



Below: A New York Air National Guard pararescue airman works on a simulated patient using Battlefield Air Targeting Man-Aided Knowledge (BATMAN) equipment during a casualty drill at Francis S. Gabreski ANGB, N.Y. BATMAN wearable technology includes lightweight sensors and comms gear for battlefield airmen. Right: Second Lt. Krystin Shanklin demonstrates “leap-ahead” technologies that will help USAF gain the dominant edge.



An Air Force for the Future

By John A. Tirpak, Editorial Director

USAF will embrace leap-ahead “Third Offset” technologies to sustain its position of dominance.

Determined to maintain the Air Force’s technology edge, service leaders at AFA’s Air Warfare Symposium said they’ve closely aligned their Fiscal 2017 budget request with the Defense Department’s “Third Offset” strategy, intended to develop leap-ahead capabilities. Technology-driven since its origins, USAF plans to lead the Third Offset charge.

Speaking in Orlando, Fla., Air Force Secretary Deborah Lee James and Chief of Staff Gen. Mark A. Welsh III said they’ve substantially boosted USAF’s latest funding requests for research and development, structuring new programs to evolve and adapt rapidly as competitors acquire the very capabilities that have given USAF decades of air and space dominance.

Over the last 25 years, James said, “the world has been watching us,” and having seen the benefits of precision,

stealth, and space-enabled capabilities, among many others, adversary militaries are “developing technologies and strategies to counter this advantage.”

In her keynote address, James said, “No one knows exactly what that next Third Offset will entail,” but she promised that USAF and airmen “will lead the way by turning theory into reality.”

Welsh noted in his speech that USAF is short of airmen, particularly in areas such as remotely piloted aircraft operators and maintainers. Though the Air Force requested a slight boost in airmen for Fiscal 2017, James said she may use executive measures to temporarily increase end strength to cope with missions in high demand but that don’t have enough people. Though USAF is authorized 311,000 airmen, James said under the law she can increase that by two percent.

“The demands on the force,” she said, are so intense that “I believe more than 317,000 is likely to be prudent.” The increase would come through a combination of recruiting and retention of those with vital skills, she said.

The entire Air Force, Welsh said, is a “low-density, high-demand” asset, using a term that came into vogue in the 1990s to describe an often-utilized capability that never has enough capacity to go around.

“Everybody wants more airpower,” he said, describing the insatiable demand from regional commanders for intelligence, surveillance, and reconnaissance, mobility, command and control, strike, contracting, “everything.” If there’s insufficient capacity in all these areas when the next major contingency erupts, he warned, “you will lose.” The lack of depth in USAF’s capacity should be “an important discussion as we get into planning for

future contingency operations,” Welsh asserted, saying he believes it’s time past due for a national debate on sizing and modernizing the service.

In fact, Welsh said, both modernization and readiness have been hammered so long in the Air Force—because of 25 years of nonstop combat operations—that its ability to do what it’s asked to do may be in question.

“If somebody asks you, is the Air Force ready?” Welsh asked rhetorically, the answer would have to be another question: “To do what?” If the service is only required to perform close air support in the current Middle East fight, then “Yep, we’re 100 percent ready. Send us,” Welsh said. But if the mission is a major theater war in Europe or the Pacific, “against a well-trained, well-equipped enemy, the answer is, ‘We’re not very ready for that.’ And it’s going to be ugly.”

Throughout the conference, USAF leaders talked about these new capabilities largely in the abstract, reluctant to discuss many specific efforts that may already be underway in the classified world. However, some technology areas are almost certain to play a role. These include hypersonics; autonomy and artificial intelligence; “swarming” unmanned platforms; “arsenal planes” and stealth unmanned escort aircraft; smarter, faster, and longer-ranged munitions, directed energy; cyber weapons; and man-machine interfaces that will help speed up decision-making.

All are supposed to defeat the same capabilities that gave the US such a lopsided victory in 1991’s Operation Desert Storm and in nearly a dozen other conflicts since—those described as the “Second Offset” to superior numbers in the old Soviet military in the 1970s and ’80s.



USAF photo by SSgt. Corey Hook



USAF photo by TSgt. Robert J. Horstman



Left: A B-52H on static display with weapons that demonstrate the broad capabilities of the veteran bomber. Above: A Hawaii-based F-22 Raptor flies over the Arabian Sea during a mission for Operation Inherent Resolve. The F-22 is a candidate for manned/unmanned pairing with autonomous wingman aircraft.

The “First Offset” was relying on nuclear weapons in the 1950s to address the Soviet numerical advantage.

Deputy Defense Secretary Robert O. Work coined the term “Third Offset” last year.

