchev with “son of a bitch, ... bastard, ... no cojones,” and other epithets.

Reconnaissance on Nov. 1 found the missile sites bulldozed and the missiles

removed. By December, all of the strategic missiles and the B-59 bombers were gone. The Jupiters were quietly pulled out of Turkey, with Polaris submarines deployed to take over their function.

In January 1963, Rusk testified at a closed hearing of the Senate Foreign Relations Committee that the promise of on-site inspections in Cuba had not been fulfilled, and that the United States did not consider its noninvasion pledge binding “if Castro were to do the kind of thing which would from our point of view justify invasion.”

By personal direction of the President, Rudolf Anderson was posthumously awarded the Air Force Cross for heroism. This was the first time this new decoration, second only to the Medal of Honor, had ever been presented.

According to postcrisis intelligence analysis, there had been 40,000 Soviet troops in Cuba, many more than the US had estimated. Five of the SS-4 sites had been operational, with 33 missile launchers. The Soviets had about 20 nuclear warheads in country although none of them had been mounted on the missiles. The SS-5 missiles, aboard the cargo ship when the quarantine began, never reached Cuba.

Kennedy had demonstrated courage during the crisis, stood firm, and played his hand well. He was careful not to boast in public, but others—including his admirers in the news media—were more than ready to heap credit on him. Both Kennedy and Khrushchev contributed to the peaceful outcome by their exercise of restraint.

Immediately after the crisis, the Soviets publicly depicted it as a triumph that prevented an invasion of Cuba. Pravda said that Soviet “calm and wisdom” had saved the world from a “nuclear catastrophe.”

The Russians didn’t really believe it, and any benefit to Cuba was vastly outweighed by the spectacle of the Soviets withdrawing their missiles and forces in a losing confrontation with the United States.

In October 1964, Khrushchev was removed from power and forced into retirement. There were various reasons for his ouster, not the least of them being the humiliation suffered by the Soviet Union in the Cuban Missile Crisis. ■

John T. Correll was editor in chief of Air Force Magazine for 18 years and is now a contributor. His most recent article, “The Muddled Legend of Yalta,” appeared in the September issue.



A low production rate has stabilized the critical strike fighter program but raised costs.

By John A. Tirpak, Executive Editor

AF-2 and AF-4 F-35s perform a touch and go at Edwards AFB, Calif.

Lockheed Martin photo

Slow Climb for the F-35

The F-35 program is attempting to fight its way back from severe cost and schedule problems that put the joint service project under intense scrutiny in recent years. Since the program's 2010 restructure—to allow more time to accomplish test, development, and production milestones—it is now ahead of the revised schedule in most categories, catching up fast in others.

Not all the news is good, however. Costs have continued to rise, partly because DOD slowed the production rate to produce only about 30 aircraft a year.

According to Lockheed Martin and Pentagon program officials, F-35 flights and cumulative test point goals in 2011 exceeded the revised schedule by seven

percent. Static structural testing was completed, and the short takeoff and vertical landing variant, the F-35B, finished all at-sea test objectives during a deployment to the USS *Wasp* amphibious assault ship. Six aircraft have been delivered to Eglin AFB, Fla., where they are conducting preliminary flying ahead of the launch of operational pilot training later this year.

Flight tests and test points accomplished in 2012 so far are surpassing the levels of 2011, tracking to 35 percent ahead of the revised schedule. Flying with external weapons has commenced, as has nighttime aerial refueling.

The F-35 is not only a joint program but an international effort as well. Besides the US, Australia, Canada, Denmark, Italy, the Netherlands, Norway,

Turkey, and the UK are partners. While some of the participating nations have delayed or reduced the number of their F-35 buys, none have left the venture, and all have voiced continuing support for it, despite its development issues. Norway actually raised its order. Israel and Japan have ordered the F-35, and it's considered a leading competitor in South Korea's and Singapore's upcoming fighter contests. Spain is considering a buy as well.

Based both on financial considerations and renewed confidence, Britain, which had switched from buying all F-35B STOVL variants to F-35C carrier models, has reversed course again and is back to buying STOVLs only.

Nevertheless, significant problems persist. The unique helmet worn by



Lockheed Martin photo by Randy A. Cr...

F-35s on the production line at Lockheed Martin's facility in Fort Worth, Tex.

F-35 pilots continues to have problems with jitter, latency, and night vision. The arresting hook assembly on the F-35C carrier version had to be redesigned because it wasn't properly catching the arresting wire. Software, the bane of most modern weapon systems, is a continuing frustration in the code-heavy F-35.

Max Speed, Hard Turns

Vice Adm. David J. Venlet, the Pentagon's program executive officer for the F-35, told a Senate panel in May that overall, he has "confidence in the resilience of the plan" to get the F-35 past its teething problems and into service with the Air Force, Marine Corps, and Navy. "My observations and assessments over the past year," Venlet told the Senate airland subcommittee in a budget hearing, "give me reason to believe the basic aircraft and engine designs are sound and will deliver."

Venlet reported "very good engine and airframe contractor responsiveness

and progress" during the previous year. The tests on *Wasp* "exceeded plans and expectations," he said, adding that the F-35 has now flown "to its maximum speed and hardest turn limits." Carrier pilots, he said, are "highly complimentary" of their version's handling characteristics in test flights at NAS Patuxent River, Md.

Software and flight tests will continue to be the focus of the program in the coming year, Venlet said, but he noted that he has "a solid program baseline" and all the necessary tools and resources to execute the program.

Concurrency—producing aircraft meant for operations while flight tests are under way, requiring rework when problems are discovered in tests—is a transient issue, Venlet said, and "will lessen over time." The two years of extra time and additional funding built into the revised schedule was necessary, he said; however, he doesn't think further extensions will be needed.

Neither did Gen. Norton A. Schwartz, then Air Force Chief of Staff. Asked in June if he thinks the F-35 program has had enough time to address concurrency issues, Schwartz answered, "Yes, for the A model," the conventional takeoff and landing version to be used by USAF.

"There's always going to be some retrofit," Schwartz added. He pointed out this would be true of any combat aircraft. Schwartz acknowledged the issues with the STOVL and carrier models, but said the F-35A is generally meeting the Air Force's expectations for this stage of the program. The launch of local area operations at Eglin shows the program's progress, he said, and "we have a good sense of how it's going."

In his confirmation hearing to be Schwartz's successor, Gen. Mark A. Welsh III said the head of Air Combat Command will decide later this year what

criteria will constitute initial operational capability with the F-35 for the Air Force. The IOC declaration is an indication that a new asset is ready to go to war.

Venlet said one element of the declaration will be completion of an initial operational test now under way, adding he'll submit a test and evaluation master plan to Frank Kendall, undersecretary of defense for acquisition, logistics, and technology, sometime this fall.

The last two F-35 production lot contracts were of a fixed-price type, Venlet told the subcommittee, and under the sixth and seventh lot agreements, the Pentagon will be able to "control production quantity based on the performance of the development program." The arrangement signaled DOD is headed toward a "buy to budget" approach similar to that taken on the F-22.

There are three major blocks of software associated with the F-35. The Block 2 software, flying now, allows for safe operation of the jet to the edges of the test envelope. The Block 2A software will include basic weapons capability—what Venlet called "initial warfighting" capacity. The full-up software is called Block 3 and will include "full capability" of weapons and electronic warfare, he said. Block 3 "will finish development testing in 2016 and be released to the fleet in 2017." A Block 4 version, which will include both software and hardware changes to improve the aircraft's performance, will constitute the first major upgrade for the F-35. The content of that upgrade is classified, but will likely include increased internal carriage of AIM-120 AMRAAM radar guided missiles, among other changes.



A crew chief marshals an F-35 after its first night flight on Jan. 18, 2012, at Edwards.

Venlet told the airland panel that experts from Air Force Materiel Command and Naval Air Systems Command have "looked me in the eye and confirmed for me they believe we have what it takes in time and money" to adapt to any new discoveries in flight test without derailing the program.

"Every issue that we have in view today is very much in the category of normal development for a fighter tactical aircraft," Venlet said in testimony. "Good old-fashioned engineering is going to take care of every one of those."

The Government Accountability Office, long an F-35 cost and schedule skeptic, said in a June report that F-35 cost has risen 42 percent between the original 2007 program baseline through the 2010 restructure, and unit costs have doubled. The Defense Department, the GAO said, "has for three straight years reduced near-term procurement

quantities, deferring aircraft and costs to future years. Since 2002, the total quantity through 2017 has been reduced by three-fourths, from 1,591 to 365." The GAO chalked up "most of the instability" in the project to "highly concurrent development, testing, and production activities."

To get the cost of the F-35 down, Shay D. Assad, director of Pentagon "should cost" activities, said last year that his office was looking at whether it would be more efficient to build the F-35 in single-variant lots. The production line was structured to accommodate whichever variant came along next, but Assad thought there might be efficiencies in lumping variants together to reduce the learning curve.

Six F-35s line up at Edwards. All were undergoing flight test at the base in May 2011.



Lockheed Martin photos



Lockheed Martin photo

An F-35 at Eglin AFB, Fla., taxis out for an orientation flight. The preliminary flying at Eglin is an indicator of the program's progress.

That concept is not being pursued, according to Lockheed Martin vice president for aeronautics Larry A. Lawson.

"If we gap the line too long between the variants, it's like starting over," Lawson said in a June interview. The learning curve is hurt by such an approach, but "if we space [the variants] closely, we actually don't see any setback on the learning curve," he asserted.

Lawson said the way the F-35 acquisition strategy was conceived—well before his time on the program—was "genius" in that "we don't build enough of any of the variants to have a long run in any of those." Out of 30 aircraft in Lot 5, for example, only five are F-35B STOVLs. "You can imagine," he said, "if you had to build a production line to build three airplanes in one year, how inefficient that would be."

Fundamentally, he said, "using one infrastructure, one assembly line, is really an incredibly efficient way, in terms of affordability, to build at these very low rates."

No "Aha!" Moment

However, he said that while there is a lot of focus on the factory and assembly, the bulk of F-35 costs—70 percent, he said—"is in the supply base." There is "a unique supply base to go with each of the variants," and planning lots efficiently means managing the vendors closely.

The STOVL, which was placed on "probation" by then-Defense Secretary Robert M. Gates due to engine and other difficulties, was taken off probation a year

early by his successor, Leon E. Panetta, citing rapid progress in correcting the deficiencies. Although there's no talk of it now, Lawson said there wouldn't be any monetary advantage this late in the game to terminating the F-35B version.

The F-35 program endured a 10-week machinist strike in May and June, but production only slowed by half, Lawson said. Engineers, supervisors, and salaried employees were brought in from all around the company and the test flight facilities to keep things moving. Although the slowdown "gave us a chance to get some hands-on insight" into how the production line is configured, "we didn't find a significant, 'aha!'" area for change. Management found potential improvements, but nothing of a grand cost-saving nature. The strike ended at the end of June, and Lawson expected the line would be back up to speed in about a week.

The three services that operate fixed wing fighters will buy 2,457 F-35s by 2037. And while the price tag to acquire and operate those aircraft over the next 25 years is eye-watering, never before has DOD simultaneously bought aircraft and a supply, repair, and training system, with a large number of international partners, Lawson said. Moreover, he said, the F-35's cost includes things such as an electro-optical system, advanced radar, and electronic warfare systems as part of the aircraft, but these are counted as "sold separately" on other aircraft, so making an apples-to-apples cost comparison is difficult.

Using the government's own models, he said Lockheed Martin estimates the F-35 will be "about seven percent more expensive to operate than an F-16." That shouldn't be surprising, he said; the F-35 is larger and "we know we burn more fuel" with the F135 engine. That cost also "doesn't reflect the cost of a targeting pod, ... a jammer, or any other number of capabilities that are manifest in an F-35 that are not inherent on an F-16." The fact that there is so much "more content" in an F-35 than an F-16 or F-18 creates "confusion" over comparative cost, Lawson said.

Lawson said that as new foreign military sales customers are added—and potentially demand some program manufacturing work in consideration—it doesn't upset the F-35's carefully laid out scheme of supply. Typically, it reduces cost to bring on a new user, he said. Whether a partner country or FMS customer, "you have to make an investment." Full partners have invested in development; latecomers at least tool up to make parts, or perform final assembly and checkout, known as FACO. Italy has a FACO for its own F-35s, and Japan will likely have one as well.

"They'll certainly meet their own needs, and then we'll work with them in terms of whether there is additional interest in growing their industrial par-

ticipation against a demand that may ... exist at that point in time.” Taken in the aggregate, Lawson said, every F-35 sold overseas is “worth about \$10 million an aircraft” in terms of reduced unit cost. When foreign countries buy the F-35, it “brings down the price for everyone.”

Lawson said Lockheed was about three months behind schedule on F-35 software early in the year and acknowledged the government “had some independent assessments that indicated that there was more schedule risk than that.” However, he asserted the program has “recovered against even the three months, as much as half of that. So we’re making good progress.” Based on his conversations with Pentagon managers, he said, “I think their confidence level is improving, in terms of where we are ... and the flight [tests] continue to demonstrate that the software for flying is performing very well.”

A number of fixes are being considered for the F-35 helmet. A new short-range night vision camera will be installed, Lawson said. The existing one was “the very best camera that was available at the time the helmet was designed and built,” but the improved version should eliminate some of the concerns. The program office and Lockheed are discussing whether to retrofit existing helmets or build new ones.

Software fixes may resolve problems with jitter, in which data displays on the inside of the faceplate are not as rock-solid as pilots would like. There’s also some lag in displaying night imagery from cameras all around the aircraft, as the pilot’s head traverses the field of view of one camera to another. That latency will require another software fix.

“We’ve had over 2,000 flights” on the F-35, “and every one of those flights has been with this helmet.” There’s no concern that it’s a safety issue, he asserted.

Nine Milestones

The tailhook for the carrier version has been redesigned and data is being acquired about necessary loads. Once the data is crunched, and the new hook design is finalized, “we don’t have any more issues,” Lawson declared.

