

U.S. Air Force Bomber Modernization Plans: An Independent Assessment

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Summary of Key Judgments

The Center for Strategic and International Studies (CSIS), a non-profit, non-partisan public policy think tank, has agreed to provide an independent assessment of Air Force bomber modernization plans. In conformity with its charter, this report was simultaneously provided in PDF format to its client (IRIS Independent Research) and posted on the CSIS website. In the view of the author, Clark Murdock, a senior adviser at CSIS, the most important points made in this independent assessment are:

- The Air Force's commitment to field a new bomber in 2018 (the 2018 Bomber) as mandated by the 2006 Quadrennial Defense Review report is, at best, uncertain, and that its advocacy for a new bomber lacks conviction and credibility.
- The U.S. ability to conduct long-range strike (LRS) missions throughout an adversary's territory, despite its defenses, and without relying on nearby air bases, is very important and supports the U.S. role as a global power.
- The capability needs for the 2018 Bomber are driven by three principal scenarios:
 - Addressing the challenge of a large, high-end competitor;
 - Conducting intense conventional campaigns against medium powers with hi-low military capabilities;
 - Providing long-duration air support missions in low-threat environments.
- The imperative to engage time-sensitive targets (TSTs) in all three scenarios has increased the value of range, persistence and payload in the nation's air forces.
- The current need to respond immediately to on-call tasking from small ground units engaged in counterterrorism or counter-insurgency missions is likely to be an enduring need.
- Providing persistence (which enables TST targeting) in highly defended areas is extremely challenging and is probably not achievable in technologies mature enough for fielding in 2018. However, it is still critically important to hold deep fixed targets at risk, and continuing to seek a capability of persistent surveillance and strike in highly defended areas is a useful cost-imposition strategy, even if all the capability objectives are not achieved.
- The growing likelihood that the Air Force's plans for its future fighter force will be unaffordable, given competing demands and the increasing cost of the F-35 Joint Strike Fighter (JSF), increases the value of the bomber's range and payload, in part because bombers require many fewer sorties (and tanker support) to provide needed target coverage in many scenarios.
- A new penetrating bomber should be nuclear-capable, if the cost of doing so is relatively modest (no more than five percent of the total).

- Fielding a penetrating bomber by 2018 is probably not doable, because the technology is not mature enough, and almost certainly not affordable, because the cost of trying to field immature technology will lead to skyrocketing costs.
- If the still-operational force of B-52s and B-1s is not capable of conducting the volume of long-duration air support missions (in low-threat environments) needed in the 2018-timeframe, the Air Force could consider the option of fielding first a commercial-derivative bomber optimized for the low-end mission to fill this capability gap (if it emerges). But this should not divert the Air Force from developing and then procuring the penetrating bomber the nation needs in the mid-2020s when the technology is mature and the next-generation bomber is affordable.

Introduction

As a separate, standalone input to its ongoing work, IRIS asked Clark Murdock, a senior adviser at the Center for Strategic and International Studies (CSIS), to provide a quick-turn (four-to-six weeks), independent assessment from an “external perspective” of Air Force bomber modernization options. In conformity with CSIS’ charter as a non-profit, non-partisan, public policy think tank, this report was simultaneously posted on the CSIS website and provided in PDF format to IRIS (on 25 January 2008).

The 2006 QDR Report established a new vision for “joint air capabilities”:

Joint air capabilities must be reoriented to favor, where appropriate, systems that have far greater range and persistence; larger and more flexible payloads for surveillance or strike; and the ability to penetrate and sustain operations to denied areas. The future force will place a premium on capabilities that are responsive and survivable. It will be able to destroy moving targets in all weather conditions, exploit non-traditional intelligence and conduct next-generation electronic warfare. Joint air forces will be capable of rapidly and simultaneously locating and attacking thousands of fixed and mobile targets at global ranges. The future force will exploit stealth and advanced electronic warfare capabilities when and where they are needed. Maritime aviation will include both unmanned aircraft for surveillance and strike. Joint air capabilities will achieve a greater level of air-ground integration.¹

In the “QDR Decisions” taken to implement this vision, the report said DoD planned to:

- Develop a new land-based, penetrating, long-range strike capability to be fielded by 2018 while modernizing the current bomber force.
- 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.
- Restructure the Joint Unmanned Combat Air System (J-UCAS) program and develop an unmanned longer-range carrier-based aircraft capable of being air-refueled to provide greater standoff capability, to expand payload and launch options, and to increase naval reach and persistence.²

In response to the 2006 QDR Report’s mandate for a new long-range strike (LRS) capability, the Air Force’s senior leadership has embraced the “2018 Bomber”:

We can stand off now with some of the finest aircraft ever built....But against a fifth-generation defensive system, this is not going to work for us. We need to be

¹ P. 45, Department of Defense (February 6, 2006), *Quadrennial Defense Review Report*.

