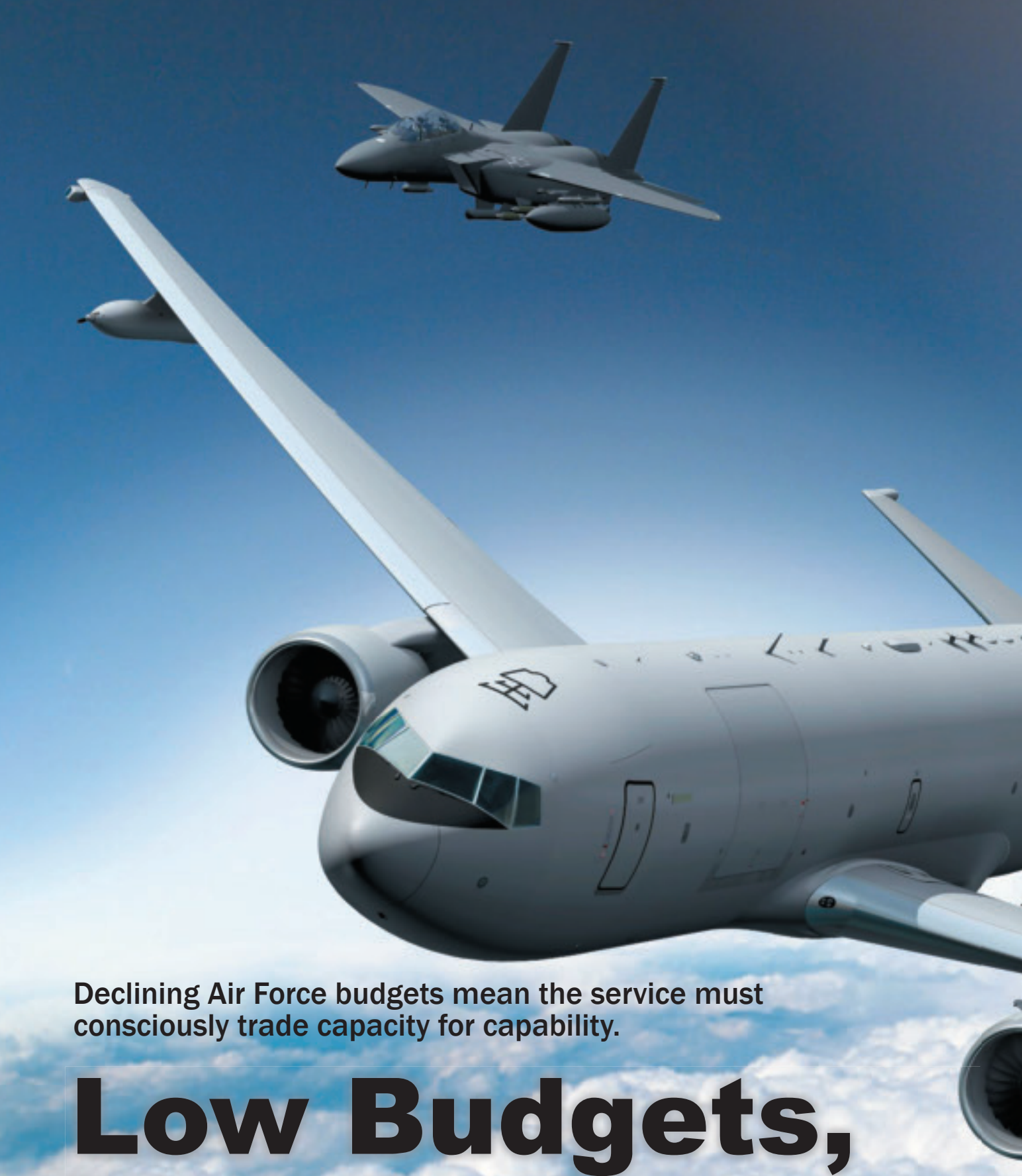
