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Finally, after years of study, controversy, changes of course, and shifts of timetables, plans for a new Air Force long-range strike aircraft—a bomber—have come into focus. The goal: Have a powerful new system on the ramp and operational no later than the year 2018.

The plan was endorsed earlier this year as part of the Pentagon's latest Quadrennial Defense Review. The new schedule is ambitious, and the Air Force already has launched a full-speed development effort to meet it. Officials say the deadline leaves the service with no time for delay.

The precise system that will emerge from the development effort is not known or knowable. Air Force leaders say it could be manned, unmanned, or "optionally manned."

The "2018 bomber" is but one part—the middle part—of a much broader long-range strike modernization program.

First comes the strengthening of existing aircraft. The Air Force will continue to fly many of its B-1, B-2, and B-52 bombers for decades to come, as each platform offers a unique set of strike capabilities. Planned improvements should keep these aircraft combat-ready into the 2030s.

Last will be the fielding, around 2035, of a true "next generation" long-range strike weapon. This may be a traditional bomber or an exotic "system of systems," with features such as hypersonic speed.

The QDR codified Air Force plans that had shifted several times in recent years. In 1999, USAF released a controversial "bomber roadmap" that put off fielding a new LRS system until 2037. (See "The Bomber Roadmap," June 1999, p. 30.)

In 2004, the Air Force abandoned this plan and advocated a multiphase approach. The goal was to field an advanced new bomber sometime between

2018 Bomber Its Friends

USAF is pushing a three-phase bomber plan, but the next new bomber is the centerpiece.

By Adam J. Hebert, Senior Editor



2025 and 2030. This futuristic system was to be supplemented by an “interim” system with a fielding date between 2015 and 2018. (See “Long-Range Strike in a Hurry,” November 2004, p. 26.)

The Air Force in 2004 sent out a request for information to industry, seeking to learn what would be possible.

“Interim” No More

Two years later, what is needed from the medium- and long-term LRS programs is better defined, as are the target dates. And what was once considered an “interim” system is now expected to fill a major mission gap.

Unlike any of today’s bombers, the 2018 aircraft should be able to operate for extended periods in hostile airspace, day or night. This aircraft will help the Air Force meet QDR goals that call for “increasing [USAF] long-range strike capabilities by 50 percent and the penetrating component ... by a factor of five by 2025.”

Why the new urgency? There was a “congruence of a few different elements” that led to the 2018 date, reports Maj. Gen. David M. Edgington, director of global power programs in the Air Force acquisition office. He said that the QDR validated 2018 as the target

date partly based on “the intelligence estimates coming on board” concerning likely future threats.

“We have requirements from the combatant commanders, which we fully embrace and intend to meet, and a changing threat environment,” Edgington said.

“The one key thing” needed in the new bomber is “to be able to strike targets in near-real time,” said Edgington. This requires “persistent presence over the battlefield.”

The current bomber fleet lacks survivability, especially during daylight hours, he noted. USAF has only 16

Bomber Upgrades Are Meeting Urgent Needs

Although much of the Air Force's future long-range strike efforts are focused on developing capabilities that will be fielded 12 or more years in the future, some new capabilities have been quickly put into service aboard today's bombers.

In response to "urgent need requests" from US Central Command, 500-pound Joint Direct Attack Munitions were recently rushed into service for the bomber fleet, said Col. Roy Cleland of the Air Force's global power acquisition office.

Similarly, based on lessons learned in Operation Enduring Freedom, there was a request to integrate advanced line-of-sight targeting pods on the B-52.

The B-52 required "buddy lasing" to attack with laser guided bombs, but targeting pods enable the bomber to lase its own targets, also improving battle damage assessment. The Litening II pod was found most suitable for the task.

Existing AGM-142 Have Nap interfaces were used with the Litening pods, and qualification took about a month. The first B-52s had their Litening pods installed in early 2004.