² P. 46, *Ibid*.

able to capitalize on those attributes of an Air Force, which are range and payload and persistence. **So this takes us to a new bomber.** [emphasis added]

General Michael Moseley, April 4, 2006

In 2018, the B-2 will be nearly 30 years old, and newer technologies are required to ensure access to denied areas in the 2015-2020 time frame due to rapid advances in foreign threats.

Air Combat Command³

Although the Air Force has not yet defined precisely the 2018 Bomber capabilities and much of its requirements analysis is classified, what is known publicly so far about 2018 Bomber attributes and characteristics includes:

- ~100 aircraft total buy
- Demonstration flight 2011
- 28,000 lbs payload
 - May also carry air-to-air missiles
- Combat radius at least 2000 nm (unrefueled)
- High altitude operations
- Max speed “high subsonic”
- Very low observable – improved stealth materials
- Nuclear mission
- Manned cockpit
- Advanced AESA (Active Electronically Scanned Array) radar and other systems⁴

These are the Air Force bomber modernization plans that are the subject of this *independent assessment*.

Methodological Approach

CSIS recruited a diverse group of subject-matter experts, including former senior DoD officials, defense strategy and policy generalists, air power experts and former Air Force officers,⁵ and hosted two workshop luncheons. [See Appendix 1 for the list of **all** workshop attendees.] The workshop discussion was governed by Chatham House rules – all participants would be identified; direct quotes (both from oral and written statements) would be used in reporting workshop results; but no quote or viewpoint would be attributed to a particular participant. IRIS produced a briefing that provided the basis for the workshop discussion, versions of which were sent out as read-aheads and were presented at the outset of the workshop meeting. [See Appendix 2 for the version given on 3 January 2008.]

³ P. 10, IRIS (January 3, 2008), *Long Range Strike: Options and Alternatives*, Brief to CSIS Working Group. See Appendix 2.

⁴ *Idem*.

⁵ The only active-duty officers involved were two Air Force fellows (at CSIS and the Congressional Research Service) who attended as observers.

CSIS also distributed (both as read-aheads and at the meetings themselves) a list of key questions that included the following:

1. How would you characterize the mission needs for the 2018 national security environment?
2. What is your view on the Air Force's current plans for the "2018 Bomber"?
3. What kind of long-range strike capability is needed in the 2018 timeframe?
4. If budget constraints make the 2018 Bomber unaffordable in the Air Force's overall modernization plan, what tradeoffs (between long-range and shorter-range strike, ISR [intelligence, surveillance, reconnaissance], strategic and tactical mobility, and tankers) would you make?
5. What will be the one or two biggest obstacles in the Air Force's current plan to field the 2018 Bomber?

These questionnaires were filled out in advance of the workshop meeting, at the meeting, and, in two instances, afterwards.

The author moderated the two sessions, took notes and only rarely participated (those instances will be identified in the report). All of the quotes and views presented in the remainder of this independent assessment report were made by workshop attendees *other* than Murdock, although he remains solely responsible for deciding which views or quotes to include, how they are characterized and the assessment made in this report. The author thanks all those who participated – the discussions were lively, informative and thought-provoking. The participants clearly believed that the subject was very important to the nation, DoD and the Air Force, and engaged seriously on the issues.

The results of this assessment will be presented roughly in the order of importance that workshop attendees attached to them, with the most important (in term of attention given to them) coming first.

Air Force Commitment to (and Advocacy for) the 2018 Bomber

About halfway through one of the workshop sessions, one participant observed:

After listening to all the different views about what the 2018 Bomber should be able to do, my question is this: Does the Air Force want to build a bomber or does the Air Force **not** want to build a bomber? If the answer is that it doesn't want a new bomber, it's going about it in exactly the right way.

In other words, the continuing debate in the policy community, the lack of a clear rationale, the lack of budget support, etc. are all things the Air Force would do if it really did not want to fulfill the 2006 QDR mandate.