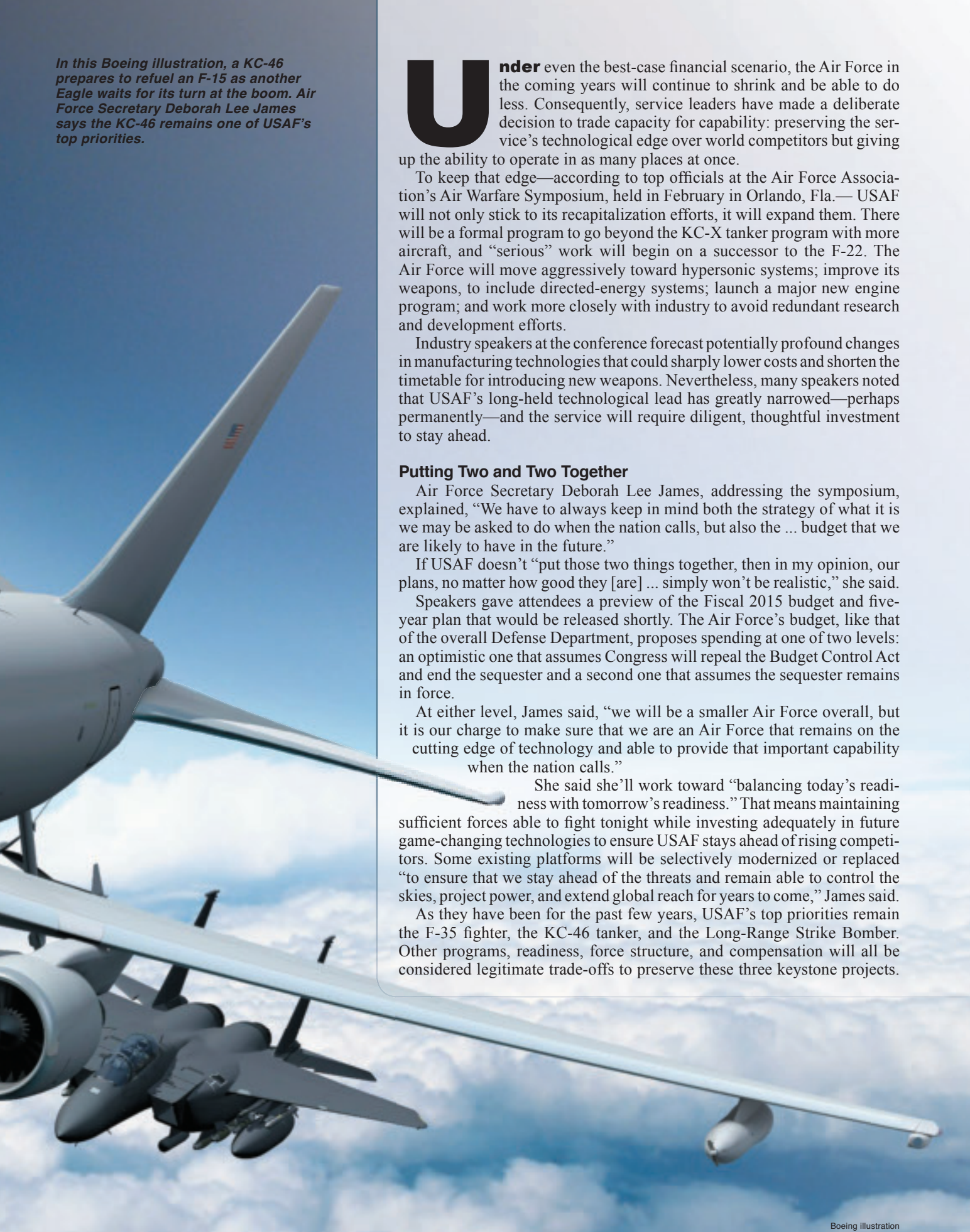