"Rapid acquisition and integration efforts" such as these help maximize the utility of the bombers by meeting those "quick needs," Cleland said.

combat-coded B-2 stealth bombers, and they are designed to attack at night. These systems may be "invisible" to radars and other sensors, but they are readily visible to the human eye.

"Any of the three [existing bombers] ... has the range to be persistent today, but you can't persist, day and night, in an anti-access type environment," noted Col. Roy Cleland, chief of the power projection division in AQ's global power directorate.

Future threats are driving the program, but there is also a recapitalization angle. The youngest Air Force B-52s already are 44 years old and are planned to remain in service for decades more. The B-1s were built during the Reagan Administration.

As these aircraft continue to age, they may unexpectedly break. USAF is already dealing with a wide range of obsolescence issues—many parts are no longer being made.

Further, the Congressional Budget Office estimated that aircraft operation and maintenance costs increase by an average of two percent for every year their average age increases. "For the Air Force, those figures could translate into an increase of \$80 million to \$230 million" in annual O&M costs, CBO wrote in 2001.

Enough Study, Already

More than 20 long-range strike studies have been conducted in recent years. In 2004, Maj. Gen. Stephen M. Goldfein, who was then USAF's requirements director on the Air Staff, said "it became clear that enough studying had probably been done," and it was time to move forward on a new LRS system.

The profusion of studies identified several "desired capabilities" for the

2018 platform, spanning from the obvious (long range) to the surprising (self-defending).

Some of the features considered desirable are: flexible payload, to include precision and nuclear weapons; high survivability through defensive systems and stealth; global situational awareness; and the ability to operate autonomously.

"Self-defending" is a desire for the bomber to "have as much of an autonomous survivability capability as [is] practical, against a wide range of advanced threats," an Air Force spokeswoman explained. For example, an LRS aircraft carrying air-to-air missiles has "enhanced survivability" against enemy fighters.

The bomber will rely on technology considered mature enough to be fielded in 2018. The Air Force is looking for

capabilities that will be at Technology Readiness Level 6 by January 2009. TRL 6 means a system model or prototype has been demonstrated in a relevant environment, while January 2009 is when the program is expected to have its Milestone B approval—the official Pentagon go-ahead for system development.

Variable geometry (swing wings) and supersonic dash capability are possibilities for the new system. Stealthy low observable characteristics are a must.

Unmanned operation is an intriguing possibility. There are benefits to removing the aircrew, but "I think it would be a showstopper for the Air Force if we cannot prove refueling capability" of an unmanned bomber, Edgington said, because gaining the required range and loiter time requires refueling. Nonetheless, even though this capability is still unproved, "we might be able to clear that [hurdle], so the manned-unmanned piece, or, quite frankly, optionally manned, is something we are excited about."

The schedule seems viable if the Air Force pursues a full "mil-power" acquisition effort, Edgington said in an interview. There is nothing "magic" about the date, but the QDR and Gen. T. Michael Moseley, Chief of Staff, have "endorsed 2018 as the mark."

USAF needs to "commit to a path ahead," Edgington said, and Air Combat Command is in the midst of an analysis of alternatives that will determine what is possible by 2018.



A B-1B releases flares and ordnance. The Air Force has a wide range of modernization programs on the books for its three existing bombers, many of which could still be in service long after a new long-range system is fielded in 2018.

Photo by Richard VanderMeulen



This B-52 is one of 94 still in USAF's inventory. The Air Force wants to trim its B-52 fleet to 56, making it more economical. Congress has resisted such moves in the past.

The study will, in March 2007, recommend the best alternative for providing the long-range strike capability, said Lt. Col. Kevin Shorb, AOA director at Langley AFB, Va. What is needed is a “responsive, high volume, long-range aircraft,” Shorb said, and the AOA will make specific recommendations.