Several others commented that Air Force Chief of Staff General T. Michael Moseley said he wanted it, but “it was far from clear that his commitment was widely shared by the rest of the Air Force.” Others observed that support from Air Combatant Command (ACC) was lukewarm at best, and that advocacy from the relevant combatant commands (COCOMs), particularly Strategic Command (STRATCOM) and Pacific Command (PACOM), seemed weak and ambivalent.

After asking whether there was a “well-developed strategic concept” for the 2018 Bomber and being told “that if there is, nobody knows about it,” one participant concluded that the absence of a clear strategic rationale suggested that the “Air Force’s commitment wasn’t serious.” The discussion generated a long list of 2018 Bomber characteristics that suggested lack of seriousness: lack of budget, unrealistic schedule (2011 demonstration flight and 2018 initial operational capability, or IOC), inventory target of 100 aircraft before requirement is set, “no careful thought or plan,” inconsistent with Air Force experience (e.g., no unmanned variant), little mention of how a/the 2018 Bomber fits into “joint use of forces” (particularly in support of Navy’s maritime control mission), etc. As one participant wrote at the end of the session:

The current plan appears to lack a strategic rationale and a clear articulation of the scenario and ways in which long-range strike assets would be used. The Air Force has not yet made either the policy case or the technical case for a new bomber, nor has it provided a realistic assessment of likely costs and tradeoffs.

Almost as widespread as the perception of weak Air Force commitment was the belief that Air Force advocacy was critical in determining whether the 2018 Bomber would ever be built, because “strong Air Force support is critical to getting additional revenue.” In fact, little or no effective Air Force advocacy was the second most frequently cited obstacle to fielding a new bomber. However, this view was not universally shared, as one participant observed that “you can only get something new [e.g., a new bomber] from the demand side [namely, by those who employ forces], because the supply side [e.g., the “force providers” like the military services] will only sustain old stuff [e.g., the current bomber force].” Several commented that COCOM advocacy for a new bomber was missing, particularly after Murdock noted that “it was operational pull from the field that had led to the rapid fielding of UAVs [unmanned aerial vehicles],” not former Chief Ron Fogelman’s efforts “to jam UAVs into the force in the 1996 vision and long-range plan.”

Importance of Long-Range Strike

Most participants believed that long-range bombing “was an American thing – one of the things we do when we fight wars.” In a less colloquial, but certainly more elaborate, written submission after the second workshop session, one participant stated:

The core *strategic* reason that the United States should give priority and adequate resources to fielding a long-range strike system (LRSS) beyond the B-2 within the next 10-15 years is to be able to hold at risk targets at any depth in enemy airspace even when protected by advanced air defenses. This capability has been one hallmark of the U.S. military ever since 8th Air force began flying missions against occupied Europe from England in 1942. It was also the main justification for creating an independent USAF in 1947. . . . Thus, my view is that moving ahead and fielding a new LRSS in the foreseeable future (no later than the early 2020s) is a critical indicator of American will and commitment to remaining a *global* superpower.

Another participant took an inverted approach to underscoring the importance of bombers:

As a thought exercise, assume you had only three variants of air power – land-based tactical air, sea-based tactical air and bombers – and you have to give up two of them, which would you **not** want to be without? In light of the basing risks [either on land bases in the region or on increasingly vulnerable carriers], the answer has to be bombers.

While not disputing the value of long range, a few participants stressed that, as one wrote before the meeting, “First and foremost, we must start talking about ISR in the same breath as strike. Finding things is at least as important in most cases as hitting things.” Although others agreed that “ISR should be the primary driver,” there was no pushback to the comment that “once you have your long-range ISR platform, you might as well put a bomb bay in it.”

Although distinctly in the minority, one participant did not take the inherent value of long range almost as a given, but insisted (in a written answer provided before the meeting) that it depended on likely U.S. mission needs:

ISR, mobility, tanking and short range strike win out over long range strike. For all forms of warfare and deterrence, ISR (defined as both tactical and national) is required. For local warfare, mobility and tankers are essential, and short-range assets are needed. For local punishment from a distance, the use of existing long air assets has already been shown to be adequate. For strategic confrontations with major powers, the current inventory of missiles and aircraft is sufficient (if one had to prioritize). A new bomber that encounters budget constraints is likely to end up at low priority, unless its “fit” within the architecture of systems is clearer; evidence exists that it can be provided on the cost and schedule proposed; and, the warfighting scenarios and peacetime competitions are reasonable examples of the challenges the U.S. may face.