Emblematic of USAF’s effort to lead the new technology push will be the B-21 bomber, previously called the Long-Range Strike Bomber. James revealed the aircraft’s designation—which she chose to evoke the notion of a “21st century” system—as well as an “altered” artist’s conception.

The image strongly resembles the earliest publicly released picture of the B-2 bomber, unveiled in 1988. Like the B-2, the B-21 is a flying wing, but one with flatter, more angular air intakes than the B-2’s rounded, scalloped intakes. The cockpit is positioned similarly to that on the

B-2, and the aircraft’s overall shape is a winged diamond—similar to the B-2 but lacking two of its “sawtooth” trailing edges. The exhaust area was not depicted, and it’s not possible from the image to determine the aircraft’s size or true wing angle of sweep.

Along with USAF’s other fifth generation platforms, the F-22 and F-35, the B-21 “will give our country a networked sensor-shooter capability enabling us to hold targets at risk in a way the world—and our adversaries—have never, ever seen,” James said.

She declined to provide any further details, telling reporters that the aircraft remains classified and that withholding some program and visual information “is all part and parcel of protecting the critical capabilities of the aircraft.”

James said the B-21 program’s unique organization suggests how other new high-tech projects may advance. The B-21 has been managed from the outset by USAF’s Rapid Capabilities Office, which so far has no analogy among the other services. The small, secret RCO has been working “hand in hand with the Life Cycle Management Center” to create an open architecture for the bomber that will not only closely manage operating costs but frequently insert new technologies, keeping the B-21 ahead of world anti-access, area-denial systems, she said.

Work has outlined five “building blocks” for the Third Offset, James explained. They are: “autonomous learning systems,” which are machines that can learn and adapt over time; “human-machine collaborations,” wherein machines help humans process vast amounts of information, as the F-35’s helmet does; “assisted human operations,” translated by James as “wearable technology,” such as lightweight sensors and communications gear for battlefield airmen; “human-machine combat teaming,” where a manned system, such as an aircraft, would partner with an unmanned platform that would provide sensor information, communications, or extra munitions; and “network-enabled semi-autonomous technology.” James said this fifth building block would allow weapons to communicate

with each other to find targets if the communications or sensor links to the launching aircraft are lost.

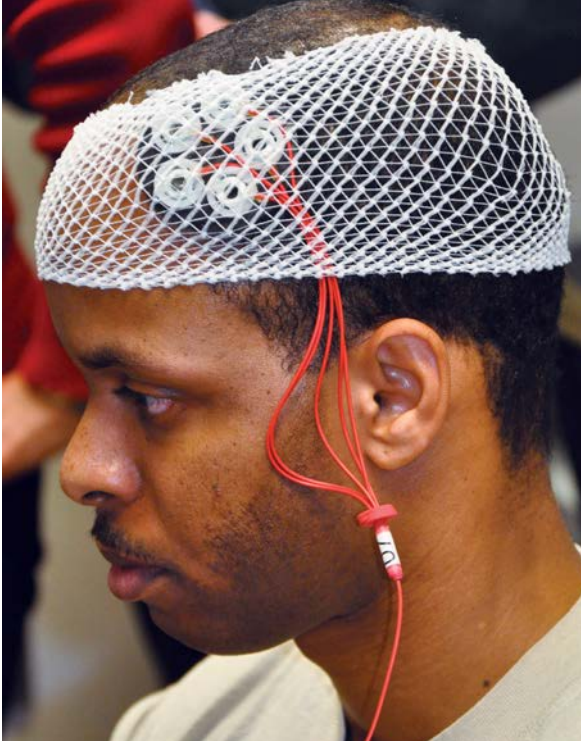
Just before the Fiscal 2017 budget was rolled out, Defense Secretary Ashton B. Carter gave a speech in which he said the US military might look to “arsenal planes” as one way to marry legacy technologies—existing aircraft—with large magazines of long-range, stealthy standoff munitions.

“Let’s say we had something stealthy that was unmanned, that carried 16 missiles and was semi-autonomous,” said Air Combat Command boss Gen. Herbert J. “Hawk” Carlisle. It would be able to penetrate “with the Raptor” and use the F-22’s sensors “through a ‘combat cloud’” network to select targets and shoot at them. The F-22 pilot could first expend all the escort’s weapons and then remain in the battlespace with a full internal combat load, he explained. The effort has been referred to as “loyal wingman.”

Such “manned/unmanned pairing” concepts are being explored by “national labs—Lawrence Livermore [and] MIT Lincoln Lab”—and Air Force Research Lab, in conjunction with ACC, Carlisle said.