Not quite, but Lawson said other gripes about the airplane are all “nominal [issues] ... within what you would expect to see during development,” a quote very similar to some made by Venlet in budget testimony.

The fact that the flight-test program



Vice Adm. David Venlet, DOD's program executive officer for the F-35, speaks to media representatives. Venlet has expressed confidence that the fighter will deliver as promised.

is proceeding ahead of schedule for the second year in a row is a good sign that other problems are small and well on their way to being corrected, Lawson said. By the end of 2012, “45 percent of the flight science testing will be complete on the A variant. ... That’s a good indicator of progress.”

In 2012, there will be nine major milestones for the F-35, according to Stephen O’Bryan, Lockheed Martin VP for F-35 business development. These are flight testing the Block 2A software; completion of the A model’s first “life” of durability testing; modification and testing of the new tailhook; the first weapons drops; high angle of attack testing; the commencement of training at Eglin; first deliveries of F-35As to Air Combat Command; standup of Navy and Marine Corps squadrons at Eglin; and first deliveries to international customers Britain and the Netherlands.

An operational utility evaluation on the A model got under way in July, and Lawson said it should be complete by the end of the year. Assuming it is successful, operational flight training should start soon afterward.

While the A model has completed its first fatigue life, both the B and C models should finish their “first life” in 2013, Lawson reported. A “life” is equivalent to 8,000 hours, but the static models will be tested to multiple lifetimes to give engineers a heads-up as to where to look for structural wear in the distant future.

Lawson said the benefits of having a common aircraft for the armed services accrue from having a busy production

line and diminish when the line is moving slowly.

The production rate is “really the most powerful thing you can do to reduce cost,” Lawson asserted. “The good news,” he said, is that government cost models “show we’re moving to an affordable airplane. But the point of lowest cost is achieved at maximum rate.”

Lawson said the Air Force has kept its word about not meddling with requirements on the F-35, which on other programs has led to requirements “creep” that has added cost and put timetables in jeopardy.

“There’s certainly a lot of attention to what the Block 4 configuration is,” he noted. “The government leads those [discussions].” He said what’s considered for the improvement program follows “a threat-driven approach.” There are “a number of modifications that we can make to the airplane to address future threats,” he added, but because the mold line must remain more or less unchanged, these changes have to do with internal equipment.

There are some systems “where you may want to add an additional card to an existing suite,” he observed, and the F-35 will likely be fitted for new weapons, as they come along, and other means to defeat the anti-access capabilities of adversaries.

He likened the F-35 to the F-15, on which he worked early in his career. The F-15 was declared operational in 1975, fully 37 years ago, “and as I reflect on [the F-35], I’m confident this airplane is going to be around for four-plus decades,” Lawson said. ■

A crew chief marshals an MC-12 Liberty at JB Balad, Iraq, in 2010. The light aircraft remains a valuable intelligence, surveillance, and reconnaissance asset in Afghanistan's low-threat environments.



The 1990s ushered in a revolution in precision attack. The 2000s made unblinking Air Force intelligence, surveillance, and reconnaissance a prerequisite for joint operations.

Unblinking is the key here. In the Cold War, the Soviet Union changed slowly, so occasional satellite overflights or U-2 missions were often good enough to track the evolving threats. Today, the threats are smaller, more adaptive, and more numerous. Military commanders demand the ability to watch certain areas—or even

individuals—for long periods and with zero interruptions.

Although the war in Iraq is over and Afghanistan is winding down, the momentum for ISR capability continues. The rapid ascent of ISR has made it tough to determine how best to modernize and improve future ISR capability. First, although space assets are and will remain critically important in this realm, the huge expansion in capabilities over the past decade took place in a wide range of air-breathing platforms.

The unblinking eye is really a set of ISR capabilities, from fine-tuned 30 frames

per second video covering a tiny area to sophisticated radar tracks spanning whole swaths of a country.

Modernization decisions are often difficult and expensive. While USAF plans to spend \$7.1 billion in Fiscal 2013 alone on its ISR enterprise, it isn't buying many new platforms for future requirements. Already, the annual buy rate of the MQ-9 Reaper has been cut in half from 48 to 24, and MQ-1 Predator production ceased in 2011. USAF is angling to transfer most of its MC-12s from the active to the reserve components in part to save money. In fact, it's the

Toward an Unblinking Eye

The Air Force's ISR capabilities have been revolutionary, which puts them in ever greater demand.

By Rebecca Grant



USAF photo by SrA. Brittany Y. Bateman

Department of the Navy that has 185 new wide-area surveillance aircraft on order. The Air Force is struggling to set a new course as it reshuffles ISR for a range of contingencies that must soon include peer competitors cloaked by anti-access defenses.

Can USAF muster the momentum to keep open the joint force's unblinking eye?

War Surplus?

What USAF has on its hands is a war surplus air-breathing ISR fleet teeming with video sensors mounted on large and

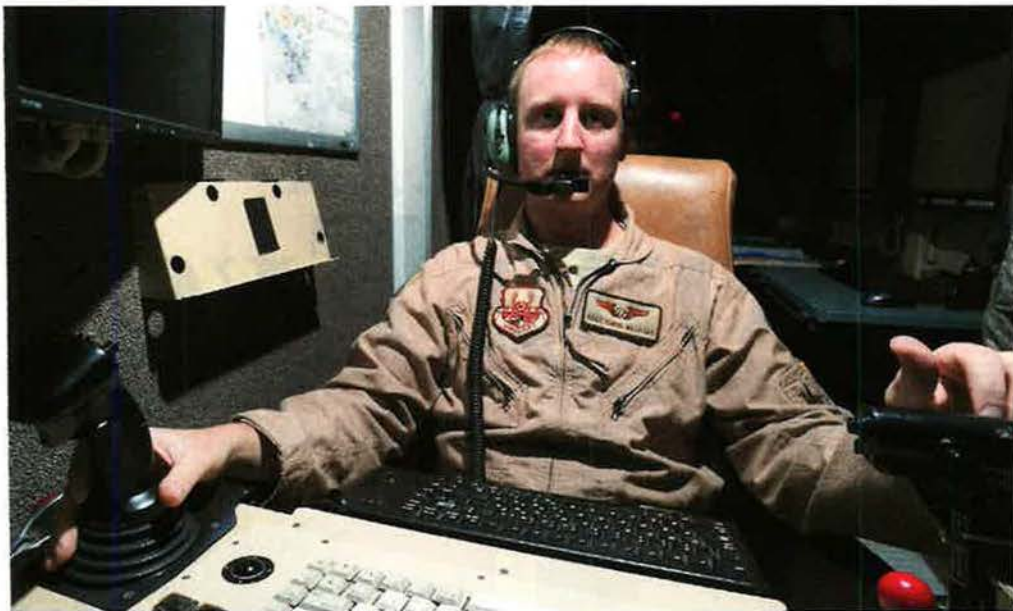
small aircraft. The Air Force flies upward of 1,500 hours per day with its ISR aircraft, and two-thirds of those are video collectors focused on extremely small segments of the battlespace.

Predators, Reapers, and MC-12s remain valuable for low-threat airspace. Indeed, the Air Force is moving forward with upgraded sensor packages to expand the number of spots each aircraft can monitor at once.

At present, each Predator, Reaper, or MC-12W Liberty on patrol focuses on one spot. However, new wide-area motion imagery (WAMI) packages such as the

Gorgon Stare system will enable a single ISR aircraft—manned or unmanned—to cover several areas at once. With Gorgon Stare, the Predator can establish a citywide view or isolate simultaneous spot image areas with greater resolution.

The Defense Advanced Research Projects Agency has developed another wide-area imaging process called Autonomous Real-time Ground Ubiquitous Surveillance, or ARGUS, which can cover about 40 square miles. Neither provides quite the crisp frame rate of the current systems at 30 frames per second. Still, the systems multiply coverage greatly.



USAF photo by S/A. Mall Coleman-Foster

SSgt. Christopher Watford controls an MQ-1B Predator's sensors during a mission. The Predator and Reaper fleets look at small areas in permissive airspace, but they weren't designed for long-term wide-area surveillance or hostile air environments.

The wide-area systems can also produce many more spots of coverage, and that leads to more data. Gorgon Star offers 10 spots; images from each ISR aircraft. ARGUS has the potential for 65. However, either could break the bank on manpower—unless USAF makes changes in how it handles processing, exploitation, and dissemination (PED).

“It is clear to all that imposing PED requirements on WAMI video chips that are identical to those for current narrow-field-of-view FMV [full-motion video] sensors would lead to an unsustainable rate of growth in PED manpower,” a 2012 RAND study led by Lance Menthe found. “Naïvely multiplying the motion imagery crew size by the number of motion imagery spot equivalents, we see that by 2015, the

Air Force could, in theory, require up to 117,000 personnel dedicated to motion imagery exploitation alone—one-third of the Active Duty Air Force.”

The RAND authors suggest automated target recognition to alert human analysts when it is time for eyes-on image analysis. Assuming USAF finds software solutions for better processing, the fact remains the multispectral video field of regard is too small to find theaterwide trends or track large swaths of moving elements—be they terrorists or refugees. On a larger scale the effect is akin to multiplying soda straws.

Keeping watch over the Pacific or contested areas of the Persian Gulf region could well demand surveillance much more survivable than the Preda-

tor or Reaper. Capable as it is, today's fleet looks at small areas in permissive airspace and just wasn't designed for long-term wide-area surveillance or hostile air environments.

Thinking Big

Radar sensors remain the key to an unblinking eye for theaterwide views, all-weather imaging, and track detection. For example, the E-8 JSTARS, in wide-area surveillance mode, can cover an area spanning 19,000 square miles. No amount of video sensors can match the sweep.

There's no question that radar-based motion intelligence is essential to the force mix. It proved its worth again and again during the long wars in Afghanistan and Iraq. For example, a JSTARS aircraft pinpointed moving Iraqi forces during a sandstorm in the second week of Operation Iraqi Freedom, and US forces relied on it frequently in Afghanistan as well.

Most of all, demand for wide-area surveillance and ground moving target indicator (GMTI) radar is not a thing of the past. The Global Hawk Block 40 that will carry GMTI entered the force in 2009. South Korea requested deployment of a JSTARS to monitor North Korean forces during tensions in late 2010.

In Libya in 2011, JSTARS was immediately deployed to help sort out ground positions of rebel forces and Qaddafi loyalists. Distinguishing rebel fighters from regime forces took on special importance because the area had not been a priority ISR target.

Army Gen. Carter F. Ham, US Africa Command boss, attested to the value of JSTARS for intelligence about Qaddafi loyalist and rebel forces. “Joint STARS has been an integral and important component of the suite of collection assets which the US and others have applied to operations in Libya,” Ham told Congress. “Joint STARS’ particular capability in detecting moving forces has been particularly useful and noteworthy, especially early on in the campaign where the regime forces were moving, Joint STARS was able to identify those and greatly aided the vectoring in of aircraft to interdict some of those efforts.”

Wide-area surveillance is likely to be even more important as US forces shift to monitoring hotspots and characterizing threats in low- to medium-intensity conflicts.

Then there is the challenge of near-peer surveillance. Insurgents in trucks are not the only targets. Mobile military targets such as missile launchers or hostile RPAs require unbroken surveillance to discern



Boeing

Navy plans call for 117 new P-8 surveillance aircraft, such as the one shown here. The P-8 will become operational in 2013.



A Blackhawk helicopter equipped with an integrated ARGUS pod. The wide-area imaging process can cover some 40 square miles in photographs such as at left.

habits and make inroads in shutting down attacks.

Failed Attempts

However, the Air Force's path for investing in wide-area surveillance is especially tricky, and the track record is not encouraging. USAF has been trying for years to find a modernization solution.

A concept for a space-based system for radar imaging surfaced in the late 1990s as an attempt to migrate radar surveillance functions, including GMTI, from aircraft onto a new platform in space. By 2002, space-based radar was a pathfinder program with significant backing from the Office of the Secretary of Defense, but was later terminated due to cost and concern about technology readiness.

USAF also tried to develop a new widebody Boeing 767 platform for ISR: the E-10. In the early 2000s, the E-10 was intended to replace the E-3 AWACS, E-8 JSTARS, and RC-135 Rivet Joint. Work began in May 2003 when a team led by Northrop Grumman, Boeing, and Raytheon won a \$215 million contract to start preliminary system development and demonstration on a new aircraft. It was to be a command and control constellation, "a fully connected array of land, airborne, and space-based sensors that use common standards and communication protocols to relay information automatically in machine-to-machine interfaces," as the Air Force described it.

However, the full E-10 program was canceled in February 2007. Again, concerns about cost and immature technology caused leaders to pull the plug.

Cancellation of the E-10 deferred questions about where to take the mission.

Costs unquestionably played a big role in this double failure. The pitfall in both cases was betting too much on immature technology and failing to agree on an operational concept for all users.

The Air Force in 2010 began working through an analysis of alternatives on GMTI long-range solutions including upgrades and new manned and unmanned aircraft and airships.

The basic plan was to re-engine and modify 17 JSTARS aircraft while adding 22 Global Hawk Block 40s. The Air Force was also exploring other platforms for GMTI, such as Reaper, a new MQ-X unmanned aircraft, or even airships.

An analysis of alternatives provided no actionable path forward. The study concluded that the best option was to retire JSTARS, keep the Global Hawk Block 40 with its GMTI sensors, and add a new aircraft: a business jet like the Gulfstream equipped with a new radar.

The Air Force had already cut back the buy of Block 40 Global Hawk from 22 to 11, and the business jet-based system was deemed simply unaffordable. "The reality is that there is not enough space [in the budget] to undertake a new start, business-class ISR platform," Schwartz testified in March.

Air Combat Command never released the study because it contained too much proprietary information.

"The GMTI capability is something we need," Deputy Chief of Staff for Plans and Programs Lt. Gen. Christopher D. Miller said in March. "There are probably cheaper

ways to get through it over the long term, [but] every other way of accomplishing that mission requires investment."