Lt. Col. Tony Siler, chief of ACC’s ground dominance team, added that although the current bombers are very capable, future battlefields will be “more hostile.” The AOA is also evaluating various weapons improvements and upgrades that could trickle down to the legacy bombers.

The Coming Lockdown

The acquisition community is waiting for the results of the AOA, Edgington said, and “we’re going to have to have very rapid progress” once the study is complete. “That means locking down some requirements and being able to go out to industry with ... the request for proposal” later in 2007.

There is certainly no shortage of options. Another CBO report, released this March, evaluated several LRS alternatives and found tremendous variance in cost and capability.

- Converting C-17s into missile-carrying “arsenal aircraft” is a cost-effective way to increase LRS capabilities, but the mother ships themselves would be slow and vulnerable.

- A long-range supersonic bomber is appealing, but CBO estimates a notional program of 150 aircraft would

cost \$912 million per aircraft—more than double any of the other alternatives.

- A 150-aircraft fleet of subsonic bombers is estimated to cost \$409 million each, but would offer capability similar to the arsenal aircraft and the existing B-2. A benefit of this approach, however, is that it would promise better access in high-threat areas and during daylight hours.

CBO also evaluated possible medium-range bombers, such as the FB-22, and found them much less expensive than the LRS alternatives. Their shorter range, however, means that “medium-range bombers alone could not replace all of the capabilities of heavy bombers.”

A decision needs to be made, and the clock is ticking. John J. Young Jr., director of defense research and engineering, recently told reporters that waiting to formulate requirements for the bomber could push developmental funding out of the 2008 budget request and essentially delay the program by a year. Coming forward with some basic requirements now could smooth funding—and development—he said.

The Air Force is fully aware of the schedule crunch. The program is going to have to stay on “an extremely aggressive schedule” through the AOA, the system design and development phase, and the test program, said Edgington. It will require that “all key decision points are met on time. ... We are rapidly approaching the point where we’ve got to have information

to make budgeting decisions and some commitments.”

The Air Force has been in constant contact with Boeing, Lockheed Martin, and Northrop Grumman. “The three major aircraft manufacturers that we deal with all the time are all exploring the new concepts,” Edgington said. Information from the contractors in response to the 2004 RFI continues to come in.

The Air Force plans on spending at least \$1.6 billion through 2011 to begin developing the next generation bomber.

Fewer, but Better

In 2001, the Air Force proposed retiring a portion of the B-1B fleet and necking down Lancer operations from five bases to two, all to help pay for improvements to the remaining B-1s. After much back and forth with Congress, the fleet was reduced from 93 B-1s to today’s inventory of 67.

The Air Force would like to use a similar approach with the B-52. The QDR weighed in on this issue as well, saying DOD plans to “reduce the B-52 force to 56 aircraft and use savings to fully modernize B-52s, B-1s, and B-2s to support global strike operations.”

The Air Force’s assessment is that the 56 B-52s are “adequate to meet the combatant commanders’ needs,” Edgington said. The issue had not been resolved in August, but if approved by Congress, the drawdown would take place over two years. The first 18 B-52s would be retired in 2007, the other 20 in 2008.

Smaller but similar reductions have been proposed many times in the past. Since 1997, the Air Force has annually tried to retire 17 B-52s. Congress blocks the move every year, adding funding to keep a larger fleet of attrition reserve aircraft. Of the 94 BUFFs, only 44 are combat coded and one is on permanent loan to NASA.

There are “alternate interpretations or understandings of the combat capability that the B-52 brings. It’s a viable weapons system,” Edgington said, describing the debate. “Well, the more the better is one interpretation, ... but we’ve got combatant commander requirements that say ‘this is the number of targets we need to strike ... and this is the survivability you need.’”

The Air Force can meet the military requirements with 56 B-52s, Edgington said, but Congress is highly reluctant

to draw down the fleet with no other bombers in or near production. Retiring the 38 aircraft would save taxpayers \$680 million through 2011.