By putting the need for LRS in a cost-constrained context, this analyst argues – tellingly, I think – that (1) the U.S. needs ISR to do anything; (2) it can do most of what it needs to

do with tanker, mobility and short-range strike; and (3) a low-priority or poorly executed bomber program ain't the answer. Of course, this still leaves open the issue of how much priority the U.S. should give to a high-priority, well-executed bomber program that is well suited for future "warfighting scenarios and peacetime competitions."

2018 Capability Needs

In recognizing that DoD needed a "family of strategic concepts" to address the requirements associated with warfighting scenarios, discussion of 2018 mission capability needs coalesced around three principal scenarios:

- Addressing the challenge of a large, high-end competitor (usually identified as China);
 - "China has the strategic depth, and is developing the anti-access/area-denial capabilities, that will present the United States with a growing need to be able to strike from very long ranges."
- Conducting intense conventional campaigns against medium powers with hi-lo military capabilities (such as Iraq in 2003 and Iran in the future);
- Providing long-duration air support missions in low-threat environments (Afghanistan and Iraq today, the global campaign against radical Islamists, etc.).

Another 2018 capability need that received considerable discussion stemmed from the nuclear mission and will be discussed separately. The suggested list of capability characteristics needed in a 2020 timeframe seemed endless: persistence/loiter, all-weather, day-night, net-worked connectivity, very low observable, prompt response, precise, survivable, high-volume, manned-unmanned interoperability, etc.⁶

The imperative to engage time-sensitive targets in all three scenarios (ranging from mobile surface-to-air missiles (SAMs) to terrorist leaders) focused increasing attention on

⁶ In response to the question on what kinds of LRS capabilities were needed in 2018, one participant submitted (in advance) an exhaustive list, which included "the ability to":

- Impose sustained intense precise conventional strike against fixed and mobile targets in locations other than Great Power nations
- Impose surprising, very precise conventional attacks on a limited number of targets with near simultaneity anywhere, including Great Powers (e.g., hit nuclear installations, buried installations, space launch facilities, ASAT sites, SAM sites, BM sites, terrorist facilities, and people engaged in genocide)
- Deliver nuclear weapons in a general war
- Provide very precise fire support for the ground military operations or special operations
- Provide precise fire support for long term ground, air or sea military operations
- Protect sea lanes of communication in the absence of naval forces
- Defend naval forces against air, surface and submarine attack
- Demonstrate sufficient capability to incentivize opponents to invest in local air defenses with their limited defense resources
- Demonstrate significant leadership in key technologies to discourage other nations from presuming they can close the gap

persistence and payload as key capability needs for air power. Current operations in Iraq and Afghanistan underscore the importance of being able to support ground forces engaged in distributed operations against a dispersed adversary. One participant wrote (at the end of the session) that LRS would be “needed for a range of missions” and listed first “persistent CAS [close air support] for GWOT (on-call tasking).”⁷ While some believed that post-Iraq and post-Afghanistan would reduce the volume of persistent air support needed by ground forces, all seemed to agree that this was an enduring demand for “high-volume, low-threat conventional missions.”⁸ Another participant observed (in writing before attending the session):

The bulk of **COIN/CT** [counter-insurgency and counter-terrorism, the first of the “three key missions dominating the next couple of decades”⁹] will be about training, equipping and advising the forces of friendly foreign governments. However, from time to time, direct U.S. operations will be called for. The Afghanistan experience provides a pretty good template for the operational demands that these will place on the USAF. Specifically, we should anticipate having to sustain aircraft on orbit for extended periods to provide ISR and on-call fire support to small units on the ground.

Responding immediately to tasking from the ground required both persistence and payload—persistence because stand-off munitions would not arrive in time for TST and payload for both endurance (a bomber can stay in the air without tanker support much longer than fighters) and capacity (a bomber carries much more ordnance). Although the participants often varied in their statistics – e.g., it takes 4-5 fighter sorties to replace one bomber sortie or bombers flew 10 percent of the missions over Afghanistan and employed 70 percent of the weapons – none questioned the value of bombers in this role, although several believed that a new bomber was not needed for this mission: “Remember the ‘B-52 mother rule’ – ‘The mother of the last B-52 pilot has not yet been born.’”