Growing Demand

Ample radar-based imaging is essential for wide-area surveillance. Combatant commanders have no plans to scale back global ISR requirements. Some, such as US Southern Command Commander Gen. Douglas M. Fraser talked openly of their need for persistent ISR. "I'm a combatant commander," Fraser said in March. "I could always use more ISR. I'm not different than anybody else."

The GMTI and synthetic aperture radar combination is the only all-weather source for motion intelligence because it is based on sophisticated interpretation of radar return.

It doesn't take a major conflict to kick wide-area surveillance demand into high gear. Requests for GMTI surveillance may be spread across geographic areas. Take the basic case of "pattern of life" analysis of a suspicious compound. Forces may receive a cellular phone indication. Then they must shift wide-area coverage to survey the site patiently.

In good weather, with permissive airspace, a Predator or Reaper may circle in for close-up full-motion video. But insurgents are wise to many of the ways they are watched. They may choose to wait for night and cloud cover before gathering in hopes of evading detection. But there's little hope of concealment if a radar-imaging aircraft is on hand producing images and catching movement tracks.



The E-8C JSTARS test bed (T-3) during tests of the MS 177 multispectral sensor, currently used on the U-2.

As Fraser acknowledged, the requirements in each region are specific. While he rated SOUTHCOM's current allocation as "OK," he also pointed out the need for "more maritime capacity."

Not coincidentally, it is the Navy that is rolling out major theater ISR platforms. Two big Navy programs for land-based aircraft will dominate ISR aircraft acquisition for the next several years. Navy plans call for 117 new P-8 surveillance aircraft and a projected 68 MQ-4 adapted Global Hawks for its Broad Area Maritime Surveillance (BAMS) mission. The P-8 will reach operational capability in 2013 and the BAMS MQ-4 in 2015.

Of course, the Navy recapitalization is designed to carry out maritime patrol and anti-submarine warfare missions. The Navy is buying BAMS as an adjunct to the P-8, and the mission will be to provide combat information to operational and tactical users such as carrier strike groups, according to Naval Air Systems Command.

Chief of Naval Operations Adm. Jonathan W. Greenert praised a demonstrator BAMS at work in the Persian Gulf and operating often over the Strait of Hormuz. "The BAMS-D remains heavily used. The theater commander loves it. He's sort of addicted to it," Greenert said. "We use it on every strait transit. Somebody goes out ahead. It's a nice view of who's out there."

Can the Navy P-8s and BAMS Global Hawks contribute to the kinds of ISR missions flown by USAF aircraft today? Navy MQ-4s will post information to the Global Information Grid (GIG) and support a variety of intelligence activities and nodes. In a secondary role, the BAMS Global Hawk will also be used alone or in conjunction with other assets to respond to theater-level operational or national strategic tasking.

The radar capability will be there to contribute to national intelligence requirements and combatant commander ISR needs. But

under current Navy plans, the joint force maritime component commander will likely control the new P-8s and BAMS.

USAF leaders are well aware that conquering denied airspace is one of the biggest ISR challenges, and also have other solutions in mind.

Stealthy, survivable ISR platforms are set to become an important part of the ISR inventory. Glimmers of new unmanned systems include the Lockheed Martin RQ-170 Sentinel. For stealth ISR collectors, USAF also has the F-22 and F-35 for the mission known as nontraditional ISR. The name is somewhat misleading simply because using top-line fighters for surveillance and reconnaissance became a common practice during missions in Afghanistan and Iraq.

Facing the Tests

"Before NTISR, we had fighter aircraft with surveillance capabilities burning holes in the sky, just waiting to be tasked by ground commanders," said Maj. Marco Fiorito, who was deputy chief of collections management at the combined air operations center in 2006. "Instead of wasting these resources, we've begun to use them to fill some of the gaps in our traditional ISR operations," Fiorito said.

Fighters with active electronically scanned array (AESA) radars and other sensors are capable of acting as highly sophisticated ISR collectors. The F-35 has two major potential ISR collectors in its suite, the AESA radar and a Distributed Aperture System, or DAS, which offers 360-degree tacking capability for its electro-optical and infrared sensors.

One role of the DAS is to assist navigation and support for the F-35—but it has also proved capability in areas such as ballistic missile launch point detection and tracking. AESA radars have inherent radar collection abilities that can be calibrated for imaging, signals, and a variety of other applications. All signs are that USAF will be counting

on the stealth fighters to become part of the ISR suite, and to assert the unblinking eye in denied airspace.

In the years ahead, the unblinking eye of Air Force ISR may spread from air and space and into cyberspace, too—if it is not there already. Officials have hinted cyber intelligence will become a bigger part of the picture.

The cyber contribution to ISR has two parts. One may in fact be collection. When and whether "cyber ISR" compensates for other types of collection is yet to be determined.

At the same time, cyber systems already form the backbone of ISR processing. The task ahead is to do it much, much better. Lt. Gen. Larry D. James, head of ISR on the Air Staff, stressed that ISR products will be network-centric. "ISR in the cyber domain is an area that needs more attention and an area where we're starting to see more investment," he explained in February at Air Force IT Day. In practice, this means improving database tools and access so authorized users can pull imagery from a cloud-type architecture. Another refinement would be adding the ability for the database to push imagery or other intelligence to the user based on a designated set of criteria.

USAF's capacity for unblinking ISR faces several tests. However, there's little question that for airmen, ISR is a major and growing mission area. And it will be airmen who ensure its future.

"When it comes down to the end of the day," said James in June, "how fancy the hardware or technology is doesn't matter—somebody has to make sense of it, execute it, and provide it, and that's the people." ■

Rebecca Grant is president of IRIS Independent Research. Her most recent article for Air Force Magazine was "Adaptive Engines" in the September issue.

Game Changers in Space

By Robert S. Dudney



The Air Force's satellite enterprise—for many decades the developer and operator of the world's most advanced military spacecraft—is under pressure to downshift.

Even staunch advocates of today's sophisticated orbital systems are questioning the practice of building a few large, exquisite, government-owned spacecraft that cost billions of dollars apiece and take many years to get into service.

They say problems now confronting the US military space system require the Air Force and its industrial partners to find cheaper and faster ways to get payloads on orbit.

Gen. William L. Shelton, head of Air Force Space Command, told the National Space Symposium in Colorado Springs, Colo., that some next generation military constellations could well feature small and relatively simple satellites. He said some defense payloads could be sent aloft on commercial spacecraft.

This recalibration, if it continues, could prove to be one of the biggest changes for USAF since it got into satellite work in the 1950s.

The movement reflects two realities. The first is the certainty of a shrinking budget. Experts say the Air Force can no longer afford sufficient numbers of the highly advanced systems and must find alternatives. The second is

Air Force military satellites have been fantastically successful ... and expensive.

Staff Illustration by Zaur Eylanbekov



Technicians surround a Wideband Global SATCOM in the acoustic chamber at the Boeing satellite manufacturing facility in El Segundo, Calif. WGS satellites will serve as USAF's communications workhorses for some time forward.

the undeniable and growing physical threat posed to US orbital vehicles, which are valuable, undefended—and few. Lower-cost systems could provide safety in numbers.

No one expects USAF to sharply turn away from its giant technological marvels in space. It is executing a change out of constellations that—for a while, anyway—will bring on board even more of these highly advanced, multimission spacecraft.

Shelton reported not long ago that, in his view, “the die is cast” on military constellations for the next 10 or 15 years.

Still, satellite developers have moved into “study mode,” Shelton said, trying “to determine the validity of certain ideas [that could become] game changers from a cost and security standpoint.” The awesome strengths and notable weaknesses of traditional satellite-making are seen in the constellations now in place.

Missile Warning

The legacy Defense Support Program satellite, built to detect heat from missile

launches and nuclear blasts and pass the data to US users, has been a stalwart and will soldier on for a while longer. It will have to.

DSP has been around since 1970 though the youngest bird thought still to be in service was launched in 2007. The exact composition of the fleet in geosynchronous orbit is classified.

Its designated successor, the Space Based Infrared System, has had serious problems. SBIRS consists of two elements: large, dedicated satellites in geosynchronous orbit and other payloads on host satellites in highly elliptical orbits.

The first dedicated 5,600-pound SBIRS ball was launched in mid-2011, nine years behind schedule.

The program has been beset by large cost increases, too. A recent Government Accountability Office report put the tab for each satellite at \$3 billion, though that number is certain to decline as more are built.

Experts chalk up much of the problem to excessive requirements, immature technologies, and complex software.

Up-and-down funding added to the woes.

Shelton said the first SBIRS GEO satellite can detect dimmer and shorter-duration heat events than is possible with DSP. The new satellite also can provide more accurate missile launch and impact point predictions, compared to DSP.

“We collectively made this program very hard,” Shelton observed, “but we are seeing great data from the sensors on the spacecraft.”

Position-Navigation-Timing

The GPS constellation, comprising 31 orbiting satellites, provides time, location, and velocity data. GPS signals are used by all services as well as civilians, but are especially critical to the guidance of precision air weapons.

Replenishment of the constellation is an urgent need. As of June, two Block IIA satellites had been operating for more than 20 years. The 4,000-pound craft is expensive, so the Air Force doesn't buy spares.

The first ball of the GPS IIF replacement generation went aloft in May 2010; it was four years behind schedule, said GAO. A second was launched in July 2011. A third is being prepared for launch this fall, and a fourth for 2013.

The first GPS IIF encountered interference as a result of its transmitter construction and antenna patterns. The second was said to suffer problems with its cesium clock, a navigation device.

The Air Force foresees a smoother path with its next generation GPS III satellite, which is already far along. Plans call for the first of 32 spacecraft to launch in 2015. It will have higher power and other significant improvements.

Shelton believes development of GPS III has been a “model” of project cost and schedule discipline. USAF is holding to strict requirements, mature technologies, and close contractor oversight, and thus has kept GPS III on track.

It's a good thing. The Air Force needs to stay on schedule to avoid gaps in operations as old GPS spacecraft leave service. Shelton has reported that USAF will “just barely make it.”

Protected Communications

USAF's Milstar constellation provides secure delivery of national and nuclear command and control orders. The legacy space system consists of five balls in geosynchronous orbit.

Each Milstar is big, weighing some 10,000 pounds. It is jam-resistant, redundant, and hardened against nuclear radiation.

Current Air Force Constellations

Satellite Program Name	Function	Orbit	Number
AEHF—Advanced Extremely High Frequency	military satellite communications	GEO	2
DSCS III—Defense Satellite Communications System	military satellite communications	GEO	8
Milstar—Military Strategic and Tactical Relay	military satellite communications	GEO	5
WGS—Wideband Global SATCOM	military satellite communications	GEO	4
GPS—Global Positioning System	position-navigation-timing	MEO	31
DSP—Defense Support Program	missile launch warning	GEO	*
SBIRS—Spaced Based Infrared System	missile launch warning	GEO	*
DMSP—Defense Meteorological Satellite Program	weather data collection	LEO	2
ORS-1—Operationally Responsive Space	intelligence-surveillance-reconnaissance	LEO	1
SBSS—Spaced Based Space Surveillance	space situational awareness	LEO	1
STSS—Space Tracking and Surveillance System	space situational awareness	LEO	2

* Number of operational satellites is classified

LEO = low Earth orbit MEO = medium Earth orbit GEO = geosynchronous orbit

As of June 27, 2012

Each Milstar is big, weighing some 10,000 pounds. It is jam-resistant, redundant, and hardened against nuclear radiation.

Milstar works well now, but it had serious start-up problems. Each one came in years late and over budget, in large part due to super-high technical requirements.

Milstar is being augmented—and will in time be supplanted—by the new Advanced Extremely High Frequency satellite. AEHF is even larger than Milstar—each satellite weighs 14,000 pounds. Two are on orbit, with more to come.

The original plan was to replace Milstar with the laser-based Transformational Satellite Communications System. TSAT was a bust, though, and was scrapped after billions were spent.

AEHF is a big improvement over Milstar. Each satellite boasts a capacity 10 times that of its predecessor. AEHF's voice messages are clearer. Like Milstar, it can operate in a nuclear war.

Also like Milstar, AEHF had problems. The first ball was launched four years behind schedule and cost \$1 billion. Because of a propulsion glitch, it took a year to reach final orbit.

Weather Forecasting

Defense Meteorological Satellite Program spacecraft have collected weather data since 1962. They will keep at it into the 2020s because there is no proven successor.

The Air Force has launched more than 50 DMSP spacecraft, although most of these have aged out of service. Today, USAF operates two primary and as

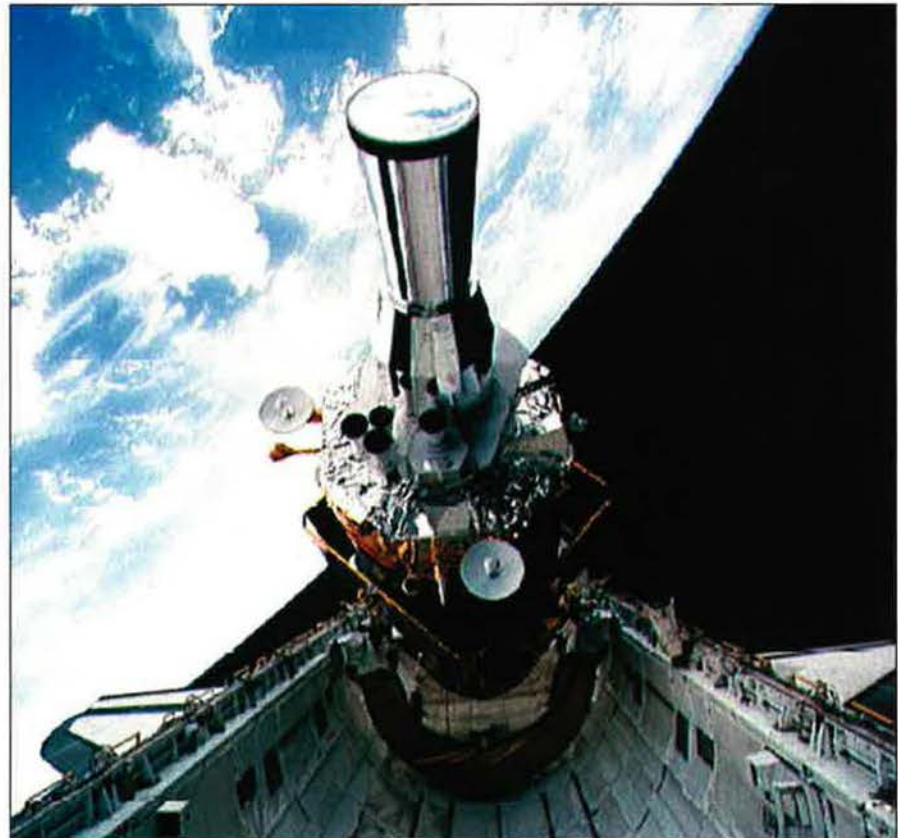
many as four backup DMSP satellites in polar orbit.

