Great Expectat

The 2018 bomber—stealthy and bristling with weapons—will be designed to "penetrate and persist."

By Adam J. Hebert, Executive Editor

Today's Air Force boasts a bulging portfolio of attack capabilities. However, when service leaders take a closer look at what's inside it, they find some deficiencies mixed up with the considerable strengths. Examples:

The stealthy B-2 bomber has long range and a big weapon-carrying capacity, but only fights at night and thus cannot prosecute critical daytime targets.

B-52s also offer range and payload but are extremely vulnerable to air defenses and must attack well-defended targets with missiles from a great distance, giving the enemy time to react.

The B-1B, though supersonic, lacks stealth or standoff weapons.

F-22 fighters can get to and destroy heavily defended targets in high-threat environments, but they can carry only two medium-size bombs and cannot strike unrefueled from long range.

What's missing, say officials, is an aircraft that can strike from a great distance, survive in a dangerous environment, carry a heavy bomb load, and operate effectively around the clock, in good weather or bad.

The new "2018 bomber" is supposed to be that aircraft.

Air Combat Command recently conducted an analysis of alternatives for such an aircraft, and the Air Force has decided which capabilities it will seek in its next generation long-range strike system. The study evaluated "midterm" requirements, the state of technology, and the need to have a fully operational aircraft on the ramp in 2018.

The results were, in some cases, quite surprising.

"Our analysis shows that the best value, and the one that meets the requirement that we see in ... the 2018 time frame, would in fact be for a new-concept bomber," said Maj. Gen. Mark T. Matthews, head of ACC plans and programs.

The term "new-concept bomber" immediately conjures up the notion of a "B-3"-type system, which would rule out reopening the cold B-2 production line, creating a cargo-airplane-based "arsenal aircraft," or modifying B-1s with new avionics and more powerful engines.

Matthews had another declaration. "Our belief is that the bomber should be manned," he said at a May 1 Air Force Association-sponsored event in Washington, D.C. There had been considerable speculation in recent years that the next long-range strike system might be unmanned or optionally manned.

While taking the pilot out of the

The 2018 bomber is meant to be long-range, stealthy, nimble, and lethal. At left is a Northrop Grumman illustration of the notional aircraft.

cockpit is a possibility for the future, he said, the aircraft that goes operational in 2018 definitely will have a pilot on board.

As Matthews tells it, an airman in the cockpit can respond to adaptable enemies hiding in the fog of war, better integrate the onboard systems, and make spot decisions about when and how to launch weapons. "In the 2018 time frame, we haven't obviated yet the need to have [a] man in the cockpit," he said, "so that's going to be a large part of the requirement."

USAF officials expect the new bomber to have top-notch low-observable "stealth" characteristics. A key need is the ability to loiter in or near heavily defended airspace. B-1 bombers have been invaluable against targets in Iraq and Afghanistan, where they have operated as "roving linebackers" in the air, ready to deliver large weapons loads on short notice. Those two areas have benign air defense environments, however, which cannot be assumed in the future as advanced fighters and air defenses spread.

The next bomber must be able to get through air defense systems that would blunt attacks from today's B-1s and B-52s. In a nutshell, the need is to "penetrate and persist," said Maj. Gen. David E. Clary, ACC vice commander.

Advanced sensors and avionics are also expected. The aircraft will link up with future networks and must track and destroy targets that are on the move and difficult to detect.

The bomber will be subsonic, as are today's B-2 and B-52 aircraft. That puts an end to the question of whether a practical hypersonic jet aircraft could be built within the next decade. Even a B-1-style supersonic jet aircraft was deemed too expensive.

Variable Speed

The 2018 deadline was set by the 2006 Quadrennial Defense Review, and ACC's analysts weighed cost and capability trade-offs such as supersonic speed vs. subsonic speed. The requirements are based on "best effectiveness for the cost," said Lt. Col. Kevin Shorb, AOA director at Langley AFB, Va.

Marginal improvements at great cost are not necessarily desirable. Major defense contractors certainly have the ability to build a supersonic stealth bomber, but USAF leaders simply deemed the cost of doing so too high.

Matthews cited the explanation voiced by Gen. Ronald E. Keys, the ACC commander: If a hypersonic weapon "can get me to the target 40 percent faster, but the enemy is still gone by the time the weapon reaches it, why would I spend money on it? ... It's 100 percent ineffective."

Supersonic speed adds considerable complexity and cost to a design, and is not the be-all and end-all for strike aircraft. A case in point is the B-52, which first flew in 1952, has a top speed of 0.86 Mach, and remains a vital part of the nation's air fleet. In the meantime, the B-58 Hustler and FB-111—each capable of flying at twice the speed of sound—have come and gone.

"We anticipate the aircraft would have the capacity to ... carry in the range of [14,000] to 28,000 pounds of ordnance, and would have to have a range in excess of 2,000 miles," without refueling, said Matthews.