While none questioned the value of acquiring TST in wars against regional adversaries (with some advanced integrated air defense (IAD) capability) and peer competitors (where SA-20s and SU-35s make a “lethal combination”¹⁰), there was considerable debate over how “doable” persistence was in denied areas (see section on Bomber Survivability and the “Lock-Out Problem”). As one participant observed, “real persistence” in a denied area may not be possible, but the “ability to re-strike” in highly defended areas has always been critical in denying sanctuary to the enemy. Several

⁷ The rest of this participant’s list of LRS missions included: “CAS + strike in conflicts vs. regional adversaries w/ advanced IDS, and strike in contested areas in a conflict w/ a near peer, global prompt strike against feeling targets absent large conflict, and last but not least the nuclear mission.”

⁸ This mention was listed third in this participant’s priority list of LRS (including ISR) needs: “nuclear mission; high-end, high threat conventional missions (including high-volume and including deep missile targets in potential adversaries like China or Iran); high-volume, low-threat conventional missions; presence; competition – I’d like to keep in the long-range strike game.”

⁹ The other two were “Countering nuclear-armed regional adversaries” and “Countering China.”

¹⁰ Pg. 12, IRIS (3 January 2008).

commented that holding deep, highly defended targets at risk is a great cost-imposition strategy, and one participant wrote in a post-meeting submission:

During the Cold War, America's maintenance of a penetrating bomber as one "leg" of the nuclear "triad" imposed comparatively huge costs on the Soviets for territorial air defenses. (Recall that in 1948 Vostok PVO became a separate service even from the Soviet Air Force. The United States began abandoning continental air defense in the late 1960s, but the Soviets continued investing into the 1980s).

As it becomes increasingly clear that the Air Force's fighter inventory is not affordable (particularly as the cost of the F-35 continues to climb), the volume of ordnance that a bomber can provide in addition to the range and persistence offered by the larger payload make its superior target coverage increasingly important.. Since, as one participant observed, "the goal of 2,000 fighters is an illusion," bombers compensate by providing the future JFACC (Joint Force Air Component Commander) the high volume target coverage needed for campaigns like Desert Storm and Iraqi Freedom. Another participant wrote before attending the workshop:

Absent an increase in the Air Force budget, a major long-term decline in the Air Force inventory of short-range strike fighters seems inevitable. Lack of service life in legacy fighters plus rising JSF costs drive this outcome. (The good news: fewer fighters mean fewer tankers, strategic lift, munitions, though probably not ISR.) It may be possible to use [the] right kind of long-range strike assets to mitigate the consequences of this loss. If the platform were a commercial wide-body derivative, it may be affordable (low SDD [System Development and Demonstration], stable procurement with shared overhead). It could replace fighters for Irregular Warfare missions involving high persistence to service time-sensitive targets in a reasonably permissive environment. In Traditional Warfare, it could provide deep strike with stand-off munitions and massive support to the Joint ground campaign once air supremacy is established. Under this construct, the burden on the small remaining fighter force would be to quickly establish air supremacy while the long-range assets would largely handle air-to-ground attacks throughout the mission spectrum.

In conclusion, the challenges facing the 2018 Bomber are diverse in nature (ranging from a peer competitor to insurgents and terrorists attacking friendly ground) and, while sharing similar needs across the spectrum, will require different capabilities depending upon the threat environment. One participant wrote before attending the workshop:

Between now and 2018, the priority national security missions will transition from the war against radical Islam (which will continue to ebb and flow) to a focus on the rise of China and nuclear proliferation, with all three having significant homeland defense ramifications. ALL of these will require a much greater emphasis on persistent airborne surveillance, low collateral damage precision weaponry, low-observable systems that stay ahead of detection

technologies, much greater platform endurance (unrefueled range, refueled range, and persistence at range), and networking in opposed environments.

The implications of this diverse set of capability needs seems evident (at least to the author): bombers are needed to do a lot of things in the 2020 timeframe, but it is not at all clear that the same bomber can do all of them.

Bomber Survivability and the “Lock-Out Problem”

There was broad agreement that the U.S. needed to be able to “attack deep” against peer adversaries and that the current bomber force was not capable of doing it: “The bomber fleet will be largely relegated to stand-off engagements because the threat of double digit SAMs, fighters and next generation IADs will be too difficult to penetrate. All of this together may lead a potential foe to miscalculate because they do not feel at risk.” But there was significant disagreement over whether deep access in highly defended space was doable by 2018.