The Air Force has two fresh DMSP spacecraft “in the barn” ready for use in years ahead. This is fortunate because USAF has struck out in its long search for a DMSP replacement.

In 1994, the Clinton Administration forced the Air Force to join hands with civilian agencies in the National Polar-

orbiting Operational Environmental Satellite System. It was a mistake. After 16 years and many billions spent—and with no satellites to its name—NPOESS was terminated.

From the NPOESS wreckage emerged the USAF-only Defense Weather Satellite System, a stripped down spacecraft. The program lasted barely a year until it was canceled.



A Defense Support Program satellite and its inertial upper stage are readied for deployment. DSP legacy satellites have been serving for some 20 years and are expected to continue to do so for awhile yet.



An artist's conception of a Defense Meteorological Satellite Program spacecraft orbiting Earth. DMSP satellites have collected weather data since 1962 and have no approved successor program.

The recent development programs have suffered from major cost, technical, and schedule problems. Their loss raises the possibility of gaps in US weather operations.

The Air Force is essentially starting over. Shelton has said that the service this year is seeking to define a lower-cost yet adequate follow-on effort.

Global Military SATCOM

Defense Satellite Communications System III is the backbone of global military space communications. The first DSCS III was orbited in 1982, the last in 2003. Eight are still operational in geosynchronous orbit, but they are reaching the end of their service life.

USAF is trading in DSCS III for the Wideband Global SATCOM system. Conceived as a “gap filler” between DSCS III and some more-advanced system down the road, WGS has instead become a success story and will serve as the communications workhorse for decades to come.

WGS wasn't without teething problems, but the program has managed to avoid serious schedule and cost problems.

Each 7,600-pound WGS satellite offers the same capacity as the entire DSCS constellation. Four satellites in a proposed 10-ball system are on orbit.

In sum, USAF's approach to satellite building has delivered both enormous capabilities and some considerable problems.

Shelton, in his address to the symposium, called for a new mission architecture for space. Lt. Gen. Ellen M. Pawlikowski, commander of the Air Force's Space and Missile Systems Center (SMC), echoed that thought.

“It's time to take a step back,” Pawlikowski noted, “and look at the architecture that we have. We don't have the money that we used to have. ... We've got to have flexibility. We've got to be affordable.”

In a retreat from traditional thinking, Shelton told the symposium he

avored more “disaggregation” of space capabilities on future satellites.

In earlier remarks to a trade group, Shelton explained the problem this way: “We design satellites to be redundant [and] long-lived, and we cram everything we can on a single satellite. That's ... driven largely by the cost of launch.”

The service often puts several different kinds of payloads on a large spacecraft. Shelton wants to distribute future sensors and other systems over a larger number of smaller satellites.

His expectation is that this will reduce the complexity—and hence the risk and cost—of future spacecraft. Smaller satellites could also lead to smaller and less costly booster systems.

Moreover, say officials, there is a security dividend. For one thing, more satellites in orbit mean more resilience in case of attack, because it would be hard to target them all.

Shelton has noted that the new AEHF satellites contain not only secure strategic relays but also tactical communications for theater combatants. While that might be economical, it only simplifies the task of a potential attacker, he said.

No one thinks every future satellite can be small and simple. Shelton notes that physics intrudes with respect to a few missions. “You need large optics from geosynchronous orbit,” he said. “You just do. You can't do that with smaller optics. It doesn't work.”

Yet some mission areas seem ripe for disaggregation. One of these is space situational awareness, performed today by a large, Space Based Space Surveillance satellite, a telescope that scans the GEO belt for objects there.

Shelton said the US needs to get on with an SBSS replacement. “It doesn't take huge optics, nor does it take sophisticated onboard processing to provide operationally relevant data” in this mission area, said Shelton. A smaller satellite might be just the ticket.

The Air Force, by splitting up mission payloads, could replace its old DMSP weather satellites with “much smaller” spacecraft, he said. Another possible step: relieving future GPS satellites of heavy nuclear detection payloads, which current GPS spacecraft carry. This would allow developers to simplify future positioning, navigation, and timing satellites. Certain military satellite communications systems likewise could move to lighter and simpler designs.

In short, says Shelton, the prospect of turning to smaller spacecraft is “looking very attractive.”



An artist's conception of a Space Based Infrared System satellite, GEO-1. It was launched in May 2011.

Even missile warning, said Shelton, could see a move to smaller spacecraft. After the first group of SBIRS satellites is operational—about 2025—“you can think about disaggregation,” he said, and complicate targeting.

Air Force officials are pursuing the goal of disaggregation and cost reduction in another novel and promising way—by putting payloads on commercial satellites.

The term “hosted payload” refers to the use of available capacity on a commercial spacecraft for military instruments and other items. It is a form of high-tech “hitchhiking.”

The idea is not new, but it has come to the fore in recent years because the Air Force is under pressure to find means for faster and cheaper proliferation of payloads.

The Air Force on Sept. 21, 2011, took its first step in this direction with CHIRP, an infrared missile warning payload sent aloft on an SES commercial satellite, launched by an Ariane rocket.

CHIRP (the acronym for Commercially Hosted Infrared Payload) went from program initiation to launch in 39 months—a virtual land speed record for a military program). It is the Air Force’s first wide-field-of-view infrared staring sensor.

“It’s been a great success so far,” said Shelton. “We’re seeing excellent results from it.”

CHIRP, however, is experimental. “The real question for us today is: Was

that a one-off, or was that the first step into the future?” asked Pawlikowski.

What is the holdup? Retired Lt. Gen. Brian A. Arnold, a former senior space acquisition official and proponent of hosted payloads, blamed “fear, habit, and inertia.”

The Air Force and contractors in the space industrial base fought for years to get military space programs back on track, he said, and they resist taking new steps. “We tend to be a little risk-averse,” Arnold said. “We don’t like surprises.”

Space industry officials say it certainly would not be difficult to design military payloads to fly on commercial buses. Going into the commercial world, however, will force USAF to be much more responsive, flexible, and fast on its feet.

SMC has established a hosted payload office. The aim is to find out whether the Air Force can dispense with large infrastructure, dedicated command and control systems, separate data processing systems, and the like.

“Hosted payloads provide an opportunity to streamline a lot of that out of the space system,” said Pawlikowski.

Arnold Friedman, a senior executive at Loral Space Systems, told the Colorado symposium that, as of today, there is a backlog of 75 commercial satellites headed for geosynchronous orbit in the next three years. All will be opportunities for the Air Force, he said.

Pawlikowski said the hosted payload concept might mesh well with the missions of missile warning, weather forecasting, space situational awareness, and certain types of communications.

“My message today is that we see hosted payloads as a key part of our future architectures, and we are this year, in 2012, moving out to have some real directed activities.”

For Shelton, these and other steps are needed to break out of a platform-centric straitjacket afflicting military space and begin to focus on the real goal—delivery of better information for combatants.

That will mean finding ways to put together information from various sensors and expose the information to a wider group of users. That will work against the grain of traditional thought.

“We’ve built wonderful constellations with dedicated ground systems that are finely tuned to service just the core function of that individual constellation,” said Shelton. “Don’t get me wrong. The platforms are absolutely essential now, and will continue to be so, but the platforms aren’t the end game. The eventual data products enabled by these platforms must be our ultimate focus.” ■

Robert S. Dudney is a former editor in chief of Air Force Magazine (2002-2010). His most recent article was “Launchers and Lamborghinis” in the August issue.

Pioneers and Prototypes

For decades, experimental aircraft have pushed the envelope. Some led to classic designs, while others became historical footnotes. Here are a few.



Photos via Warren E. Thompson
Text by Evan A. Milberg

In the late 1940s, the XF-12 Rainbow high-speed, high-altitude reconnaissance aircraft cruised at more than 450 mph, with a ceiling of 45,000 feet. Republic built two prototypes. Competing aircraft powered by jet engines led to this project's demise.



Will it work? Test, research, and unique prototype aircraft all attempt to answer this question for their manufacturers and the military. The early series of experimental "X-planes," in particular, achieved significant milestones: breaking the sound barrier, flying above 300,000 feet, carrying out maneuvers that pushed the envelope, and validating new materials used for construction. Other, less famous, experimental aircraft have contributed to advances in military aviation as well. **11** Evolving from the P-43 Lancer, the Republic XP-47, shown here, went on to become the Thunderbolt, the dominant close air support fighter of World War II. **12** During the Cold War, Republic Aviation's F-84 Thunderjet tested the Zero Length Launch and Mat Landing concept. Called ZELMAL, it would have enabled aircraft to launch, even if runways had been destroyed.



13 Martin Marietta's X-24A tested the feasibility of using a manned, wingless vehicle to land on Earth after a trip into space. This lifting body X-plane underwent testing at Edwards AFB, Calif., between 1969 and 1971. **14** McDonnell built two XF-88s for a 1946 contract competition to build a long-range "penetration fighter" to protect bombers. Although McDonnell won the flyoff, the advent of long-range, high-speed bombers such as the B-47 and B-52 made penetration fighters unnecessary. The XF-88 design, however, served as the basis for the F-101 Voodoo.





National Archives photo 2



Photo by Dick Petercheff 1



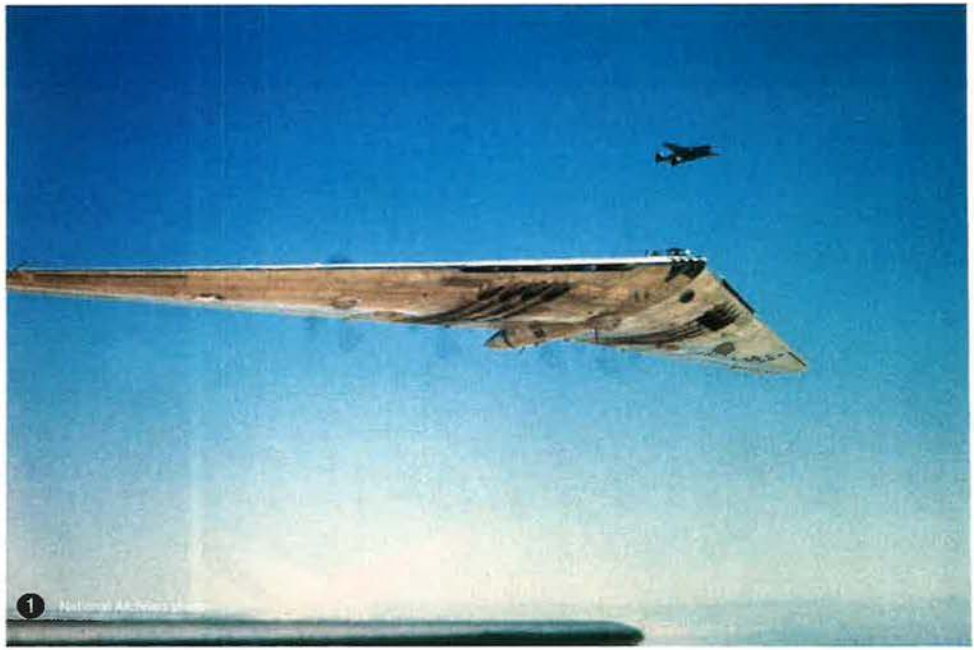
Photo by Al Gruel 3



Photo by Al Gruel 4

111 On Oct. 14, 1947, Capt. Chuck Yeager made history when he broke the sound barrier while flying the Bell X-1. It was the first X-plane. Some six years later, Yeager set a speed record, flying this X-1A. He went beyond Mach 2 (1,650 mph) at nearly 75,000 feet before the X-plane went out of control. Yeager recovered the X-1A at 25,000 feet. 121 The Flying Pancake truly looked like one. This Chance Vought design tested how to maintain wing lift at low speed; the V-173 had a top speed of 138 mph. The sole proof-of-concept aircraft flew from 1942 to 1947. 131 XB-52 suffered damage in ground testing in 1951, so a second prototype, the YB-52, had the honor of first flight, April 15, 1952. As the B-52H, the Boeing Stratofortress continues in service today. 141 The mission for this X-plane? Explore aerodynamics to speeds of Mach 2. Douglas Aircraft's X-3 Stiletto never surpassed Mach 1.2, but it pioneered the use of titanium as a heat-resistant material, and its data was used in designing the F-104 Starfighter.

111 Aircraft designer Jack Northrop's quest for a perfect airplane resulted in the Flying Wing, an effort to eliminate weight and drag. The XB-35 first flew in 1946, but design problems and other challenges led the government to end the program in 1949. As the B-2 Spirit, however, Northrop's flying wing concept has been in service since 1993. 121 This B-66 Destroyer served as a test bed for General Electric's CJ805—the civilian version of the military's J79 engine. Testing involved a free-running turbine aft of an existing turbojet, with double-stacked blades. 131 Wind tunnel testing suggested that the F-107's chin air intake would cause air flow problems, so North American Aviation engineers moved it on top of the fuselage. First flight came in 1956, but Republic's F-105 Thunderchief emerged as a strong competitor, and the F-107s became test aircraft. 141 The rocket-powered North American X-15 has been called the most important high-performance research aircraft. All three of these first manned hypersonic X-planes set speed or altitude records between 1959 and 1968. X-15A-2 was the second X-15, modified.



