

**E**nding four years of intense speculation, the Air Force declared in late October that Northrop Grumman would be the builder of the new Long-Range Strike Bomber. The announcement formally launches a 10-year effort to begin fielding a fleet of aircraft that can penetrate any air defenses and reach any target on the globe, in numbers that can both credibly conduct an extended air campaign and ultimately replace the existing, antiquarian fleet of B-52s.

Few new details of the project were released.

At a Pentagon press conference to announce the winner, Air Force Global Strike Command boss Gen. Robin Rand said the bomber will achieve initial operational capability in 2025.

“We very much need” the new aircraft “as the anti-access, [area]-denial threat contin-

ues to increase,” he said. Air Force Global Strike Command will determine what constitutes IOC and will also decide what nomenclature—such as B-3 or B-4—the aircraft will receive. Rand stressed LRS-B is part of a “joint ... family of systems” also involving electronic attack and intelligence, surveillance, and reconnaissance systems. The new bomber is required to be capable of carrying nuclear weapons within two years of its conventional IOC.

Defense Secretary Ashton B. Carter, at the announcement press conference, said, “Building this bomber is a strategic investment in the next 50 years. It demonstrates our commitment to our allies, and our determination to potential adversaries, making it crystal clear that the United States will continue to retain the ability to project power throughout the globe long into the future.”

Northrop Grumman bested a team of Boeing and Lockheed Martin on the project, which represents the first new bomber to get the go-ahead since Northrop’s own B-2 went into production in the late 1980s. The last of 21 B-2s was delivered in 1997. Though there was heavy odds-making that the award—regardless of who won—might signal a huge shake-up among military airframers and trigger a series of mergers and acquisitions, the initial impact on stocks was mild. No companies immediately declared a new business strategy. Boeing and Lockheed Martin did promptly protest the decision.

Wes Bush, Northrop Grumman CEO and president, said in a press statement that as “the company that developed and delivered the B-2 Spirit stealth bomber, we look forward to providing the Air Force a highly capable and affordable” LRS-B.

# LAUNCHING THE

“Our team has the resources in place to execute this important program, and we’re ready to get to work.”

A few days after the announcement, Boeing was briefed by top Air Force acquisition officials on how the winner was chosen.

### A FULL-UP AIRCRAFT

The program has been highly classified since its inception, and the Air Force clearly means to keep it that way, offering little new information about the project. Not only are the shape, payload, and performance of the jet still tightly held secrets, the Air Force also declined to reveal any of Northrop Grumman’s industrial team, the type of engines that will power the LRS-B, or even how many engines it will have.

Pratt & Whitney—maker of the F-22 and F-35 fighter engines—offered its congratulations to Northrop Grumman in a

public statement, but declined any further comment. The Air Force would not confirm or deny Pratt & Whitney’s involvement in the program.

Unusually for a program of this size, Lt. Gen. Arnold W. Bunch Jr., deputy chief of Air Force acquisition, said the competitors chose engines on their own to best fit their designs and the whole airplane, as a package, is what the Air Force selected.

“The competition for all components of the aircraft [was] already done as part of the proposal,” Bunch said. “It’s a full-up aircraft, is what we have received.”

No information was disclosed about where the aircraft will be built, or even the value of the contract. Service officials declined to identify any requirements (except cost), how the proposals had been evaluated, or how close the competition had been, except to declare that Northrop

Grumman had offered the “best value” solution.

An unnamed source selection authority made the ultimate call, but his or her choice was approved by Air Force acquisition chief William A. LaPlante, Air Force Secretary Deborah Lee James, and Pentagon acquisition, technology, and logistics chief Frank Kendall.

Speaking with reporters about the impending award a few days earlier, LaPlante said the tight secrecy is required because “we need to preserve, as long as we can, the advantage of what we’re doing so that adversaries can’t already be trying to build defenses” against the new bomber. For some time to come, USAF will “hold the

*The LRS-B program is highly classified. Payload, shape, type of engines, and performance are all shrouded in mystery.*

# THE NEW BOMBER

By John A. Tirpak, Editorial Director

**The LRS-B will be modular, advanced, and highly secret.**



**A B-2 built by Northrop Grumman during the production phase. The company was awarded the LRS-B contract, but Boeing, in partnership with Lockheed Martin, is protesting USAF's choice.**

most precious things” about the bomber “a little bit close,” LaPlante said.