Aircraft are “locked out” of an area if they incur “unacceptable attrition rates” during operations in highly defended areas. As the IRIS brief demonstrated, supersonic cruise greatly improves survivability, but at great costs in range (and probably payload as well).¹¹ Even then, several participants appeared to believe the mission was unachievable:

Forget about “any target, any where, any time.” We don’t need to fly into the middle of China in broad daylight to attack mobile targets; nor will it be feasible to do so. Accept the utility of standoff attacks against well-defended targets.

Providing persistence in denied areas, which is needed for TST targeting, is far more challenging than just penetrating (both for strike and re-strike) those same areas. The view expressed in the IRIS brief that integrating proven F-35 capabilities (off-board connectivity to support a fused common operational picture, precision RF emitter location and targeting and low observable/high survivability) into a new bomber was hotly debated by other participants.¹² When one participant suggested arming the bomber so it could provide its own protection, others believed that even if that could work (that is, reduce attrition sufficiently so that an armed bomber wouldn’t be “locked out”), the bomber would be so expensive as to be unaffordable. In conclusion, most of the participating experts believed that a future bomber could be built that could penetrate dense, modern defenses (although perhaps not for persistence missions). Few, however, believed it could be done by 2018.

¹¹ Pg. 12, *Ibid.*

¹² Pg. 13, *Ibid.*

The Nuclear Mission

The question of whether the 2018 Bomber had to be nuclear-capable sparked considerable debate, but little consensus because the attendees seemed sharply divided on the importance of the nuclear mission in the 2020 timeframe. For some, the nuclear mission was a top or “last but not least” priority: “As for the proliferation problem, I believe that an air-breathing LRSS will be more credible in terms of deterring countries such as Iran than the threat of intercontinental ballistic missiles. A new LRSS is central to conveying the strength of American nuclear forces to allies and prospective adversaries alike.” Another participant, who believed that the nuclear mission was in “even more trouble” than the LRS mission, argued that Congress would not support new nuclear delivery systems unless they were dual-capable, which, given the Congressional roadblock the conventional Trident missile ran into, meant a dual-capable 2018 Bomber. For one participant, even a dual-capable bomber (conventional/nuclear) was not sufficient, because DoD needed to “make the case in simple, unclassified language” for a “long-range, manned triple-capable [ISR/conventional/nuclear] bomber.”

While no one argued explicitly that the nuclear mission for bombers did not matter any more, many left it off their list of priorities, and several indicated they would give the mission up entirely if it improved prospects that a new bomber would actually be fielded (better a conventional bomber than no bomber).¹³ This debate about whether to make the next-generation bomber (NGB) nuclear-capable probably will turn on the issue of cost – at the 19 December session, one participant said the nuclear mission was responsible for 25-30 percent of the cost of the 2018 Bomber, while another equally credible participant said at the 3 January session that it was only 4 percent of the total. This discrepancy between workshop estimates probably depends on whether the 2018 Bomber is “hardened” against the EMP (electro-magnetic pulses) effects of nuclear explosions, which a participant reported later is “very expensive, impacts airframe design, and can’t be retrofitted later.” Many participants believed that even a conventional-only bomber needed to be able to operate in a nuclear environment, since nuclear-armed adversaries could use high-altitude detonations, even over their own territory, to defeat U.S. air and space-based assets. If making the 2018 Bomber nuclear-capable only cost another 4 percent (largely for secure C-3 and nuclear-unique safety, surety and targeting capabilities), most would support it, although a few noted that a new nuclear-capable bomber would be viewed as threatening by the Chinese, who would respond by increasing their inventory of modern, nuclear weapons.

¹³ A few participants observed that the Air Force’s inclusion of the nuclear mission in its publicly-described list of 2018 Bomber characteristics either demonstrates lack of seriousness (since there’s no rationale for it), lack of consistency (since the 2007 Bent Spear incident indicates how little the Air Force really cares about the nuclear mission on bombers), duplicity (since saddling the 2018 Bomber with the unpopular nuclear mission makes it less likely it will be fielded) or all of the above.