Declining Air Force budgets mean the service must consciously trade capacity for capability.

Low Budgets, High Technology

By John A. Tirpak, Executive Editor



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

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

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

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

Putting Two and Two Together

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

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

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

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

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

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

Boeing illustration

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

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

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

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

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

In parallel, USAF will create a 20-year strategy that will coalesce the various portfolio roadmaps, Welsh said, into "a single Air Force master plan."

Teething Problems

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

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

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

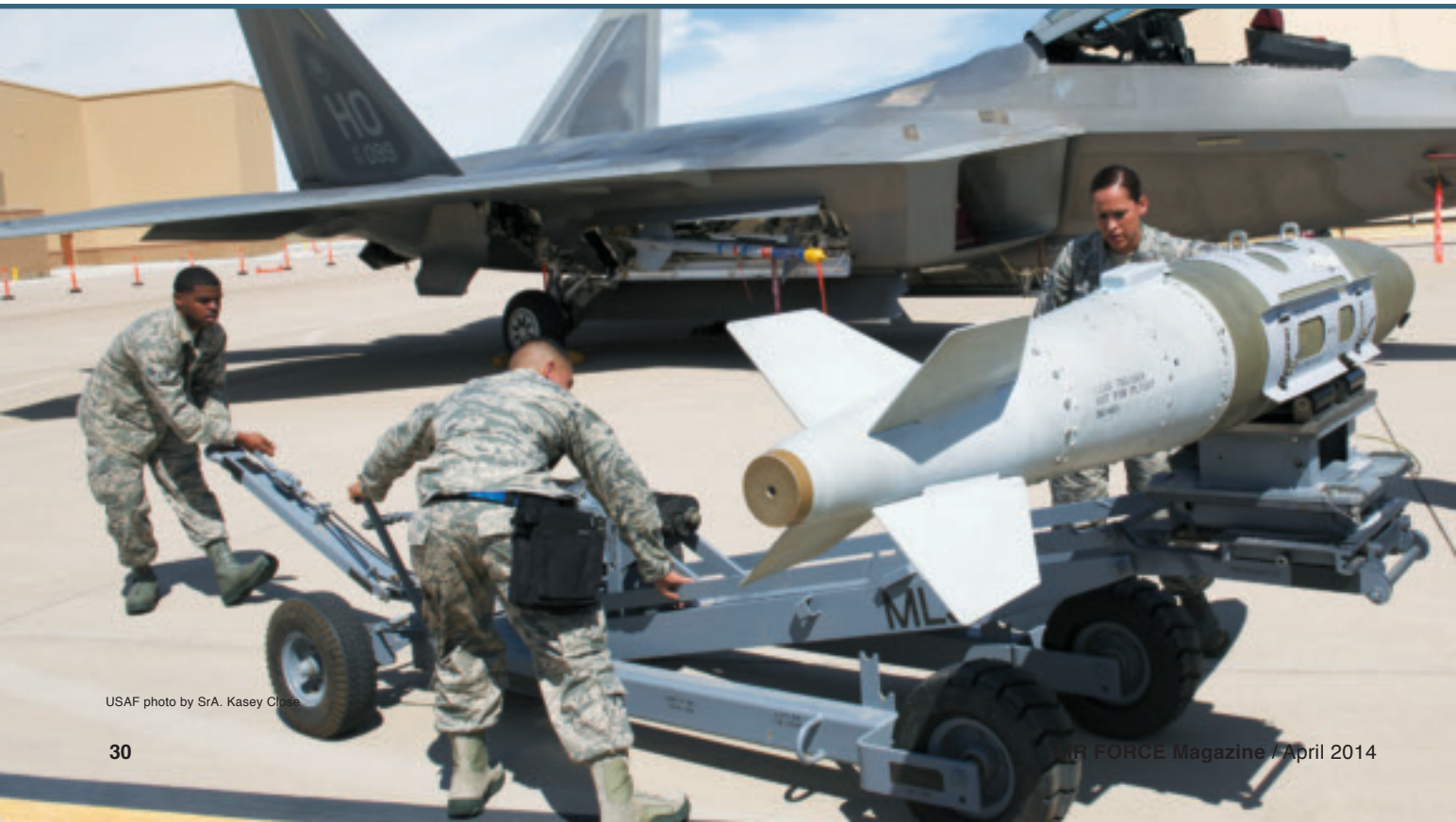
"The F-22 buy was truncated," Welsh said. "Good or bad, it doesn't matter at this point," but "we don't have enough F-22s to provide air superiority for a theater's worth of conflict." Therefore, the F-35 will have to fulfill some of the air superiority mission "before it goes and does the things it was supposed to be designed to do. It's just the way it is."