A few days later, in a telephone interview with *Air Force Magazine*, LaPlante said the service has started work on a classification guide that will spell out what details—and when—the Air Force will reveal about LRS-B. He anticipated that some additional material might come out around the time the 2017 defense budget is presented to Congress.

The only hard requirement that USAF discussed for LRS-B is its cost. At the Pentagon press conference to unveil the winner, LaPlante explained that it was former Defense Secretary Robert M. Gates who set a ceiling flyaway cost—known as the APUC, or average procurement unit cost—of \$550 million apiece for the bomber in 2010 dollars.

“This was a key performance parameter established back then, ... specifically designed to ensure that we made the bomber affordable,” LaPlante explained. He then asserted that, based on independent cost estimates from the Air Force Cost Analysis Agency and the Pentagon’s own Cost Assessment and Program Evaluation shop, the actual cost of the LRS-B “will be \$511 million per

aircraft in 2010 dollars when procuring 100 aircraft.”

The Secretary of the Air Force said the service hopes to do “even better” than that. The AFCAA and CAPE estimates were “within two percent” of each other, LaPlante noted.

One defense business analyst described the unit cost figure as “eye watering.” Another said the fact that James believes the cost will be lower still is a clear indication that Northrop Grumman was “aggressive” in pricing its LRS-B proposal.

Bunch also acknowledged that \$1.9 billion has been spent on “risk reduction” efforts on the program so far and LaPlante said that the engineering, manufacturing, and development phase will cost \$21.4 billion in 2010 dollars—the baseline year of the program.

“This is a cost-reimbursable type contract with cost and performance incentives,” LaPlante said. “The incentives minimize the contractor’s profit if they do not control cost and schedule appropriately.” That means if Northrop Grumman meets its cost and schedule targets, it will receive the full—but unspecified—amount of fees under the contract. Missed deadlines or cost growth will reduce those fees—possibly

## BOEING’S PROTEST

Boeing, along with its partner Lockheed Martin, filed a protest of the LRS-B award on Nov. 6, starting the clock on a 100-day assessment by the Government Accountability Office to determine if there were any improprieties in awarding the contract to Northrop Grumman, and if there were, what remedies are needed.

In a press statement, Boeing questioned Northrop Grumman’s technical and financial ability to carry out the program, and suggested Boeing had offered a lower price, calling the selection process “fundamentally flawed.”

“The cost evaluation performed by the government did not properly reward the contractors’ proposals to break the upward-spiraling historical cost curves of defense acquisitions, or properly evaluate the relative or comparative risk of the competitor’s ability to perform, as required by the solicitation,” Boeing claimed. The company said it had offered “the best possible LRS-B at a cost that uniquely defies the prohibitively expensive trends of the nation’s past defense acquisitions.”

down to zero if the program slips badly in either arena.

Moreover, the contract sets out “options for the first five production lots, comprising 21 aircraft out of the total fleet of 100,” LaPlante explained. Those options are fixed price, indicating that the Air Force believes the selected design to be mature, based on well understood technologies.

LaPlante said the Air Force is no longer thinking in terms of “80 to 100” LRS-Bs, but is driving toward the 100 figure. If fewer than 100 are built, unit costs will be higher, he said.

The Air Force’s stated need for 80 to 100 LRS-Bs comes off as “squishy,” Mackenzie M. Eaglen, a fellow at the American Enterprise Institute, said at a recent Air Force Association Mitchell Institute for Aerospace Studies discussion about the new jet. The quantity range indicates the number is soft and that no hard analysis has been done on the requirement, Eaglen alleged, and Congress is likely to fund to the lower number. This is a problem because the real requirement is likely to be around 174 aircraft, she predicted.

In a study released in November by the Mitchell Institute, retired Air Force Lt.

Gen. Michael R. Moeller said the phaseout of the B-52 and B-1 fleets in the 2030s means the service will need more than 100 LRS-Bs, simply to achieve the sortie rates required in a future air campaign against a well-defended enemy.

“A modernized and capable Air Force bomber force of 150 to 200 aircraft is required to maintain America’s asymmetric advantage in long-range precision strike over any potential future adversary,” Moeller wrote in the report.

In the pre-award press conference, LaPlante explained that the program was scheduled to avoid any steep ramp-ups in production, which typically invite cuts when last-minute budget reductions must be found. LaPlante called the schedule and budget for the bomber “resilient” against tinkering by budgeteers, to make the program predictable and come in on time. Because changes add cost, no requirements have been altered since they were set in 2011.