The current long-range strike inventory has a full slate of modifications and improvements in the budget, and each of the three existing bombers offers something unique.

The venerable B-52 carries the largest variety of weapons, including various cruise missiles, and offers the highest reliability of the three bomber types. The B-1 can perform high-speed, low-level attacks and, with three weapons bays, can attack with the heaviest and most flexible weapons payload. The stealthy B-2 is capable of taking out the most heavily defended targets with precision weapons, 5,000-pound bunker busters, or nuclear bombs.

These aircraft remain busy, regularly deploying to provide global combat power over Afghanistan, Iraq, and in deployments to Guam in the western Pacific Ocean.

Still Spry

Despite their advancing age and some parts obsolescence issues, the bomber fleet remains healthy. "I think we've invested in the right areas, and all those areas are funded to avoid grounding-type scenarios," said Edgington.

The B-52H, more than 40 years old, is barely halfway through its estimated lifespan. The average B-52 has approximately 16,000 flying hours, and "the aircraft is good to over 28,000 hours, so we're only over half of what



Photo by Clive Bennett

The Air Force has 67 B-1Bs such as this one from the 28th Bomb Squadron, Dyess AFB, Tex. B-1B reliability and combat performance has improved since a decision to reduce fleet size and fully fund B-1 modernization programs.

we could potentially milk out of that airplane," the two-star said.

The B-1, meanwhile, is "only a third of the way through what we consider to be its lifetime, and the B-2 is still a toddler, in terms of overall life."

The Air Force "can't make a B-52 stealthy, but you can keep it viable," Edgington observed.

For the B-52, ongoing modifications focus on resolving some "electronic countermeasures [ECM] issues" in the ALQ-172 ECM system, Edgington said. "We're seeing parts obsolescence issues in the spares, so we're replacing those." The modifications will come through 2007, and the improvement program is expected to decrease ECM failures sixfold.

B-52 avionics also need work. Some navigation system spare parts will run out next year, so the Avionics Midlife Improvement program is replacing the inertial navigation system, aircraft computers, and data transfer unit. Work continues through 2008.

The Air Force is also improving the BUFF's firepower with new weapons and connectivity. An updated weapons interface unit will solve yet another parts obsolescence issue.

Longer term, the Combat Network Communications Technology (CONNECT) program will enable rapid re-tasking of advanced weapons and cruise missiles, add extremely high frequency satellite communications, and modify the Link 16 data link. CONECT will not be complete until 2018.

The B-1 suffered from numerous developmental and reliability problems in 2001, when the decision was made to shrink and reinvest in the fleet. Although the bomber has redeemed itself in recent operations, there are still several potential grounding items that the Air Force is working to fix.

"There's one issue on the radar that's been our primary focus—changing out some of the obsolescent parts and finding the right spares," Edgington said. The radar component upgrade will be complete in 2013 and will replace obsolete parts and enable additional upgrades.

The B-1's onboard diagnostics computer, which maintenance personnel rely on to know what needs to be fixed, is being updated.

The inertial navigation system is another potential grounding item, and



USAF photo by SSgt. Bennie J. Davis III

The stealthy B-2 would perform "Day 1" wartime missions. Each B-2 (such as this one deployed to Andersen AFB, Guam) is a precious asset.

a replacement ring laser gyroscope system with embedded GPS will improve navigation accuracy and reliability. The navigation system modification will be complete by 2011.

Not all the work being done on the B-1 is to mitigate problems. A fully integrated data link will be in place by 2016, adding Link 16 and beyond line-of-sight communication to the bomber. This will automate weapons retargeting by passing target data directly to onboard weapons.

This targeting capability will speed up the B-1's targeting flexibility. "J-series" weapons can be retargeted in flight today, Cleland noted, but this is done by the time-consuming "fat finger" method—an operator manually punches in new coordinates for each individual weapon.