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

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

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

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



USAF photo by SrA. Kasey Close

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

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

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

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

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

He added, "And folks, it's time to start working on a sixth [generation] fighter. Nobody wants to hear that, but it's time. ... We've got to think and talk about it right now."

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

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

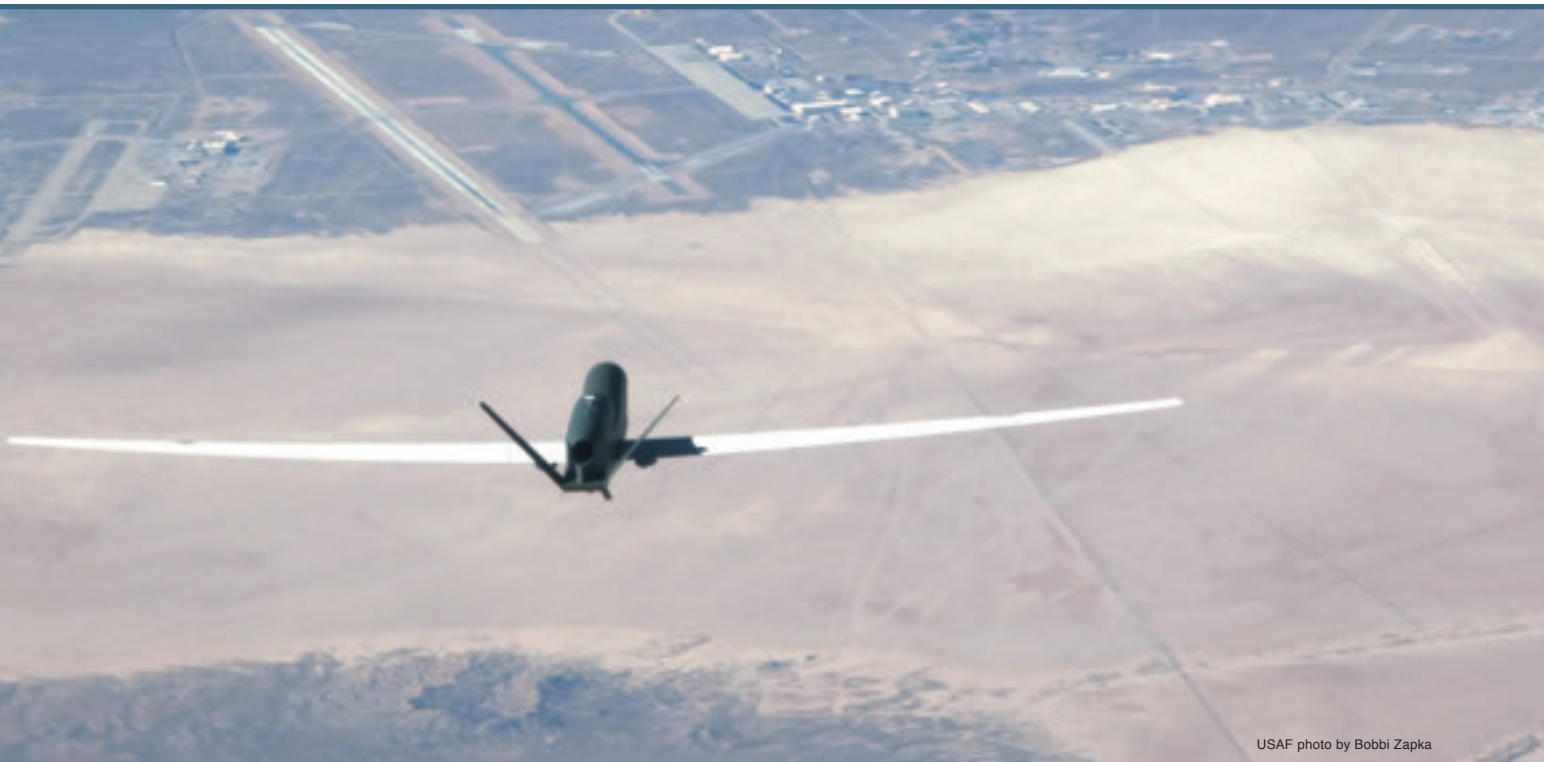
The Air Force is "standing strong" on the absolute need to start recapitalizing its aging bomber fleet with the Long-Range Strike Bomber, he said. "We have to have that capability. We need to deliver it in the mid-2020s." Welsh later told reporters that he is the only person authorized to alter the LRS-B's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