2 Photo by Al D'Amico



3 Photo by Al D'Amico



4 Photo by Carl Bluge



National Archives photo 1



Photo by Max Spielberg 2



National Archives photo 3



USAF photo 4

111 A contract for a vertical takeoff and landing aircraft pitted Convair's XFY Pogo, shown here, against a Lockheed competitor in 1951, but only Pogo made successful VTOLs, with transitions to horizontal flight. Designed to operate from small warships, Pogo proved too difficult for the average pilot to fly, and the program never advanced beyond the first prototype. 121 Beginning in 1948, Northrop's X-4 Bantam tested a jet fighter minus a horizontal stabilizer. This

X-plane proved that the design didn't work for supersonic aircraft. 131 The first US jet fighter came from Bell Aircraft: the XP-59 Airacomet. It made its first flight at Muroc Dry Lake, Calif., where this photo was taken, in October 1942. Bell produced 66 of these airframes, but they didn't make it into combat. Airacomet nevertheless provided training and data for development of other jets. 141 Before Pearl Harbor, the US military sought a bomber that could

fly nonstop to Europe, drop its bomb load, and return. Consolidated Aircraft's XB-36 met the requirements; however, production of other bombers pushed aside its development. XB-36 eventually took its maiden flight in 1946 and, as the B-36 Peacemaker, was USAF's largest bomber ever. Not all experimental airplanes made it past the testing phase, but each provided essential research and data used to develop future USAF aircraft. ■

The Air Force is changing, and testing will change with it.

Flight-Test Tra



The Air Force flight-test community is searching for a new way to thrive—and preserve its legendary ethos in the 21st century. Today, the Air Force fleet is smaller than any time since its inception in 1947. This gritty reality of fiscal austerity has asserted itself on the flight-test community, where the broad range of Cold War programs is an increasingly fond memory.

While the 1950s and 1960s were the Golden Age of flight test, with Cold War budgets and urgencies fueling rapid and overlapping programs, the modern flight-test arena is about long-term sustainment programs on vehicles already in service, some for decades. The differences are

profound, but the Air Force flight-test community has accommodated similar changes in the past.

Flight testing of US military aircraft began when the Wright brothers validated their design before demonstrating and selling it to the Army in 1909. Eventually, the test methodology grew into an effort conducted by the manufacturer to test an aircraft before turning it over to the air service whose military pilots and engineers would then verify or challenge the manufacturer's claims.

To be sure, air service engineers were involved from the outset of a project, but the testing regimen for production aircraft was largely sequential in nature. Though pioneers such as the Wrights and Glenn H. Curtiss test-flew their

own early designs, the maturation of the commercial test process gave rise to hired civilian test pilot heroes of the 1930s and '40s.

Phase Testing

But the cachet of military test pilots was on the rise. Starting with a seminal survey of various company flight-test operations during World War II, the Army Air Forces began inserting itself into the test process earlier. This saved money and time by cutting duplicative test efforts; USAAF testers argued it also gave the service a better product sooner, putting end user oversight into the process early on.

The evolution of postwar Air Force flight-test methodology was character-

nsformation

By Frederick A. Johnsen



An F-111 trails behind during B-1B testing.

ized by phase testing, which became the model for development of production aircraft between the late 1940s and 1958.

The eight phases alternated between the contractor and the Air Force, but the rhythm and compression of these efforts enabled the F-86 Sabre to enter operational service only 16 months after the prototype's first flight.

If phase testing codified Air Force participation earlier in aircraft development, it represented largely chronological rather than integrated development and testing by the Air Force and the contractor. By 1958, an abbreviated category-testing rationale replaced the eight phases with three categories. The contractor performed Category

I, USAF performed Category II, and major commands performed Category III. The category model was simpler, but the developmental tests were not. It was the dawn of weapon systems and complex operations that needed to interact flawlessly.

The category-testing model came under criticism in the 1960s during the F-111 program, which embraced concurrent development, testing, and production. Although mutual USAF-contractor presence was specified in the categories, the contractor had lead responsibility for Category I and the Air Force for Category II. The Air Force decried the amount of time and duplicated effort. Ultimately, the F-111 became an important and successful

combat tool, but its pained gestation may have suggested a more desirable test methodology for modern high-performance aircraft.

The F-111, critics argued, was merely a "paper airplane" when it won its competition against another company's design. The Department of Defense turned away from concurrent development and production of aircraft and embraced a fly-before-buy policy.

Along with this development came the 1972 combined testing model. A combined test force (CTF), typically led by an Air Force officer, put Air Force and contractor pilots and engineers in the mix from the outset of a program. Defining differences in the developmental and operational sides

of Air Force flight testing, the service categorized combined testing into development testing and evaluation, plus initial operational test and evaluation, leading to a combined operational test and evaluation before any production decisions were completed.

The 1970s witnessed several fly-off demonstrations at Edwards AFB, Calif., where the Air Force chose the A-10 over the A-9, the demonstration YF-16 and YF-17 each metamorphosed into the production F-16 and F/A-18, and the Boeing YC-14 and Douglas YC-15 both introduced high-lift transport concepts, some of them eventually showing up in the C-17.

The currently favored CTF model involves several USAF disciplines along with those of contractors to deliver the best aircraft in the least time. Fly-before-buy has hedged over the years to accommodate the developmental cost of new military aircraft, with initial low-rate production, reminiscent of the old pre-World War II service test regime. Aircraft such as the C-17 have entered unit service even while the test program was still ongoing at Edwards, with incremental performance envelope increases issued to operational units as more of the envelope was cleared.

Realignments

Some in the test community say the CTF model has devolved into something less than its creators intended. Budget-driven hollowing of the government developmental test corps has led to increased contractor roles in the CTF, critics contend. As far as budgets are concerned, USAF's development, test, and evaluation effort, as a percentage of the larger research, development, test, and evaluation enterprise, slipped from about 9.8 percent in 1996 to around 7.3 percent by 2005, according to a 2008 report by the Defense Science Board Task Force.

If current ratios of government-to-contractor developmental testers in the CTF mix have changed, the basic CTF model is nonetheless sound, argues retired Maj. Gen. Curtis M. Bedke, who was commander of the Air Force Flight Test Center from 2004 to 2007 and the Air Force Research Laboratory until his 2010 retirement.

Bedke calls the CTF "an inherently solid, flexible, and disciplined organizational structure that has served the Air Force and flight test very well over the years." There is no "flaw or old-think" to the CTF concept, Bedke asserts;



A Galaxy at Edwards AFB, Calif., during testing in the C-5 Reliability Enhancement and Re-engining Program.



T-1, USAF's first C-17, takes off from Long Beach, Calif., to Edwards in 1991 for testing. Globemaster IIIs entered unit service even before testing was complete.



A YF-16 and a YF-17, both carrying AIM-9 Sidewinder missiles. The YF-16 became USAF's F-16, and the YF-17 became the Navy's F/A-18.



Photo by Jet Fabura



Boeing photo



Photo by R. L. House

both contractor and Air Force voices are heard throughout an entire process that involves contractor and engineers, test pilots, and management. "It ensures testing is done once, and done right, with the understanding and agreement of everyone involved in the process," he argues.

The pace of new aircraft designs also forces the flight-test world to re-evaluate how it delivers the best weapon systems to customers. How are USAF's flight-test and procurement communities adjusting to the realities of fewer programs but longer timelines?

Realignments within Air Force Materiel Command indicate some movement in this area. In mid-2012, AFMC folded its 12 centers into five.

A name change makes the Air Force Flight Test Center at Edwards, simply the Air Force Test Center. It oversees AFMC's test mission at three major sites.

In addition to the work at Edwards, realignments at Eglin AFB, Fla., put the 46th Test Wing into the newly designated 96th Test Wing. Along with the 412th Test Wing at Edwards, the 96th TW aligns under the test center. Meanwhile, the Arnold Engineering and Development Center at Arnold AFB, Tenn., was redesignated the Arnold Engineering Development Complex and also aligned under the test center.

Brig. Gen. Arnold W. Bunch Jr., the first commander of the newly redesignated Air Force Test Center at Edwards, says critical test activity is accomplished across the AFMC test enterprise at Eglin, Arnold, Edwards, Holloman AFB, N.M., and a variety of smaller sites. "My job is to show the same amount of love to all of the locations and all of the test enterprise," he explains.

Bunch takes the global view of the service's test enterprise. "Instead of a laser-beam focus on Edwards Air Force Base test activities, ... my focus is enterprise-wide test activities," he says. For the first time, he notes, all aspects of AFMC testing (anechoic chambers, computational modeling, weapon systems, cyber, flight, ground, wind tunnel, and others) align under a single center. This presents tremendous opportunities to standardize processes across the test enterprise for effectiveness and efficiency, Bunch points out.

The reorganization was designed to take overhead costs out of various staffs through consolidation. No staffing cuts were made below the wing level. The net savings for AFMC's entire reorganization is based upon 1,000 fewer

positions and a savings of more than \$100 million annually.

The consolidation and realignment of test activities is emblematic of Air Force realities in an era where a spectrum of threats must be countered, coupled with the effects of a lingering economic downturn. A balancing act requires the Air Force to maintain a prudent technological edge, while addressing asymmetric threats such as terrorism. At the same time, observers note an exodus of experienced testers in the last decade as the wave of Cold War civilians and Active Duty members retire. Force drawdowns have kept replacements at a level some consider too low to maintain managerial proficiency and corporate knowledge.

Charles E. Adolph, a former contractor test engineer who subsequently spent more than a quarter-century as a military and civil service engineer and technical director at Edwards before moving on to OSD, expresses concern about an unintended gutting of the flight-test enterprise's core talent in the era of tight budgets.

The Importance of Timing

Reducing the number of experienced developmental testers in the name of cash savings is a false economy, Adolph says. Loosening government requirements by substituting commercial standards has, too often, only proved why specific government requirements were levied in the first place. The best service is rendered to the Air Force and the American taxpayer, he believes, when informed government developmental testers are involved with the program office from the planning stages to ensure normal developmental problems are identified soon enough to correct before production.

"Failure to identify and admit to technical issues and solutions, as well as real costs, early in the program cycle is the overwhelming cause for subsequent cost increases and schedule delays," Adolph notes. "Robust testing early in development, and objective assessment of test progress, are absolutely essential, to allow for early identification and correction of design deficiencies."

The timing of flight testing late in the research and development sequence can inadvertently work against the flight-test enterprise's ability to deliver. Bill Flanagan, a retired USAF test veteran who participated in flight test both as an Air Force officer and a Northrop B-2 flight-test weapon systems officer,

observed test programs running over time and over budget with design and delivery problems, only getting resolved at the expense of those who make up the tail end of the development process: the flight testers.

“As the cost rises and the lateness becomes apparent, there will be pressure to cut the length of the flight-test program to release the development and testing personnel to cut expenses despite the fact they are the ones most needed to conclude the test program. Since testing comes last, there will be pressure to reduce testing since it is what is not yet completed,” Flanagan wryly notes.

Flanagan’s prescription for effective flight test in an increasingly austere budget environment is a resuscitation of the lean flight-test program for the F-111 Pave Tack night attack-guided weapons system in the late 1970s.

Preserving Infrastructure

With only two flight crews and a small staff including contractor engineers, the Pave Tack operation used developmental test missions that involved operational-style weapons delivery—closely mirroring actual employment of an F-111 in combat. As a result, the initial operational test crew gained valuable experience as well as two to three test mission flights per week. The initial flight-test program was completed in approximately eight months and the lesson for the future, per Flanagan, was that greater efficiencies of time and cost can be realized by blending developmental and operational test goals.

Flanagan also suggests the proper CTF dynamic might need more, not less, contractor involvement to economically deliver the right product on time. He adds it could be more helpful to use more thoroughly integrated CTF teams for even less duplication of effort.

The Air Force flight-test infrastructure is touted as a national asset, but could tight budgets force it to shed capabilities and facilities?

“The basic infrastructure must be preserved; as less testing occurs, this means the cost per program of the ‘invested infrastructure’ will be higher,” Bedke responds. “But one doesn’t reduce the size of the airspace by half if the number of aircraft are cut in half; the runway isn’t reduced in length by 50 percent; the array of radars and unique, one-of-a-kind test facilities can’t be reduced.”



On the other hand, he says, some things can and should be reduced. One also always needs to consider the long term and the impact of cutting some capabilities that may take years or decades to recover once lost. Bedke acknowledges detrimental effects of budget belt-tightening that have left some aspects of Air Force test infrastructure hurting, in need of repair or modernization.

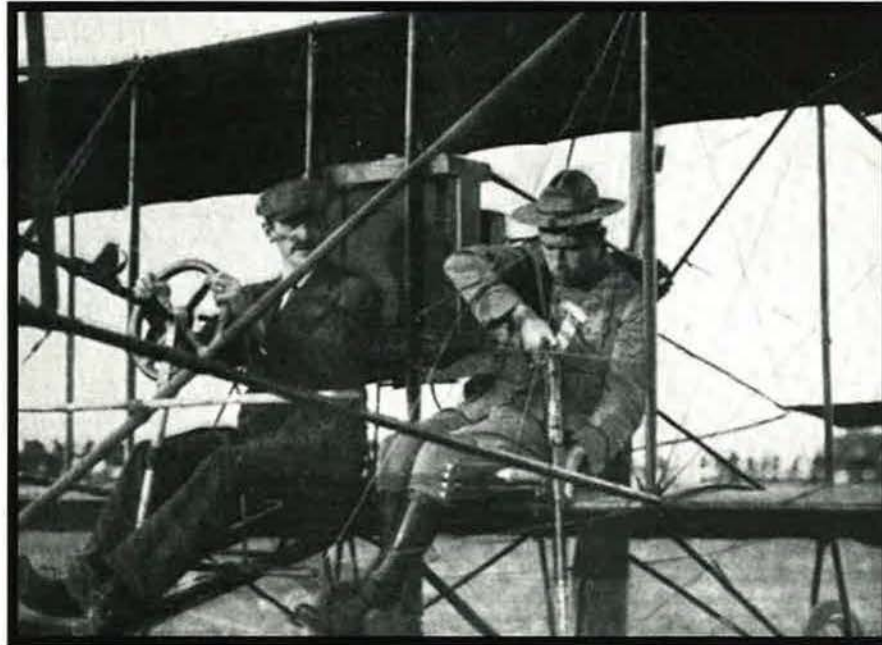
“Someone will have to ensure that the important things are recapitalized even in an austere budget environment,” he says. The replacement of Edwards’ deteriorating half-century-

old 15,000-foot paved runway in 2008 was one such investment—and more are called for. Even with prudent recapitalization, the changing world of flight test may drive decisions to mothball or even divest some Air Force test assets, he acknowledges.