This next generation system may be in the medium-bomber class, as today's heavy bombers feature about twice the minimum range and double the weapons load as this proposal. The 2018 bomber's payload specs and minimum range are in the same class as the FB-111, today's F-15E Strike Eagle, and even the notional FB-22.

Matthews quickly noted, however, that "we haven't come to hard determinations of exactly what those numbers would be." The winning mix of weapons, aircraft performance, and sensors will reflect issues of cost and producibility.

USAF photo by SSgt. Jim Howard

An airman transports a AGM-86C cruise missile to a B-52 at RAF Fairford, Britain.

Photo by Richard VanderMeulen

One of USAF's 21 B-2 bombers takes off on a Red Flag 2007 mission. All 21 will receive a stealth coating upgrade, among other improvements.

In May, the proposed bomber requirements had been approved by the Air Force requirements council, but were awaiting blessing by the Joint Staff.

To be a real candidate, a particular technical capability needs to be at Technology Readiness Level 6 (meaning that a system model or a prototype has been demonstrated in a relevant environment) by 2009. The assumption is that the Air Force "can take where we are in 2009 and put it on the ramp in 2018," explained Clary.

The Air Force still has an interest in less-mature technologies such as hypersonic speed, but those kinds of advanced development efforts will be directed toward a follow-on system scheduled to appear around 2034, when the existing fleet of bombers may be on its last legs, structurally speaking.

The required number of aircraft was not studied in the analysis. Officials refused to speculate on the possible size of the inventory. The QDR, however, directed the Air Force to increase "long-range strike capabilities by 50 percent and the penetrating component ... by a factor of five by 2025."

A new system will be able to incorporate all the advances that have occurred since work began on the B-2 in the late 1970s and go beyond the upgrades that are being retrofitted onto today's bombers.

On the surface, the new requirements seem similar to what is in use today, but stealth technology has been around for more than three decades. In the interim, it has come a long way, most especially in its ease of maintenance.

The new bomber campaign marks something of a turnaround in USAF's thinking. Eight years ago, the Air Force determined that its existing bomber fleet could persevere for decades. The controversial 1999 bomber roadmap proposed delaying the start of a new acquisition program until 2019 and not fielding that bomber until 2037.

This would have greatly extended what airpower analyst Rebecca Grant now refers to as a "bomber gap." In a recent study for AFA's Eaker Institute, "Return of the Bomber," she argued that such a gap emerged in 1997 with delivery of the last of 21 B-2 bombers. She noted that, for 80 years, "from 1917 until 1997, America's airmen always had a bomber either in development, in design, or in test." But for a decade now, this has not been the case.

Retired Air Force Gen. Richard E. Hawley, former commander of US Air Forces in Europe and Air Combat Command, also expressed concern about the lag in bomber production. He noted at AFA's May 1 bomber forum that an old aircraft's ability to keep flying does not necessarily mean it will be effective in combat.

This distinction is significant, because the Air Force's most recent estimates are that the B-1 will remain structurally sound until 2038, the B-52 until 2044, and the B-2 until 2058. Therefore, if the Air Force waits for the existing bombers to fall apart, it will be waiting for a very long time.

But the Air Force has traditionally "not replaced airplanes because they started falling apart," Hawley noted. "We've replaced fleets ... because the environment in which they operate had changed and we needed a new capability."

Maj. Gen. David M. Edgington, now air component coordinator for the Multinational Force-Iraq, said that the 2006 QDR selected a target year of 2018 partly because of intelligence estimates about likely future threats.

The Air Force has stepped up the required fielding date for a next generation bomber several times since 1999 and now embraces a three-stage approach for bomber modernization.

The first stage features improvements to the existing fleet. The second stage features the platform to be fielded in 2018. In the third stage, USAF proposes to field a revolutionary system, using technology deemed too immature to count on by 2018.

This system may feature capabilities such as directed energy (lasers), advanced engine technology, or hypersonic speed.

The Air Force has a comprehensive upgrade program in place for each of the three existing bombers, which it considers Phase I of its long-range strike modernization program. For example, the B-2 wing at Whiteman AFB, Mo., now has eight jet aircraft that have received the Advanced High Frequency Materials (AHFM) upgrade, a significant LO enhancement over the original design. Three bombers get the modification per year, as they go through depot maintenance in Palmdale, Calif.

AHFM replaces the original tapes and caulks used to seal access panels and fasteners on the B-2 with a "spray on" coating that is applied much more quickly. The "cure time" before the bomber is ready to return to action is also much faster.

90-Minute Fix

Whiteman officials demonstrated the difference at a Red Flag exercise earlier this year. An AHFM-equipped B-2 needed a flight-control part replaced. Maintainers did so, and an hour-and-a-half later, the B-2 had "the same low observable signature it had prior to the repair," officials explained. A non-AHFM aircraft receiving the same repair would have been out of service for three days.