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

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

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

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



USAF photo by Bobbi Zapka

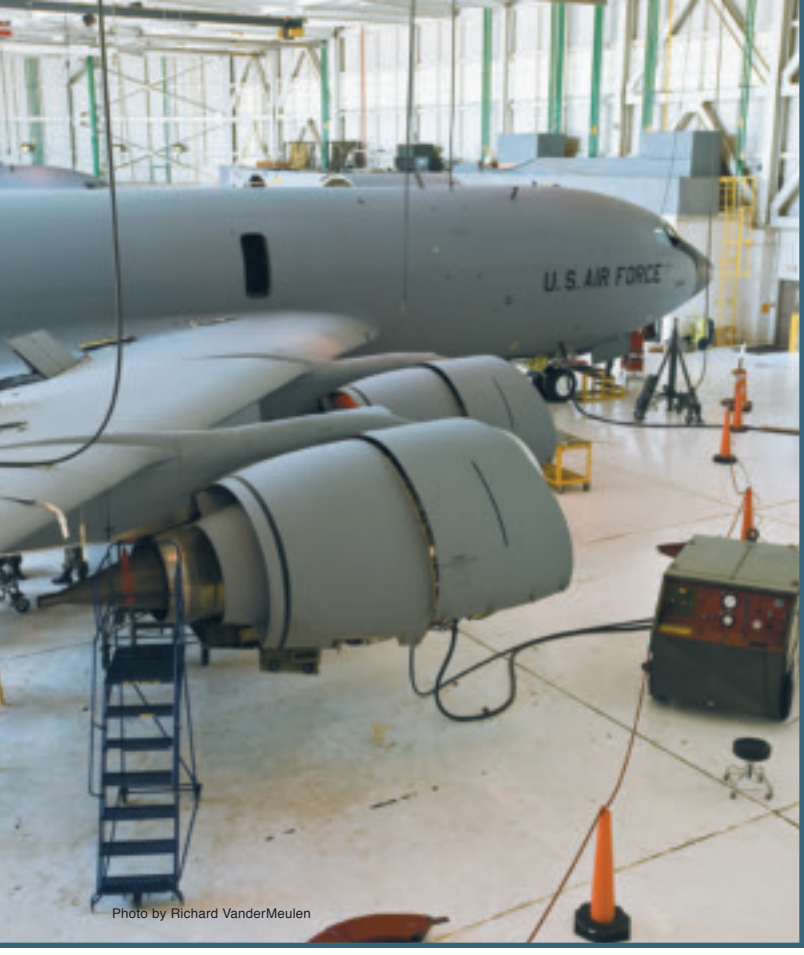


Photo by Richard VanderMeulen


Illustration by Erik Simonsen

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

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

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

"S&T funding is absolutely essential to a service that prides itself on being fueled by innovation. It was born of technology and must stay ahead of the technological curve," Welsh said in the press conference. "So we have got to pay a lot of attention to S&T."