The B-1 is also the threshold weapons system for the extended range Joint Air-to-Surface Standoff Missile, a 500-mile range variant of the stealthy JASSM cruise missile. The Air Force is "very excited to get JASSM-ER on the platforms that don't have stealth," said Edgington.

How Stealthy Is Stealth?

As the only LO bomber, the B-2 has a unique difficulty—simply staying mission capable. "With any stealth platform, you're going to have some challenges," said Edgington. The B-2's inability to meet mission capability goals has been driven by "high requirements for LO maintenance." Simply taking off and "having an airworthy platform that can go drop bombs is not mission capable for an LO platform," he said.

A B-2 is not considered mission capable unless it can meet "Day 1 of the war" requirements, where the B-2 is "absolutely critical to take down strategic systems or the eyes and ears of the enemy. You're going to have to have a pristine, perfect LO platform."

USAF may not need that same degree of stealthiness later in a campaign, after enemy defenses have been ground down, but the Air Force measures "solely to a mission capable rate," Edgington said. The fleet posted a 30.5 percent MC rate in 2005.

The Alternate High Frequency Material program is attacking the root cause of the low MC rates—the extensive maintenance and "cure times" for the B-2's stealth coatings. Any time a B-2 access panel is opened, it must be resealed. For most B-2s, this requires tape and caulk that can take 20 hours to cure. AHFM



Artist's conception by Erik Simonsen

USAF plans to field a true next generation long-range strike weapon (seen here in an artist's conception) in 2035. The "exotic" bomber may be a traditional bomber or a system of systems with capabilities such as hypersonic speed.

is replacing 3,000 feet of tape and caulk with a "spray on" stealth coating that dries in less than an hour.

Although only five AHFM bombers had been delivered to Whiteman AFB, Mo., by August, the Air Force reports that those aircraft require 64 percent fewer LO maintenance man-hours per flying hour.

This represents "a whole generational leap in LO technologies," Edgington said. AHFM "probably increases [by] eight to 12 percent" the B-2 mission capable rates, as those jet aircraft spend much less time sitting and curing in non-MC status.

"The most capable aircraft" are available to the combatant commander at all times, Edgington added.

The B-2s are being converted to AHFM coatings as they go through depot maintenance at Northrop Grumman's Palmdale, Calif., facility, at a rate of three per year. The entire fleet will be converted by 2012.

Also in progress is a radar modernization that "is required for the B-2 because of some frequency conflicts that we've had," Edgington explained. By 2012, the B-2's radars will move off a frequency where they are secondary users and upgrade to an active electronically scanned array (AESA) system. The first test flight of the B-2's AESA radar took place this summer.

The stealth bombers have also recently completed installation of a smart bomb rack assembly that allows the aircraft to deliver 80 independently targetable 500-pound Joint Direct Attack Munitions.

Here to Eternity?

The B-1, B-2, and B-52 will be around for a long time. Previous service life estimates postulated that the B-1 airframes could remain in service until 2038; the B-2s until approximately 2040; and the B-52s until 2044. Even with a new bomber fielded in 2018, USAF's inventory of long-range strike assets could still suddenly drop off in about 30 years, making the third phase of LRS modernization important even today.

Although officials will not rule anything out, some capabilities are unlikely to reach TRL 6 in time to be used on the 2018 bomber. These developing technologies include hypersonic speed, wing morphing, exoatmospheric flight, and tactical directed energy weapons—lasers.

If a given technology is desirable but deemed too immature for fielding in 2018, "it kicks forward to the 2035 platform, which is still out there," said Cleland.

(Some desirable LRS improvements identified in the AOA could also be pushed into the "Phase I" modifications that are planned for the current fleet.)

The Air Force is therefore continuing the science and research efforts to develop revolutionary LRS capabilities. The service has budgeted \$275 million between Fiscal 2008 and 2011 to help develop advanced LRS technologies because a hypersonic bomber or exoatmospheric missile could have a major payoff in 30-some years. ■