The B-2 is getting other sustainment and capability upgrades as well. The radar is a "secondary user" on its frequency, which can interfere with commercial users, and it will be replaced by a new active electronically scanned array. New weapons computers, nuclear-survivable

Selected Strike Options

	 MQ-9	 F-15E	 FB-22 (notional)	 B-3(notional)	 B-1B	 B-2	 B-52
Approx. Combat Radius	1,800 mi.	1,000 mi.	1,800 mi.	2,000+ mi.	4,000 mi.	3,500 mi.	4,400 mi.
Weapons Load	3,750 lbs	23,000 lbs	15,000 internal 30,000 total	14,000-28,000 internal	48,000 lbs	40,000 lbs	70,000 lbs
Top Speed	slow	Mach 2.5	supersonic	subsonic	supersonic	subsonic	subsonic
Stealth	No	No	Yes	Yes	No	Yes	No

communications, and low-maintenance windshields are also desired.

The B-1B has for years had a broad range of upgrades in the works, as it transitioned from a nuclear-only bomber to a conventional-only platform. But many of the advances the B-1 has gone through in recent years have been done in an ad-hoc manner instead of a coordinated fashion.

"It is time to gather up all these Rube Goldberg additions and integrate them" on the B-1, said Clary.

Modern glass cockpits will be more sustainable, and new data links will allow for dynamic retargeting faster and more accurately. A priority for the B-1 is to add targeting pods, which have already been used to great effect by B-52s. "A man standing out in a field next to a mud hut is not going to be seen on radar, but I can see that on a targeting pod," said Lt. Col. Craig Campbell, deputy chief of ACC's combat aircraft division.

In a B-1, "I can sit over Afghanistan for eight to 10 hours" and reach any point in the country in about 20 minutes, he noted. The Sniper targeting pods will become operational in the summer of 2008, if everything goes according to plan on an aggressive schedule.

"The potential exists for the B-1, in three to four years, to be considered a B-1C," added Campbell.

The Air Force's oldest bomber is also its most reliable, but currently has excess capacity. USAF has proposed drawing down the B-52 fleet to 56 aircraft, 32 of which would be combat coded.

The 2007 National Defense Authorization Act orders the service to maintain a fleet of 44 combat-coded aircraft. Pending legislation instructs the Air Force to keep an overall fleet of 74 B-52s, but Keys said even a requirement for 44 combat tails could be met with an overall fleet of 56.

Additional aircraft come at a price, however.

When it comes to maintaining old airplanes, the cost curve is "not linear," noted Clary. It is accelerating. In the case of the B-52, the average operating cost per aircraft has increased from $5.5 million in Fiscal 1996 to $13.6 million in FY06 (in then-year dollars, not adjusted for inflation). Officials said taking the fleet down to 56 B-52s would save taxpayers roughly $200 million per year.

US Strategic Command requirements are always a part of the equation for figuring out how many B-52s the Air Force needs, and demand for nuclear cruise missiles has declined as well.

The Air Force currently maintains an arsenal of 1,140 AGM-86 Air Launched Cruise Missiles and 460 newer and stealthy AGM-129 Advanced Cruise Missiles. The B-52 is the only platform for these missiles.

Recent plans call for USAF to retire all of its ACMs and cut the ALCM fleet by more than 500 missiles, leaving 528 nuclear cruise missiles. Maj. Gen. Roger W. Burg, director of strategic security, said the ALCM force would be consolidated at Minot AFB, N.D., and all excess cruise missile bodies would be destroyed.

"These cruise missile force structure changes are part of a balanced force reduction that supports both Presidential direction" and the Moscow Treaty requirement to get below 2,200 deployed nuclear weapons by 2012, he said.

Burg explained that the ACM was singled out for elimination partly because it has reliability issues and higher maintenance costs.

The B-52 is also USAF's primary conventional cruise missile delivery platform. The Air Force has a "very limited number" of CALCMs, said Campbell, which "in some scenarios will go very quickly," but current cruise missile inventories meet operations plan requirements.

The option of converting decommissioned ALCMs to non-nuclear CALCMs "will be evaluated," said Burg, but "we're talking about technology that is 25 years old." Furthermore, additional conversions are not in the budget.

The prospective CALCM successor, the Joint-Air-to-Surface Standoff Missile, has run into serious reliability problems, however, and JASSM's future is far from certain.

The Air Force has already received about 600 of the conventionally armed JASSMs, but they have only worked about 60 percent of the time in flight tests. Sue C. Payton, Air Force acquisition executive, described that reliability rate as "not acceptable."

Regardless of how the cruise missile issues shake out, Col. James A. Firth, ACC's combat aircraft division chief, noted that a fleet of 44—or even 32—combat-coded B-52s meets all projected wartime requirements.

Unmanned systems have also been in flux. The Air Force has abandoned the Joint Unmanned Combat Air System, and its 2018 bomber will be manned, but that does not mean unmanned strike is dead. The more readily attainable systems—namely, Predators and Reapers—are being purchased and deployed as quickly as possible.

The Air Force has a wide array of alternatives available to improve the nation's long-range strike capabilities, and the service intends to make the most of these options. ■