### PRICING IT OUT

“It was deliberately set up that way,” he said, “To make it easy for programmers to keep it funded.” What has caused many

program disruptions before, he said, is “assumptions of having to ... go to a high rate of production, and then the funding situation changes, the world changes, and that gets cut, and then we have the [death] spiral.” Multiply the unit cost of \$550 million “by a number that you get when you’re in steady state production—seven or eight—that’s something” affordable year after year, he said.

Indeed, it may have been this slow-and-steady approach to production that may have neutralized Boeing and Lockheed Martin’s strengths in producing large numbers of aircraft. One analyst said the notional schedule “is not much faster than hand-building” the airplanes.

To put the price of the LRS-B in perspective, the Air Force released information comparing the development and production costs of the B-1A/B and the B-2 with the LRS-B.

In inflation-adjusted Fiscal 2016 dollars, the B-1A/B programs required \$19.3 billion in development money, producing 100 aircraft at a flyaway unit cost of \$410 million each.

The B-2 program—for which a production capability of 132 aircraft was built but

The Air Force in turn said that while “it is every competitor’s right to file a protest, the Air Force is confident that the source selection team followed a deliberate, disciplined, and impartial process to determine the best value for the warfighter and taxpayer.”

Northrop Grumman said it was “disappointed” that Boeing and Lockheed Martin “have decided to disrupt a program that is so vital to national security.” The company said it had faith in USAF’s process and that it “took into full account the parties’ respective offerings and their relative capabilities to execute ... on schedule and on budget.” Northrop said its approach is “inherently more affordable and based on demonstrated performance and capabilities. Our record stands in contrast to that of other manufacturers’ large aircraft programs of the last decade.” This last comment was a clear dig at Boeing’s difficulties with the KC-46 tanker and Lockheed Martin’s overruns and delays on the F-35 fighter. Northrop Grumman noted it is “the

only company to ever design a stealth bomber” and insisted it had offered “the best solution” in the contest.

Officials familiar with the protest said Boeing was upset that the Air Force seemed to put high emphasis on past performance with bomber programs, not giving proper credit for technology advances since 1997, when the last B-2 was produced. The Air Force pointed out several times to reporters, however, that acquisition laws demand they count historical performance on similar projects.

Boeing and Lockheed Martin also suggested they hadn’t been properly credited for their ability to produce large numbers of aircraft, saying that Northrop’s yearly output is a small fraction of the Boeing team’s. The Air Force noted, though, that it plans to build only a small number of LRS-Bs every year, potentially negating the volume experience of the Boeing team.

The protest tactic has worked for Boeing before: In 2008, Boeing lost the KC-X tanker contract to Northrop

Grumman, teamed with EADS (now Airbus). The GAO determined that USAF hadn’t followed its own rules in the contest, threw out the result, and insisted the Air Force do the whole thing over. Boeing won on the re-compete in 2011, and is now building the KC-46. Boeing readily acknowledges that it underbid the fixed-price tanker program, and is now more than \$500 million in the red, eating any overages resulting from schedule delays and design mis-steps. However, an industry official observed that the LRS-B development contract is cost-plus: While Northrop Grumman would lose incentive fees for poor performance, the government would be on the hook for any overages.

If the GAO finds no issues with the process of the award, it could make that announcement sooner than 100 days. If there are issues, remedies could include small changes such as clarifications of bids or rescoring some elements of the contest, all the way up to throwing the whole thing out and ordering a new competition.

only 21 were bought—cost \$37.2 billion in development, with a \$1.5 billion unit cost.

Also expressed in Fiscal 2016 dollars, LRS-B development will cost \$23.5 billion, and the program will produce 100 airplanes at a unit price of \$564 million, versus the required \$606 million.

All comparisons include the cost of engines, provided as government-furnished equipment on the B-1 and B-2 programs, but contracted for by Northrop Grumman under the LRS-B program, a USAF spokeswoman said. Military construction costs were not included in the cost comparisons.

The unit cost will be averaged over the program's lifetime, so earlier ones will be more expensive and "the last one will be least expensive," LaPlante pointed out.