Making the 2018 Target

While many said “Why 2018” and some believed that “picking the number 2018 out of the air” reflected the Air Force’s lack of seriousness, few opposed the conclusion (written during the session) that “2018 = unrealistic.” Another participant submitted before the session:

Fielding a new bomber in 2018 is fraught with back end schedule and cost risk. The cost risk comes from the USAF needs to recapitalize the fighter force, the Tanker Force [sic], the tactical mobility force and the CSAR [combat search-and-rescue] force all in the same timeframe. The schedule risk comes because the technologies required for the 2018 Bomber to counter the growing threat are immature. Additionally recent history tells us that the time required from Milestone B to IOC already exceeds the remaining time. It appears the USAF will either get a bomber that is not very capable initially or one that is doomed to slip.

Noting that the Air Force’s plan calls “for the use of prototypes in about three years but IOC seven years later” is “internally inconsistent” -- the “prototypes will not actually test the feasibility of the risky elements in the program; yet, is that not the purpose of prototypes?” For this analyst, the 2018 target implies “the new design will have a lot in common with existing designs,” despite the Air Force’s enumeration of 2018 Bomber characteristics, because “if radical solutions are to be pursued [e.g., to penetrate highly defended areas], how can the plan be confident in a 2018 IOC or useful prototype demonstration in 2011?”

If the 2018 Bomber, as described by the Air Force, is not achievable by 2018, what could be? In the view of one participant, something clearly much less capable:

Making a 2018 IOC may be problematical. It means that first procurement has to be around 2013. If the platform is high-end (e.g., stealthy, long range, advanced avionics, perhaps stealthy, perhaps unmanned), there will need to be significant concurrency between development and procurement with resulting high risk for cost, schedule and performance. It will provide critics with a strong rationale to cut funding or cancel the program if budgets get tight. If the platform is derivative (e.g., FB-32, commercial wide-body “arsenal plane” with standoff munitions), a 2018 IOC might be achievable.

In one session’s discussion of the 2018 target, one participant exclaimed: “We’ll do this [namely what can be done by 2018] and then we’ll do a 2037 Bomber,” which brings this report to the next issue.

Hi-Lo Mixes, But of What?

Somewhat surprising (to the author) was the fact that both workshops spent little time on capability mixes of manned-unmanned systems and delivery-vs.-munitions, subjects that usually spark considerable debate. Most participants seemed to assume that unmanned systems (including space-based) will provide much of the ISR and that the more interesting issue was how much ISR needed to be on a penetrating bomber capable of operating in highly defended areas. It seemed to be conventional wisdom that bombers acting in low-threat areas could be unmanned, although a few explicitly took issue with this view. Most participants, however, seemed to agree that high-value missions (e.g., nuclear) in high-threat environments (e.g., against foes with some/robust defenses) would require manned bombers. In continuing to advocate the high-end LRS mission “[d]espite skepticism in the seminar discussion over the possibility and affordability of fielding a LRSS that can persist enough in defended airspace to be able to attack fleeting, time-sensitive, mobile, or emergent targets,” one participant simply stated: “Networking and ISR capabilities I take for granted.” All the participants seemed to agree that “*if we cannot ‘find and fix’ targets, we can’t strike them.*” [no emphasis added] Strike, whether long- or short-range, requires ISR and C-3 connectivity (that is, “net-centricity” or “networked”) and much, if not most of that, will be provided by space-based and unmanned systems – that is a given, it appears, for workshop participants who wanted to move on to more interesting issues.

Continuing advances in munitions, which implies change in the appropriate platform-munitions mix, also was assumed as the decision context. For example, it seemed widely accepted that stand-off munitions were not the answer to acquiring TSTs in denied areas.¹⁴ A couple of participants, without much support from others, argued that some of the ISR required for penetrating denied areas could be “off-loaded” from the platform to advanced munitions, leading one of them to submit the following later:

Lastly, all our current precision weapons require precise target coordinates. The one [munition] that could search for targets on its own was LOCASS [Low-Cost Autonomous Attack System], and neither the USAF nor the Army was comfortable with battlespace robots searching out and attacking targets on their own. This is a cultural problem, but we need to get over it. (I don’t think the Iranians or Chinese have similar qualms.) LOCASS-like munitions offer one way of offloading some of the IRS demands for precision strike onto the munition.