Bunch must keep an eye on how test capacity reductions take place and the associated effects. “I almost worry more about the human capital” than the physical plant, he says, because of the long lead time to reconstitute lost experience. “Test skills aren’t conferred with a degree to a new engineering graduate. They must be built in-house,



USAF photo by S/A Stacy Sanchez



USAF photo



ODD photo

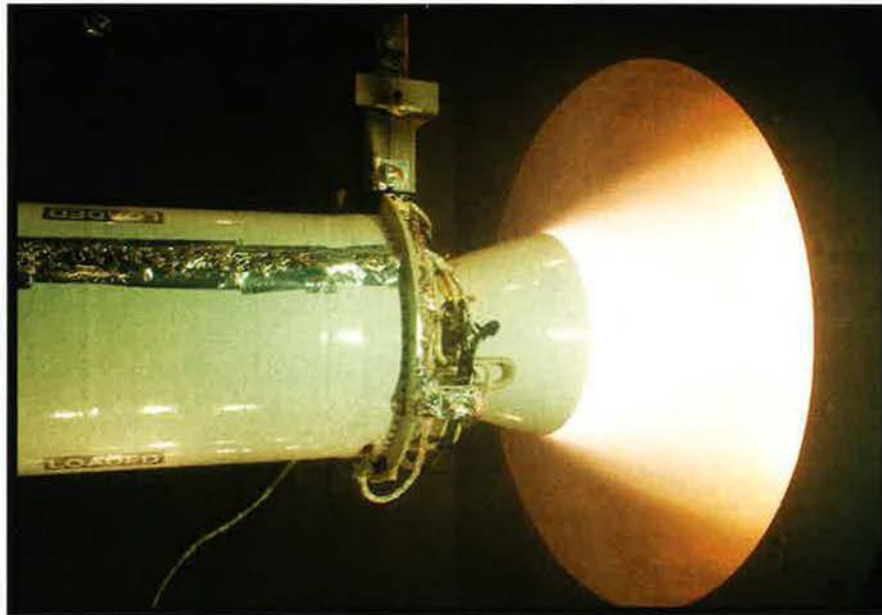


Photo by Rick Goodfriend

Clockwise from top left: A YC-15 on display at the Edwards gate. Lt. Jacob Fickel (r) demonstrates how he fired the first shot from an airplane, testing the use of weapons from the air. Aircraft designer Glenn Curtiss is at the controls. A Minuteman rocket motor undergoes testing at the Arnold Engineering Development Complex, Tenn. A KC-135 (r) runs an icing test on an A-10.

over time, and gained through experience," he says.

Air Force flight test can expect to operate with smaller budgets and smaller staffs in the next decade. Hard decisions must be made, and infrastructure must be upgraded where needed and shed where obsolete. The erosion of seasoned talent in the government test discipline has caused problems and must be corrected by ramping up recruitment and retention.

At the same time, the combined test force model is sound and needs to be exercised fully. Some may argue for more participation by the government

side. Others say contractors could fill staffing gaps. Government testers—the informed customers—must insert themselves in development programs to discover and fix problems early—before a weapon system enters production. Developmental and operational testing, although different in some aspects, can overlap in many areas to achieve economy of motion.

Slackers don't endure in the stark Mojave Desert surrounding Edwards. The Air Force Test Center faces a much smaller number of programs, fading budgets, and the need for long aircraft

lifespans. To be successful, it will need the same brand of can-do gusto that saw America's first jet flight in 1942, the first supersonic flight in 1947, and numerous test programs since. ■

Frederick A. Johnsen is the director of the Air Force Flight Test Center Museum at Edwards AFB, Calif. He is the author of more than 24 books and monographs on aviation topics, including Fire Bombers in Action. His most recent article for Air Force Magazine, "Attacking Fires From the Air," appeared in the October 2010 issue.

The Hercules of An Loc

By Sam McGowan

The crew of a C-130 showed incredible courage during the harrowing battle for An Loc.

The seldom-used runway at the National Museum of the US Air Force at Wright-Patterson AFB, Ohio, opened one day in August 2011 to allow a special aircraft to land. The C-130E, serial No. 62-1787, had served long years on Active Duty and with Air National Guard units. Just before retirement, it had been reassigned to Active Duty with the 19th Airlift Wing at Little Rock AFB, Ark.

Few of the crew or maintainers of this Hercules knew it had flown a heroic but little-heralded mission late in the Vietnam War. Even when it arrived at the museum, few of those who saw it



land knew why it had been especially chosen for display there.

This C-130, however, had been one of several pressed into service to save the besieged city of An Loc, South Vietnam, in 1972, after the US had already begun disengaging from the Vietnam War. Indeed, the C-130 had no longer even been configured for combat delivery and was slated to leave the country.

In the spring of 1970 US and South Vietnamese troops entered Cambodia, attacking North Vietnamese sanctuary bases just across the border from South Vietnam's Tay Ninh province. The North Vietnamese were driven deep into Cambodia and back up the Ho Chi Minh Trail

complex into Laos. Once that happened, the war in South Vietnam dropped to a low ebb, with little fighting.

By the spring of 1972, the American presence in South Vietnam had been drastically reduced, as US forces turned over more and more missions to the Vietnamese armed forces, a process called "Vietnamization." Only a handful of US ground combatants remained in the country and they were being withdrawn. Air Force units in South Vietnam had similarly downsized, including the once-vast tactical airlift apparatus that had served as the primary line of communication between rear area bases and more than a hundred forward airfields.

At the height of the war, the 834th Air Division had just under 100 C-130s temporarily assigned to it, along with a wing each of Fairchild C-123 Providers and de Havilland C-7 Caribous. By April 1972, though, the C-123s and C-7s had been given to South Vietnam, and C-130 strength in Pacific Air Forces had been reduced to one wing, the 374th Tactical Airlift Wing, based at Ching Chuan Kang Air Base, commonly known as CCK, on Taiwan. Another squadron was based at Clark AB, Philippines, but was also in the process of inactivating. Cam Ranh Air Base, once the primary C-130 field, transferred to South Vietnamese control. A detachment from the 374th TAW at Tan Son Nhut Air Base, outside Saigon, controlled the remaining C-130s.

All Hell Broke Loose

The C-130 force that had seen extensive action in 1968 and 1969 spent nearly two years flying basic logistics missions. Consequently, only a handful of crews still maintained tactical proficiency. Pilots and other crew members who had seen heavy action had either retired, been discharged, or moved into new assignments outside the C-130 community. Young men fresh out of training and men coming out of Military Airlift Command C-141s and Strategic Air Command bombers replaced them.

Suddenly, in early April 1972, all hell broke loose.

While the United States was withdrawing from South Vietnam, the North Vietnamese had built up their forces in Laos, despite a massive air campaign there by US fighters and AC-130 gunships based in Thailand. The North Vietnamese were preparing for a large-scale invasion of the South. Allied intelligence discovered in early March three People's Army of North Vietnam (PAVN) infantry divisions just across the border from Tay Ninh province. They expected the soldiers to make attacks on towns in the region. Instead, the PAVN troops discreetly moved across the border into the adjoining Binh Long province and captured the town and airfield at Loc Ninh. One division blocked Highway 13, the road to Saigon, south of the city of An Loc. Another attacked the city itself. These divisions intended to capture the provincial capital and use it as a base for a drive down Highway 13 against Saigon.

The only obstacle to this plan was the South Vietnamese force defending An Loc. It proved to be more formidable than the PAVN expected. The attack turned

into a siege as the PAVN 9th Division surrounded the city, cutting it off from all ground resupply.

Initially, South Vietnamese and US Army helicopters delivered supplies and reinforcements to the city, but as the communists built up their strength around An Loc, they brought in an anti-aircraft regiment equipped with .51-caliber, 23 mm, and 37 mm guns; they kept any further helicopter flights at bay.

The South Vietnamese turned to airdrop, using US-supplied Fairchild C-119 Flying Boxcars and C-123s. Although the supply effort was valiant, ground fire combined with the tiny drop zone made the airdrops unsuccessful. While South Vietnamese Air Force (VNAF) three-ship formations made some drops at 700 feet, some crews released their loads from 5,000 feet to avoid ground fire. Due to the lack of high-altitude rigging equipment, the drops proved fruitless as the loads drifted aimlessly and most bundles came down in enemy-held territory. All drops took place in daylight, and the threat of ground fire made them deadly missions. After the enemy shot down two VNAF C-123s, the South Vietnamese Air Force suspended daylight drops from low level. High-altitude drops continued but were generally ineffective.

The failure of the VNAF effort led US Military Assistance Command Vietnam to decide to use US Air Force C-130s to resupply the besieged city.

No one had expected the USAF C-130s to return to combat operations; in fact, no proper rigging equipment for the US container delivery system existed in all of South Vietnam, and only a handful of crews were even airdrop-qualified.

Eventually, enough tactically qualified personnel were found among the C-130s on rotation to the 374th TAW detachment to make up three crews for a planned drop on the afternoon of April 14.

Loadmasters scrounged from Vietnamese aerial delivery stocks to find the necessary rigging materials. Not finding everything they needed, they jury-rigged nonstandard gear.

While the loadmasters figured out how to rig their loads, pilots and navigators attended briefings. They were to approach the drop zone at medium



Loadmasters Sgt. David McAleece (l) and SSgt. Charles Shaub look over a camera some time after the An Loc mission. Both were wounded in that airdrop.

altitude, then descend quickly and level off at 600 feet two minutes away from the release point. The rigging problems delayed the planned takeoff, however, leaving insufficient time to make the drop before dark, so the mission was postponed until the following morning.

A Dreadful Night

Capt. William R. Caldwell was to fly the mission's third airplane, call sign Spare 617. A 1,900-hour pilot, Caldwell was one of the most experienced C-130 pilots at Tan Son Nhut at the time. His copilot, John Hering, and navigator, Richard A. Lentz, were both first lieutenants. The flight engineer was TSgt. Jon Sanders, experienced, but not in Southeast Asia or in combat. One of the loadmasters, SSgt. Charles L. Shaub, had seen the most combat of anyone on the crew. Shaub was on his second tour at CCK, where he had previously served from 1969 to 1970. The other loadmaster, A1C Dave McAleece, was a first-term



William Caldwell retired as a colonel.

airman and although he was tactically qualified, his combat hours consisted of routine flying around South Vietnam.

At 5:30 a.m. April 15, the officers were back in the briefing room while the engineers preflighted the aircraft and the loadmasters checked the drop bundles. The previous night had been dreadful; the crews knew they might not survive the extremely dangerous mission.

To make their drops, each crew would have to approach the drop zone at low altitude and only

150 mph. In Vietnam only helicopter crews operated in such low-and-slow conditions, and they didn't fly into areas with known anti-aircraft artillery of the magnitude surrounding An Loc. The mission harkened back to that of troop carrier C-47s of World War II. Airlift crews early in the Vietnam War had also sometimes operated under similar conditions, with predictable heavy losses.

The mission called for three C-130s, but instead of following each other into the drop zone in a three-ship, in-trail formation, the plan required each crew to make its run separately. This put them at a disadvantage: The PAVN gunners, alerted by the arrival of the first Hercules, would be ready for the others.

The first crew did indeed make its run and drop without a problem, though tracer fire swarmed it, and it took one hit in the rudder.

The second crew discovered a malfunction in their release gate—caused by the use of nonstandard rigging material—and pulled off so the loadmasters could fix it.

Caldwell was cleared in for the drop, but missed the initial point on his first approach and turned out to come back in again. His C-130 carried a cargo load of 27,000 pounds of howitzer and mortar ammunition.

Thirty seconds from the release point, Caldwell's airplane began taking hits. A shell burst near the cockpit, shattering the windows on the pilot's side, wounding the copilot and killing Sanders, the engineer. Both loadmasters received shrapnel wounds. The worst damage came from a shell that knocked out a section of the bleed air line on the left side of the cargo



C-130 Spare 617 arrives at the National Museum of the US Air Force in Dayton, Ohio. Two of her crew members, Caldwell and Shaub, were awarded Air Force Crosses for actions performed during the siege of An Loc.

compartment. When the line ruptured, hot bleed air poured into the cargo compartment and was sucked into the cockpit. The intense heat set two of the ammunition-laden bundles in the cargo area on fire. Fire also broke out on the left side of the airplane, in the area of the wheel well. Shrapnel hit both engines on the left side; they soon caught fire.

An Loc Was Saved

The crew's most immediate problem was to get rid of the load. The loadmasters called for the pilot to jettison it, but the electronic release failed. Shaub decided to use the manual release handle in the cargo compartment. Seconds after falling free of the airplane, the two burning bundles exploded.

Shaub next turned his attention to fighting the fire. He grabbed one of the fire extinguishers from the wall, even though the metal was red hot from the wash of hot bleed air. He severely burned his hands. Meanwhile, Caldwell closed the bleed air valves on the engines on the right side and shut down the two engines on the left side. With the flow of bleed air halted, Shaub was able to extinguish the fire, saving the airplane a second time.