A different choice might have had significant industrial base ramifications. Had they won, Boeing and Lockheed Martin would have had a lock on the top three Air Force acquisition programs, including Boeing's KC-46 tanker and Lockheed Martin's F-35 fighter. Northrop Grumman, without a major aircraft prime contract, might have been subject to a merger or acquisition. Still, LaPlante insisted that "the specific industrial base was not at all a [criterion] in the source selection." He's also previously noted that with the recapitalization of the E-8 JSTARS and the T-X trainer competition coming up—along with a number of classified programs he would not discuss—the Air Force deems there to be enough work available to preserve competition among the major airframers.

In the pre-award press conference, LaPlante said prior performance on major programs was a key element in vetting offerors' costs. Boeing has had difficulties with the KC-46 tanker, giving up "all its schedule margin," James said in September, and the tanker was not deemed an especially tough technological challenge.

Lockheed Martin, though it has vastly improved its performance on the F-35 program, is still behind on software and

in fielding the global maintenance system to support the international program.

Northrop Grumman, however, is credited with having some real successes in open-architecture efforts involving the B-2 and other programs and is also credited with good performance on a highly classified high-flying reconnaissance aircraft program.

The number of LRS-B test aircraft, LaPlante said, would be comparable to that in the KC-46 program, employing four prototypes that will eventually join the 179-airplane fleet.

The LRS-B has been run by the Air Force's Rapid Capabilities Office, and LaPlante, in the pre-award press conference, said it will stay there for the foreseeable future.

The RCO, he said, "is a streamlined acquisition shop that does some of our most sensitive and important work." It has "an incredible track record" delivering cutting-edge capabilities, he said. "It's got our best people there, they love their jobs, they are there from six in the morning to nine at night." The only RCO product acknowledged by the Pentagon, he said, is the X-37B reusable unmanned spaceplane.

"Imagine that same kind of office that does a lot of other things—and I'm not talking about one-off things, [but] ... things that go into production. They're very good."

Like the team that developed and built the F-117 stealth attack jet, the RCO "is a small, empowered group of requirements people for warfighters, with acquisition people, with maintainers, who are all empowered, have protection of leadership, and they generally would streamline processes."

Though it has lots of oversight from within the Pentagon and the key defense committees in Congress, the RCO remains "lean and mean," LaPlante asserted.

"The size of this program office for LRS-B is about 80 people when you add them up nationally, because there are pieces of it that are in sustainment, there are pieces

of it that are doing materials," and other specialties at disparate locations.

He also said LRS-B has benefitted from "Red-Blue teaming" wherein one group is developing the technology while another is trying to devise ways to defeat it, and one feeds into the other.

"It's informed by intelligence, but it's not driven by intelligence; it's driven by physics and operations research," LaPlante said.

## STAYING AHEAD OF THE THREAT

The only "equivalent program," he said, was "our Air Survivability Program," an effort now 30 to 40 years old, that "has the same equivalent set of experts, and Lincoln Labs is the lead, ... and it is constantly trying to figure out ways to work stealth in the ... air part of that problem. ... It's ahead of the threat and it discovers physics, and it's figuring out where we need to go."

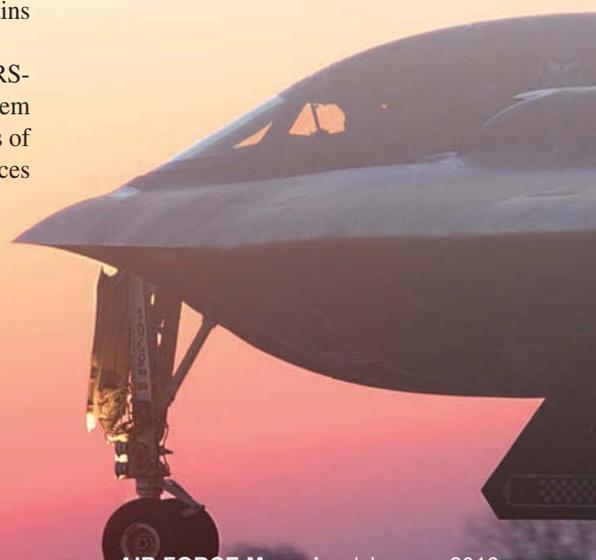
The LRS-B will be built using an open missions systems architecture: The government will own the design data on avionics and other subsystems so that upgrades—expected to come every other year or so—can be competed. This is yet another way the Air Force expects to keep costs down, LaPlante said.