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

Swarm Operations

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

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

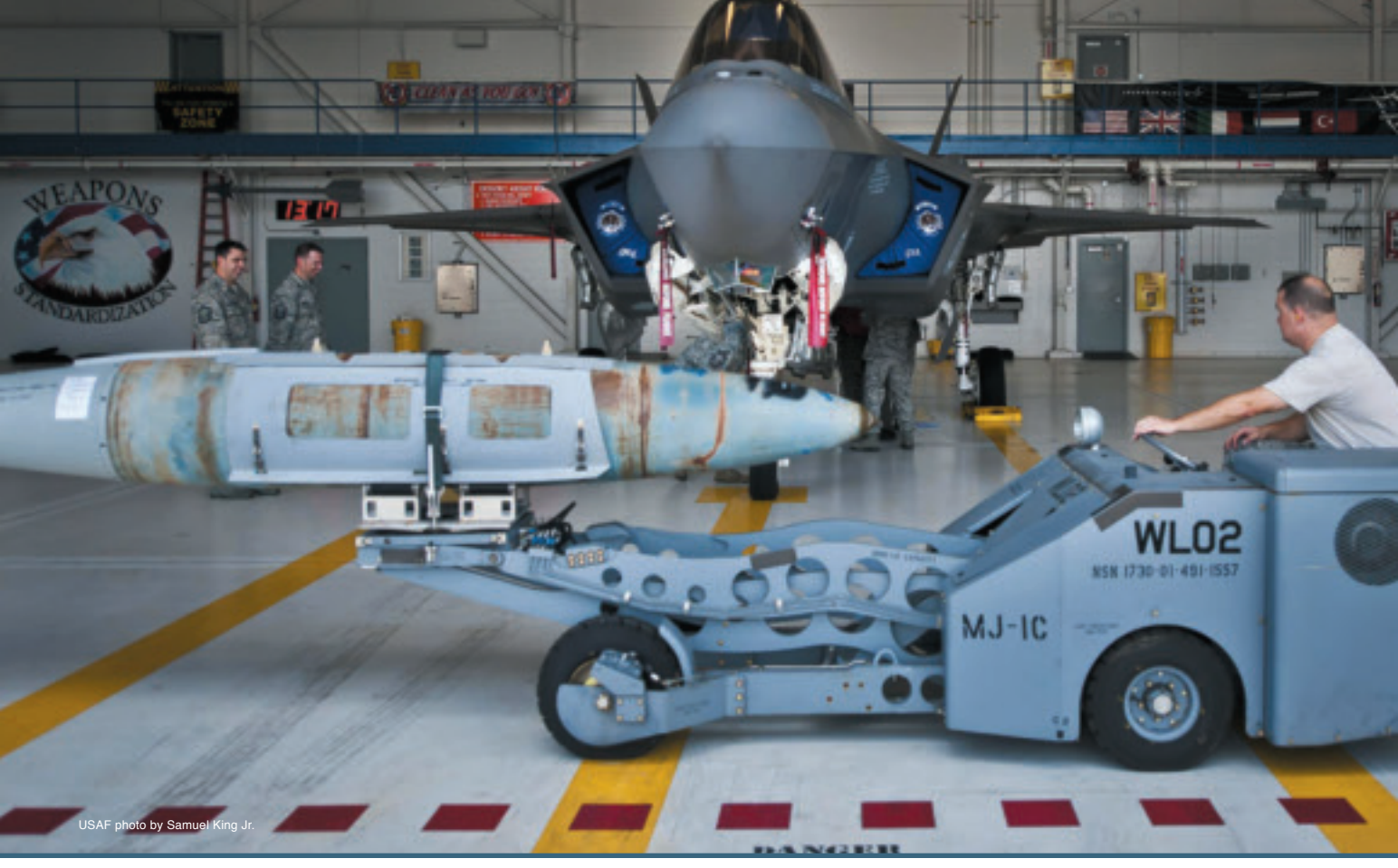
Speaking during a panel discussing the "Revolution in Modern Weapons," Christopher J. Bowie, director of Northrop Grumman's Analysis Center, said "additive" manufacturing—better known as "3-D printing"—could "completely disrupt and enhance the manufacturing economy." He noted that Boeing is already using 3-D printing of parts and is flying some 200 of them on 11 types of aircraft. Northrop Grumman is doing 3-D printing of parts using titanium—not just plastic.

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

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

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

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



USAF photo by Samuel King Jr.

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

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

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

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

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

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

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

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

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

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

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