Caldwell next thought about finding a field to put the airplane down. He also considered ordering the crew to bail out, but decided some were too severely injured.

Although his airspeed bled off considerably while he took care of the emergency, he managed to get it back up. He realized the airplane was still

flyable, so he decided to return to Tan Son Nhut, some 60 miles away.

With both left engines shut off, the airplane had lost secondary hydraulics. This meant cranking down the landing gear manually. Shaub's hands were too badly burned to handle the crank. McAleece was able to turn it, although he had been wounded. He cranked the gear down and it locked into place while the C-130 was in the traffic pattern. The airplane was flying on two engines, and while it was in the approach pattern, power on one of the two remaining engines rolled back to 80 percent. Other than that, the landing was uneventful.

The medics who rushed into the airplane declared Sanders dead.

Drops at An Loc continued into May, with only limited success. The enemy shot down three more C-130s, along with several Vietnamese C-123s. A barrage of anti-aircraft fire hit the C-130 commanded by Capt. Don B. Jensen on April 18. Army helicopter crews saw the airplane crash-land in a swamp and rescued the crew. The other two crews, on April 25 and May 3, were lost.

In early May a two-man team arrived in Saigon. TSgt. John F. Limbach from the Tactical Air Warfare Center at Eglin AFB, Fla., and Maj. Myles A. Rohrlick from Tactical Air Command headquarters corrected problems in the rigging methods used on high-altitude parachutes. A new method of dropping the loads used slotted extraction parachutes to stabilize the loads and permitted using ground radar to guide the drops from well above the

range of the anti-aircraft guns. An Loc was saved.

For their roles in the April 15 mission, Caldwell and Shaub each received the Air Force Cross. Shaub, who was promoted to technical sergeant soon after the incident, also received the Air Force Sergeants Association's 1972 William H. Pitsenbarger Award for heroism.

Caldwell retired from the Air Force as a colonel. Shaub retired and returned to his home near Portland, Tenn. He died in Gallatin, Tenn., in 1996.

The C-130 on that mission was repaired and returned to service. It was eventually assigned to the 314th Tactical Airlift Wing at Little Rock, Ark., and went to the West Virginia Air Guard. It later transferred to the Arkansas Air Guard at Little Rock where members of the ground crew discovered the airplane's historic past and notified their commander, who then contacted the Air Force museum. The C-130 had been scheduled to retire in Fiscal 2013 but wing cracks pushed up the retirement date.

The airplane that saw so much heroism as Spare 617 now awaits public display at the museum at Wright-Patterson. ■

Sam McGowan served 12 years in aircraft maintenance and as an aircraft loadmaster in Military Airlift Command, Pacific Air Forces, and Tactical Air Command. He is a Vietnam veteran, a retired corporate pilot, and freelance writer who resides in Missouri City, Tex. His last article for Air Force Magazine, "Loadmaster Evolution," appeared in December 2011.

By Robert S. Dudley

Tell Bob Gates. Oh, You Did?

"It's a game changer. It does air superiority on steroids. It's a strategic gem, a national treasure."—*Brig. Gen. Matthew H. Molloy, commander of USAF's 18th Wing at Kadena AB, Japan, on the value of the recently arrived F-22 fighter, Associated Press, Aug. 30.*

Wages of Sequestration I

"Every modernization program is affected in a major way, especially some of the key ones that we are going to rely so much on here over the next 10 to 20 years as we try and populate the force with new capability we need. And I think the trade space will become readiness and modernization. That's horrible trade space to be operating."—*Gen. Mark A. Welsh III, Air Force Chief of Staff, commenting on looming sequestration cuts, quoted in Air Force Times, Sept. 10 issue.*

Wages of Sequestration II

"You would not be buying F-35s. You'd be keeping F-16s and F-15s on line for years longer, and you'd have less of them. ... The Russians and the Chinese are selling air defense capabilities to almost anybody who wants to buy them, including the North Koreans. So, if you're a pilot flying an F-16 or an F-15 five or six years from now, the chances of you being at risk multiply greatly. That's why the F-35s and F-22s are so important."—*Sen. Lindsey O. Graham (R-S.C.) on sequestration fallout, Las Vegas Review-Journal, Aug. 30.*

See: Rhineland, 1936

"For all practical purposes, China has unilaterally decided to annex an area that extends eastward from the East Asian mainland as far as the Philippines and nearly as far south as the Strait of Malacca. China's new 'prefecture' is nearly twice as large as the combined land masses of Vietnam, South Korea, Japan, and the Philippines. ... By taking no position, Washington has by default become an enabler of China's ever more aggressive acts. The US, China, and all of East Asia have now reached an unavoidable moment of truth. Sovereignty disputes in which parties seek peaceful resolution are one thing; flagrant, belligerent acts are quite another. ... History teaches us that, when unilateral acts

of aggression go unanswered, the bad news never gets better with age."—*Sen. James Webb (D-Va.), op-ed in the Wall Street Journal, Aug. 20.*

The Burden Is on Us

"The [attacks] required to hit underground enrichment facilities with a high level of damage, to carry out the scale of initial and follow-up attacks, and providing resources such as near-real-time intelligence required to detect and destroy other potentially lethal Iranian military weapons—for instance, ballistic missiles that could be used in a retaliation—can only be carried out by the United States. ... The US would be the only country that has the airpower, support capability, and mix of sea-air forces in the Gulf to continue a sustained campaign over a period of time and restrike after an initial battle damage assessment [if] it is found that further strike sorties are required. ... Israel does not have the capability to carry out preventive strikes that could do more than delay Iran's efforts for a year or two."—*Anthony H. Cordesman, top defense analyst at the Center for Strategic and International Studies, new report on possible military attacks on Iran's nuclear program, Sept. 6.*

Needed: A Red Line

"The international community is not setting Iran a clear red line, and Iran does not see international determination to stop its nuclear project. Until Iran sees a clear red line and such determination, it will not stop the progress of its nuclear project—and Iran must not be allowed to have nuclear weapons."—*Israeli Prime Minister Benjamin Netanyahu, quoted in New York Times, Sept. 2.*

Plausible Deniability

"I don't know their plans. You know, we are a close ally, but we don't share all of our planning for any particular contingency. So I don't know their plan. Secondly, though I know generally their capability, I would never suggest that I know all of their capability. So when I'm asked, 'Could they do it?' I tend to look at it through the narrow lens of what I know. ... They can clearly delay, but probably not destroy, Iran's nuclear program. ... Will I get warning? ... I don't know. I haven't asked the

question. ... I don't want to be accused of trying to influence, ... nor do I want to be complicit, if they choose to do it. Really. So I haven't asked the question."—*Army Gen. Martin E. Dempsey, Chairman of the Joint Chiefs of Staff, remarks to reporters in London about a possible Israeli strike against Iran's nuclear program, Aug. 30.*

Stuck With Each Other

"They're [China and India] like two porcupines. They want to be friends, but can only move a quill at a time."—*C. Uday Bhaskar, visiting fellow at India's National Maritime Foundation, Los Angeles Times, Sept. 4.*

Bonfire of the Inanities

"When you look at the thousands and thousands and thousands of pages of [acquisition] regulations that have crept in over the years, we say, 'Start over.' If it was me, I'd take 'em all and put a match to it. ... They've totally choked industry out of the problem. [If] you see them in the hallway, you'd better run in the other direction, because some lawyer's going to write you up. We talked to two four-star generals that wanted to have conversations with industry on the JLTV [the Joint Light Tactical Vehicle]. You'd have thought they were going to kill their grandmothers."—*Retired Marine Corps Maj. Gen. Arnold L. Punaro, chairman of the Defense Business Board, commenting on the problem of DOD acquisition, interview with AOL Defense, Aug. 30.*

Making Stalin Look Good

"Deterring Iran is fundamentally different from deterring the Soviet Union. ... It's one thing to live in a state of mutual assured destruction with Stalin or Brezhnev, leaders of a philosophically materialist, historically grounded, deeply here-and-now regime. It's quite another to be in a situation of mutual destruction with apocalyptic clerics who believe in the imminent advent of the Mahdi, the supremacy of the afterlife, and holy war as the ultimate avenue to achieving it. The classic formulation comes from Tehran's fellow ... jihadist al Qaeda: 'You love life and we love death.' Try deterring that."—*Syndicated columnist Charles Krauthammer, Washington Post, Aug. 30.*

By Frances McKenney, Assistant Managing Editor

Field Trip: Alabama to California

When Alabama's **Montgomery Chapter** takes you on a field trip, better pack a suitcase.

In June, the chapter's aerospace education VP, Susan Mallett, and member Debbie Dahl led a teachers workshop on a 2,000-mile journey from Montgomery to California. The field trip gave the instructors hands-on science, technology, engineering, and mathematics experiences and educated them about STEM careers their students could pursue.

The project involved AFA on several levels: Participants Roberta Ludwigsen and Sylvia Dean had earlier been selected as chapter and state teachers of the year, so as part of their rewards, the **Montgomery Chapter** and **Tennessee Valley Chapter (Ala.)** sponsored them on this six-day trip. An AFA Chapter Matching Grant and AFA Alabama provided some funding. In California, **William J. "Pete" Knight Chapter** member Megan Tucker helped line up activities, and Chapter President David Smith hosted AFA members for an evening at his home. Other financial and in-kind support came from Civil Air Patrol, Air University Foundation, and other organizations.

The 908th Airlift Wing at Maxwell AFB, Ala., flew most of the 45 participants to Edwards on a C-130. After the seven-hour flight, the teachers took a hangar and flight line tour, followed by a Knight Chapter-sponsored reception at the Air Force Test Center Museum.

The workshop participants visited the NASA-Dryden Flight Research Center at Edwards, Mojave Air and Space Port in Mojave, a wind turbine facility in Tehachapi, the Southern California Soaring Academy in Llano, and at least four museums.

Of all the sites visited, Mallett picked out the NASA Jet Propulsion Laboratory in Pasadena as an attention-getter because of the Mars Science Laboratory. Mobile laboratory rovers undergo testing there, and it turned out that seeing and touching one gave the teachers a greater understanding of events, about two months later, when the rover Curiosity landed on Mars.

This field trip began as part of the AFA-Air Museum Education Initiative, fostered by George K. Muellner, then



AFA Board Chairman Sandy Schlitt (right) and Michael Dunn, then AFA's President-CEO, took part in the Focus on Defense symposium in Utah in June. See p. 72.

AFA's vice chairman of the board for aerospace education. The field trip specifically helped the pilot program get under way at the Yanks Air Museum. Mallett said that a tour and briefing at the facility, in Chino, gave the educators "historical insight into the legacy of our nation's aviation heritage."

Mallett—who also serves on the state level as AFA aerospace education VP and on the national level as part of the Aerospace Education Council—has conducted far-ranging field trips before. Other destinations were: Kennedy Space Center in Florida; Albuquerque, N.M.; and Dayton, Ohio.

This field trip, however, was far more ambitious. "The moving pieces didn't stop moving," Mallett said.

STARBASE in the Shenandoah

The first STARBASE youth education program in Virginia run by the National Guard debuted in July, capping five years of effort by the **Northern Shenandoah Valley Chapter**.

US Rep. Frank R. Wolf (R-Va.) attended the ribbon-cutting ceremony in

Winchester and told the crowd that a past chapter president got him involved in establishing this STARBASE, located at the National Guard's Cherry-Beasley Readiness Center.

DOD STARBASE Program Manager Ernie Gonzales, in his remarks, specifically mentioned strong support from then-AFA President-CEO Michael M. Dunn, whom he credited with moving the approval process along.

STARBASE is a DOD and National Guard Bureau initiative for at-risk youth ages six through 18. The program uses hands-on learning to build STEM abilities. It also covers drug-use prevention, self-esteem, and other life skills. The STARBASE acronym stands for Science and Technology Academies Reinforcing Basic Aviation and Space Exploration.

STARBASE Winchester occupies two classrooms, said James Hannam, vice chairman of AFA's Aerospace Education Council. A group of students immediately began using these rooms in the program's inaugural session that got under way after the official opening

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

ceremony. Observed by the visitors, the students carried out a typical learning activity: constructing a safety harness for an egg (representing an astronaut in a space capsule).

STARBASE began with Michigan educator Barbara Koscak in the late 1980s. She captured the interest of the 127th Wing commander at Selfridge ANGB, Mich., Brig. Gen. David Arendts, with the idea of having Air Guardsmen teach the STARBASE children. The military personnel could demonstrate the use of STEM in their everyday work and could serve as role models for the importance of education, teamwork, and self-discipline.

Today STARBASE takes place in more than 60 locations. In Virginia, Norfolk Naval Base has hosted the state's first. At the opening of the second one, in Winchester, AFAers—including Chapter President Norman G. Brander, VP Norman M. Haller, Secretary Stephen J. Pederson, Treasurer John P. Tagnesi, and Aerospace Education VP Thomas G. Shepherd—discussed the possible startup of a Richmond-area STARBASE.

Air Force Week in New York City

New York's **Iron Gate Chapter** contributed to a successful encore Air Force Week in New York City.

USAF's Chief of Staff started Air Force Week in 2006 to showcase the Air Force mission, assets, and way of life. The exhibits, air shows, sports events, and concerts that make up an Air Force Week have taken place in more than a dozen cities, most recently in 2010 in Cocoa Beach, Fla., and New York City.

This year, the opening ceremony in the Big Apple again took place on Manhattan's West Side, at Pier 86 on the Hudson River, where the decommissioned aircraft carrier *Intrepid* is docked as a museum. Secretary of the Air Force Michael B. Donley and Gen. Edward A. Rice Jr., head of Air Education and Training Command, attended the event.

Iron Gate donated \$1,000 for the USO reception that followed this ceremony.

The chapter joined with other associations in sponsoring an Air Force Week presentation by retired Col. Richard H. Graham. He spoke about the SR-71, based on his seven years of flying the "Blackbird" on reconnaissance missions. Graham has written three books about his experiences. Some 200 people attended Graham's briefing, said Chapter President Frank T. Hayes.