James told reporters that “there has been no decision per se on the type of aircraft that would become” the arsenal plane, but it’s an example of “some of the creative thinking” going into Third Offset strategies. Welsh added that a case could be made for arsenal plane-like platforms “in near-space ... [or] behind the battle lines. ... It just depends on what you’re trying to do.” Whether it becomes a “Coke machine” that dispenses the type of munition requested at will remains to be seen.

Carlisle said numbers have become almost as important as high technology in air combat, and arsenal planes might help restore some of USAF’s lost numerical capacity. He also said ACC is working with technologists on miniature munitions with the same or greater “range and kill capacity” as today’s munitions, so that more could be carried internally on stealth fighters. Because of improvements in adversary aircraft, the probability of a kill with today’s AMRAAM requires



SSgt. William Raydon receives mild electronic brain stimulation as part of a study performed by AFRL, while Andy McKinley monitors the progress of the experiment. Stimulating targeted areas of the brain can improve visual targeting and attention span, lessen the effects of fatigue, and improve energy levels and mood.



that pilots take two shots to be sure of destroying an enemy, “so that, by definition, cuts your payload in half,” Carlisle noted.

GET HYPER

One likely payload for a large arsenal plane would be hypersonic missiles. The Air Force has touted hypersonics as one of the transformative technologies that will propel the service into the future. The technology offers very high-speed and long-range strike capabilities that are hard to defend against. Such missiles could restore the relevance of some older platforms that increasingly must operate well outside enemy air defense regions.

Hypersonics may not be getting the necessary level of support, though, according to Mark J. Lewis, head of the Institute for Defense Analyses’ Science and Technology Policy Institute. A former chief scientist of the Air Force, Lewis said funding for hypersonics is relatively small given the potential payoff. The X-51 Waverider project, he said, was a huge success but wasn’t properly followed up, and additional test flights could

have dramatically advanced hypersonics knowledge at a comparatively low cost. “Something we didn’t do,” he observed, was to “take that configuration and keep building on it.”

Air Force Global Strike Command chief Gen. Robin Rand reported he would present an updated Bomber Roadmap to Welsh in March. It would, for the first time, take into account the new B-21 bomber—now that the contract has been awarded and the protest resolved—as well as other projects like the Long-Range Standoff Missile, or LRSO. The plan will refine “where we want to be in 2025 and out,” he told reporters. Rand would not say whether the LRSO is planned to be hypersonic—there have been suggestions that it will be—but did say that he doesn’t think the B-21 will be “additive” to the bomber fleet.

“As we get closer” to fielding the B-21, he said, USAF will decide “if we’re going to do further modernization on the B-1, the B-2, and B-52.” If the decision is to keep all of them, efforts will have to be made now to ensure there will be enough aircrews and maintainers for them, but he believes it would be “very difficult” to afford yet another logistics train. Phasing out some existing bombers

to make room for new ones will have to be done “very, very prudently” to make sure combat commanders have the combat capability they need while the B-21 matures, Rand said.

Welsh told reporters the Bomber Roadmap is a “living document” that is routinely updated and shouldn’t be viewed as a new initiative.

While Global Strike commanders have made a heavy push for re-engining the B-52 in recent years, “we haven’t figured out a way to put it in the budget,” said Air Force Materiel Command chief Gen. Ellen M. Pawlikowski.

A re-engining would extend the B-52’s range, improve its speed to altitude, and sharply reduce maintenance costs, but the projected savings would take too long to pay back the initial investment, Pawlikowski said. Likewise, “a number” of novel and “third party” financing schemes were looked at, but “the business case wouldn’t close” on any of them, she said. The precipitous drop in the price of fuel was not the only reason the idea didn’t pan out.

Re-engining, though, is definitely on the mind of Air Mobility Command chief Gen. Carlton D. Everhart II, who is looking at such programs for his C-17 and C-130 fleets.



Boeing photo

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

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

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

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

The Air Force has struggled for years with how to pay for new F-35s while simultaneously upgrading existing fourth generation fighters. Carlisle said 1,763 stealthy F-35s remains “the right number,” but F-16s “are going to be around a long time” and will need an upgrade. The F-16 was to

get an omnibus improvement called the Combat Avionics Programmed Extension Suite (CAPES), but only pieces of it are still in the budget. Some 52 aircraft will get an active electronically scanned array (AESA) radar to meet an “urgent operation need” from US Northern Command to meet air defense requirements, but “there are more things that I’d like to do” to the venerable Falcon, he said.

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

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

Information System (ALIS) and the Generation III helmet.

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

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

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

STRATEGIC DETERRENT

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

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

“I think we’re making progress; we’re not there, yet,” she said. ★