"We want to rapidly upgrade" the airplane to be able to stay ahead of the threat, he explained. LRS-B will therefore remain highly adaptable to changing conditions, and the business approach is "healthy for the industrial base."

The LRS-B arose from the ashes of the Next Generation Bomber program, itself an evolution of what was called the "2018 bomber" of the early 2000s.

Bunch, in the pre-award press conference, said that after the NGB was canceled

**A B-2 taxis in 2014 during Exercise Global Thunder. The next generation Long-Range Strike Bomber is expected to bring state of the art 30 years forward.**



in 2010—because Gates believed it was too expensive—“team experts from all the services” and the Office of the Secretary of Defense studied the rapidly worsening anti-access, area-denial situation, evaluating the relative merits of standoff systems, unmanned aircraft, cruise missiles, “and the cost associated with those.” They also “looked at the reusability of those things” and how useful they would be against the toughest targets.

LRS-B requirements were based on “the flexibility, endurance, the reusability, ... all of those aspects that [determined] that a long-range strike bomber was the right program to ... provide that capability and fill that requirement” for the whole of the Defense Department, he said.

“It was not just the Air Force saying we want to go do this, it was an entire team ... from across DOD,” Bunch explained. Further analysis of how many aircraft are typically in training, depot, and test indicated that 100 airplanes was the right number.

Adversaries, Bunch said, “have watched what we have done for many years with airpower. They have evolved. They continue to evolve to make us stand off more as they try to minimize our capabilities to strike targets.” The new jet will provide the national command authorities “the option to strike any target, any time.”

Integrating the many penetration technologies that went on in development after the B-2 was terminated “is not easy” and the LRS-B’s development will be “challenging,” LaPlante acknowledged. But because the aircraft is based on technologies largely in-hand and well-understood, “we don’t ... have

to invent the subsystems as we’re inventing the system.”

At the same time, “just because it’s existing [technology] or mature doesn’t mean it’s not advanced, ... not incredible,” LaPlante insisted.

Unusual for any system, the LRS-B actually went through a preliminary design review “as well as manufacturing readiness reviews” on both competitors’ aircraft, LaPlante revealed. The level of technological maturity of the chosen design “is higher, I would say, than any other developmental program that we’ve tried to initiate at this phase for a new aircraft.”

He said, “It’s not just that some of this stuff has been wind-tunneled or prototyped or flown,” but that some of the components that will be on the LRS-B “are being used today, operationally.”

To ensure the aircraft will be maintainable, he also noted that maintainers from the B-2 program were part of the program office, to ensure that the low observable capabilities of the bomber can be maintained at operationally useful rates.

A spokeswoman said later that the LRS-B is not, however, expected to offer a huge leap in maintainability versus the B-2, but will be “comparable” in this regard. Initial maintenance will be provided through contractor logistics support, but ultimately the Air Force intends an organic capability, she said.

Bunch said the bomber will have a “flexible weapons load,” suggesting the effort ongoing with the B-2 to be able to carry dissimilar types of ordnance will be baseline to the LRS-B.

Kendall, in a 2015 assessment of the Pentagon’s acquisition system, said he

has become concerned that in the effort to contain costs by reducing risk, the Pentagon may have swung too far and perhaps should accept greater risk to preserve its technology edge. Asked if LRS-B is reaching far enough to be a genuine advancement, LaPlante said it is.

“I think it has the right balance to it,” he said. Without the block upgrade approach, there would be “system pressures” to demand almost impossibly high capability from the first version, because program people wouldn’t believe “they’ll have another chance” to get those desired capabilities.

He said he thinks the program succeeds at being advanced because “you have all the hooks and ... plans to upgrade the next version of it. So that’s where I think we did it, ... by being modular and open.”

Though none of the Pentagon or USAF leaders who spoke about the LRS-B mentioned its potential as an unmanned platform, a USAF spokeswoman confirmed it will be “provisioned to enable future unmanned capability. Any decision to move to an unmanned configuration would be made in the future.”

The Air Force said the program, having passed Milestone B, will now move into the development phase. “We will continue to provide Congress with annual updates on the program’s progress at the appropriate classification levels,” the spokeswoman said. At future milestones, more information will be revealed, “typical of any other acquisition program.”

The first unit to receive the LRS-B will be the 419th Test Squadron at Edwards AFB, Calif. ★



USAF photo by A1C Joel Pfister