In addition, the chapter funded an appearance by Jonna Doolittle Hoppes. She spoke to groups of children about her grandfather, Jimmy Doolittle, leader

of the 1942 raid on Tokyo, Medal of Honor recipient, and AFA's founding father.

Hayes said the chapter manned an AFA tent in a highly visible location: the second spot on Pier 86. During the Aug. 19-21 period of Air Force Week, Intrepid Sea, Air, and Space Museum ticket sales were 9,000 on Sunday, some 5,600 on Monday, and an estimated 6,000 on Tuesday, he reported.

Hayes said that every morning, Iron Gate Chapter members arrived at the pier with 100 New York bagels, at least four dozen doughnuts, and 150 bottles of water for the airmen running the Air Force exhibits. For lunch, the chapter provided pizza—New York-style, of course.

Utah's Focus on Defense

The theme—"Acquisition and Sustainment in the 21st Century AFMC"—merely hinted at what really brought 400 people to the Focus on Defense symposium, sponsored by Utah's AFA chapters: **Northern Utah, Salt Lake, and Ute-Rocky Mountain.**

In June, government, military, and defense industry representatives turned out for the 33rd annual symposium to discuss the defense budget squeeze and to learn how Air Force Materiel Command's organizational restructuring would affect them.

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Retired Lt. Gen. Henry A. Obering III, former Missile Defense Agency director and now senior vice president at Booz Allen Hamilton, opened the day-long symposium with an industry perspective on the budget's impact and on the consolidation of AFMC centers from 12 to five.

Lt. Gen. Judith A. Fedder provided insight from her viewpoint as deputy chief of staff for logistics, installations, and mission support. Brig. Gen. Dwyer L. Dennis, head of the ISR and Requirements Directorate at AFMC, described what the requirements process will be after the reorganization.

Maj. Gen. Christopher C. Bogdan, KC-46 program executive officer at the time of the symposium, gave an overview of the tanker's role and how the program was structured for success. Bogdan is now deputy PEO for the F-35 strike fighter program.

The commander of what was then the Oklahoma City Air Logistics Center, Maj. Gen. Bruce A. Litchfield, was the last government-sector speaker. He gave what Utah State President Walter W. Saeger Jr. called "a passionate presentation" on the "positive impact" of the Air Force Sustainment Center's standup at Tinker AFB, Okla. Litchfield was promoted to three-star and became the center's commander in July. The newly renamed air logistics complexes at Ogden in Utah, Warner

Robbins in Georgia, and Oklahoma City now report to him.

Northern Utah Chapter member Kevin J. Sullivan, who commanded the Ogden complex at Hill Air Force Base from 2003 to 2007, served as symposium chairman for the second year. Saeger was overall chairman for the symposium and follow-on two-day golf tournament. The golf outing raised nearly \$35,000 for the Utah Aerospace Education Foundation.

Focus on Defense social events included its traditional salmon BBQ and a "Midcourse Correction Party" centered on the golf outing. FOD culminated with an awards banquet.

Remembering Truman and the Bomb

Kansas City's **Harry S. Truman Chapter** in Missouri held a ceremony Aug. 6 to mark the 67th anniversary of the dropping of the atomic bomb on Japan and to express gratefulness that President Truman made the decision to use it to end World War II.

According to the *Independence Examiner* newspaper, about a dozen visitors joined chapter members in observing the chapter's ceremony. It took place at the Truman Presidential Library and Museum in Independence.

Chapter President Patricia J. Snyder served as master of ceremonies. Jerry Hughes delivered the main address. Chapter VP John M. Campo and

Communications VP James M. Snyder joined members Joan M. Boyd and Anita Seibolt as the Honors Element and laid a wreath at Truman's tomb in the museum's courtyard.

James Snyder explained afterward that the group held their commemoration at exactly 11 a.m. At that time, on Aug. 6, 1945, on the East Coast, the White House press secretary released Truman's statement announcing the use of the atom bomb. (Truman himself was aboard the cruiser *Augusta*, sailing home from a wartime conference at Potsdam.)

Snyder said the Truman Chapter began performing this anniversary ceremony last year, assuming responsibility after the dissolution of the Harry S. Truman Appreciation Society. It had begun the annual observance in 1995.

Mesmerizing Colorado

Colorado State AFA—the **Gen. Robert E. Huyser, Lance P. Sijan, Mel Harmon, and Mile High Chapters**—held its annual State Awards Dinner, featuring a guest speaker with a "mesmerizing" talk.

CyberPatriot Commissioner Bernard K. Skoch "energized the crowd," wrote State President Tom Cavalli. Skoch spoke about the need for STEM and the role CyberPatriot has in developing cybersecurity skills in high school students.

Keeping the emphasis on education, Cavalli introduced to the audience the

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Colorado State Teacher of the Year, Janet Krompfer. She teaches science at High Plains Elementary School in Colorado Springs.

Among other awards, the Mel Harmon Chapter from Pueblo received the State Chapter of the Year award. Kevin D. Estrem of the Lance P. Sijan Chapter was named Colorado Member of the Year.

SrA. Nicholas A. Hurt, 721st Security Forces Squadron, Cheyenne Mountain Air Force Station, was chosen as Airman of the Year. Cavalli pointed out that Hurt had been selected even before USAF picked him as one of this year's 12 Outstanding Airmen.

Other military awards went to: TSgt. Rene Hernandez, 302nd Civil Engineering Squadron, NCO of the Year; SMSgt. Jeffrey A. Flight, 302nd Operations Group, SNCO of the Year; and Capt. Kirk W. Greene, 21st Mission Support Group, Company Grade Officer of the Year. All three come from Peterson Air Force Base.

Civilians of the Year were Michael A. Owen, from the 4th Space Operations Squadron, and Anthony R. Flowers, 50th Civil Engineering Squadron. Both are from Schriever Air Force Base.

Colorado State Executive VP Stephen K. Gourley and a team from the host Mile High Chapter in Denver organized the awards dinner.

South Carolina State Convention

TSgt. Joshua S. Thacker of the 169th Fighter Wing, McEntire JNGB in Columbia, S.C., came away as the big winner at the South Carolina State Convention. The **Swamp Fox Chapter** hosted it in Sumter in April.

A crew chief with the 169th Aircraft Maintenance Squadron, Thacker received both the Outstanding Air Force Person of the Year award and the Outstanding Aircraft Technician award.

The AFA recognition came on top of Thacker's other 2012 wins as a Continental US NORAD Region 1 Warrior awardee and as NCO of the Year for the South Carolina Air National Guard. "An all around good guy," commented State President John R. Allen Jr.

The convention's awards banquet highlighted "superlatives," as Allen put it, in several other military categories: the 79th Fighter Squadron at Shaw, named Outstanding Squadron; Capt. Seth Taylor from the 20th Fighter Wing at Shaw, named Outstanding Aviator; Capt. Tamatha Rand, 315th Logistics Readiness Squadron, JB Charleston, Outstanding Logistics; and SMSgt. James Rider from McEntire, Outstanding Mission Support.

For the second consecutive year, Clemson University's AFROTC Det. 770 received the top ROTC unit award.

Strom Thurmond Chapter member Col. James G. Riemens-Van Laare accepted the plaque for his cadets. Berea High School cadets in Greenville earned the Outstanding JROTC Unit award.

AFA awardees included **Columbia Palmetto Chapter** President E. G. Shuler III and Chapter Treasurer Sharlene Shuler and Thurmond Chapter Treasurer William F. Mays. Sharlene Shuler took home a second award, as state Member of the Year, and the Thurmond Chapter did, too, as the Most Improved Chapter.

Amy Baldwin, an Oakbrook Middle School instructor from Charleston, received the Teacher of the Year honor.

Maj. Gen. Lawrence L. Wells, 9th Air Force commander at Shaw AFB, S.C., delivered the keynote address.

More Chapter News

■ Armed Forces Week, May 11-19 in Milwaukee, promised a 128th Air Refueling Wing open house with airplanes, entertainment, and food. The **Billy Mitchell Chapter** had a hand in this last one: Its members sold steamed corn during the two-day-long military display at General Mitchell Airport. The chapter, headed by Victor L. Johnson Jr., had help from a group of cadets. Chapter members who manned the booth

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included VP Ralph J. Pietruszynski, Secretary Henry Syring, Don Adams, and Edward H. Garrison.

■ In Tucson, Ariz., in July, Sabino High School math teacher David Kukla received the Arizona State Teacher of the Year award from State President Ross B. Lampert and **Tucson Chapter** President James I. Wheeler. Kukla had first been named the Tucson Chapter's Teacher of the Year. He garnered the award through a unique process, wrote Lampert: Chapter Aerospace Education VP Bob Anderson polled students and parents at high schools and in Civil Air Patrol squadrons around Tucson to find award candidates. Kukla's nomination stood out. In addition to teaching algebra, trigonometry, and calculus, he recently helped the local CAP group land a \$250 AFA grant for a remotely piloted aircraft to use in search and rescue.

■ The **Long Island Chapter's** Teacher of the Year has been selected as the New York State Teacher of the Year. Ed Moloney teaches technology to students in grades seven through nine at P. J. Gelinas Junior High School in East Setauket. Moloney covers topics such as wind technology, solar energy, global warming, and carbon footprints and uses wind turbines, solar ovens, and stop-animation software to interest his students in STEM.

■ In New Mexico in July, the **Albuquerque Chapter** co-sponsored a luncheon with the local Military Coalition group. Republican Lt. Gov. John A. Sanchez was guest speaker. He talked to the audience about the importance of the upcoming elections and encouraged taking part in the process, according to Chapter President Robert M. Hudson. More than 70 members, as well as John A. Toohey, New Mexico state VP, attended the event.

■ Florida Region and State President Michael H. Emig, **Waterman-Twining Chapter** President Edward H. Hance, and **Red Tail Memorial Chapter** member Ben Langer paid an office call on US Rep. Gus M. Bilirakis (R-Fla.) in Palm Harbor, Fla., to present him with the AFA Florida Congressional Leader of the Year Award. Bilirakis is vice chairman of the Veterans' Affairs Committee. He chairs the Veterans' Affairs Task Force for the Republican Policy Committee and co-chairs the House Military Veterans Caucus.

■ Wearing aloha shirts and leis, Maryland State President Joseph L. Hardy and John L. Huggins Jr., president of the **Thomas W. Anthony Chapter**, were among chapter members in colorful attire for the Hawaiian-themed retirement party for Col. Kenneth R. Rizer and his wife, Cheri. Rizer had been commander of the 11th Wing at JB Andrews since 2010. At the July farewell,

the chapter announced establishment of the Rizer Presentation Fellowship. It makes possible future donations to AFA—specifically for aerospace education—in the Rizers' name. ■

reunions@afa.org Reunions

Redhorse Assoc. Sept. 22-26, 2013, in Bowling Green, KY. **Contact:** Charlie Hogan, 1838 J Brown Rd., Park City, KY 42160 (270-749-5461) (chogan@srcr.com).

Seeking members of the **16th/13th Tactical Fighter Sq**, Eglin AFB and Udorn RTAB (1965-68) for a reunion in the fall of 2013 in Colorado Springs, CO. **Contact:** Roger Krause (719-659-7696) (rlandmsk@earthlink.net Attn: Reunion). ■

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.



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Super Étendard



The Super Étendard is a strike fighter designed for the French naval aviation forces and used in combat by France and several other nations. Though small in size and numbers, the Dassault-designed warplane acquitted itself well in combat over Lebanon, the Falkland Islands, Libya, Serbia, Iraq, and Afghanistan.

Originally, plans called for the Dassault Étendard IVM to be replaced by a naval version of the SEPECAT Jaguar. This program was canceled when carrier operation difficulties emerged. Dassault then proposed an upgraded version of the older Étendard—calling it the Super Étendard—which met requirements. Eighty-five aircraft were delivered between 1978 and 1983. The single-seat,

all-metal midwinged Super Étendard is powered by a single nonafterburning SNECMA turbojet engine. It has folding wings and a tail plane which are swept at 45 degrees.

Armament varied, but equipped with the Agave radar, it was particularly well-suited to deliver the French Exocet missile. The combination of speed and modern weapons made the Super Étendard effective. In the Falklands conflict, Argentine pilots, though inexperienced, inflicted severe losses on British naval forces, sinking HMS *Sheffield* and the merchant vessel *Atlantic Conveyor*. The Super Étendard remains in service in France and Argentina.

—Walter J. Boyne

This aircraft: French Naval Aviation Super Étendard as it looked in 1989 when assigned to Flottille 14F at BAN Landivisiau, France.



USN photo by Photographer's Mate Amm. Konstantinos Gourentidis



An Argentine Navy Super Étendard performs a touch-and-go from the aircraft carrier USS Ronald Reagan.

In Brief

Designed, built by Dassault ★ first flight Oct. 28, 1974 ★ crew of one ★ number built 85 ★ one SNECMA Atar 8K-50 turbojet engine ★ armament, two 30 mm cannons, up to six external rockets and missiles (air-to-air, air-to-surface), free fall conventional bombs, one nuclear bomb ★ max speed 733 mph ★ cruise speed 600 mph ★ max range 1,100 mi ★ weight (loaded) 26,500 lb ★ span 31 ft 6 in ★ length 45 ft 11 in ★ height 12 ft 8 in.

Famous Fliers

Combat: Roberto Agotegaray, Julio Barraza, Augusto Cesar Bedacarratz, Jorge Colombo, Roberto Curilovic, Roland Glavany, Carlos Machetanz, Armando Mayora, Daniel Rastel, Jose Rodriguez, Dominique Sebastien.

Interesting Facts

Used by Iraq Air Force in Iran-Iraq War ★ named "battle flag" or "standard" (English translation of French "étendard") ★ flown by Argentina's air force in 1982 Falkland Islands War ★ has performed touch-and-gos on US aircraft carriers ★ flown by French naval air force initially off carriers *Foch* and *Clemenceau* ★ took part (French forces) in Operation Allied Force (1999) and Operation Enduring Freedom (2003).



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