However, the long-standing view of some critics/reformers that the Air Force always under-invests in munitions (at the expense of platforms) seemed to have been replaced by an underlying concern about whether the Air Force would buy the right mix of platforms to accommodate the munitions available to it. As one participant stated before the 3 January session:

¹⁴ Several participants asked for pg. 9 of the IRIS brief because it visually captured this view.

ISR, tankers, strategic mobility (to quickly deploy strike assets) and munitions should be dependent variables. Their numbers and capability should be balanced to give adequate support for the force of strike assets. Anything less lowers the capability of strike assets themselves to the point where they are no longer as attractive for investment for the next marginal dollar available.

This perspective led the participant to argue during the workshop that because of the “killer up-front costs” of buying from the outset a hi-lo mix of bombers, the Air Force should not seek its 2018 Bomber “as advertised,” but should “sneak in” a low end bomber that was a commercial derivative. This view was echoed by another participant’s pre-session written submission:

In 2018, the requirement should not be for a new bomber that can do every mission (i.e., persist by itself in heavily defended enemy territory). . . . There is a very real danger by doing the program “Black,” the USAF will overestimate what this system needs to do in 2018. Growth should be provisioned for in future increments as we re-evaluated the real threats rather than those prognosticated 10+ years in the future. Because of the wide range of missions we are talking about, maybe we should think about a high low mix of bombers. A cheap persistent bomber that would be great for GWOT and then invest in the right technologies to get a survivable bomber that holds near peer assets at risk post 2020.

In the judgment of the author, this makes a lot of sense – if you need a new bomber to address capability shortfalls in 2018 (assuming the legacy force of B-52s and B-1s are inadequate) buy that bomber (for real-time, on-call support to ground forces fighting COIN/CT missions) first. And then develop and acquire the bomber you need for the future (penetrating and persisting in denied areas) when you have the technology (both mature and affordable) you need to do that mission.

Cost-Constrained Trade Offs – What to Give Up?

All seemed to agree that the Air Force had not provided for the 2018 Bomber in its longer-range planning and programming. Given the statement by the Assistant Secretary for the Air Force for Acquisition – “For the next-generation bombers, we will not have a budget to move forward with the money we need to do integration of the currently existing technologies that are out there until FY10”¹⁵ – this is not surprising.

As the preceding discussion suggests, when participants were asked what they would give up in order to make room in the budget for the 2018 Bomber, the most-frequently offered “bill payer” was short-range aircraft:

¹⁵ Pg. 10, IRIS (January 3, 2008)

If we can constrain the cost of a new medium/long-range platform, an attractive trade would be to cut in half the buy of F-35 to procure 100 or so new LRSS (long-range surveillance and strike) aircraft.

Trade short-range to get long-range, if necessary. Add ISR to new bomber ...[which] opens trade space for other sensor platforms.

Rebalance the force mix...[through] a progressive shift from the current, many-base dependent force ratios back toward balance between the short-range and longer-range strike mix. All of the components of the force – strike, ISR, refueling, and mobility – will be affected. The 2018 Bomber is then a point on the path of the rebalancing road map.

Shift overall emphasis in Air Force programs from tac air to long-range, ISR, space, cyber and support (that is, lift and tanker) aircraft.

Personally, I'd be inclined to cut the USAF F-35 buy in half, and cancel the CV version (while holding the Navy's feet to the fire on UCAS-D, because the CV JSF will not appreciably increase the reach of a carrier battle group in the absence of USAF tankers).

Despite the priority given to LRS by most of the participants, a few participants were willing to sacrifice some 2018 Bomber capability, either by sacrificing range (buying a "regional bomber" that was a "fighter-derivative") or penetrating capability (buying a commercial-derivative for the GWOT mission). The predominant view, however, was that Air Force's fighter-bomber mix was "unbalanced," and the Air Force needed to trade short- for long-range systems

The Classification Problem

At the 19 December session, several participants argued that the classified or "black" status of the 2018 Bomber added considerably (perhaps as high as 22-25%) to the cost. This view, like that discussed earlier with respect to the cost of making the 2018 Bomber nuclear-capable, was disputed at the 3 January session. For most of those participants, keeping a program "black" (for example, the F-117 program) made it much less expensive to field it (e.g., "we fielded an operational wing of F-117 for \$5.5B). Another participant, however, observed that when the B-2 "went from black to white, the sticker shock undermined support, even among defense supporters that would normally be allies. In Congress, many conservative members were displeased that so much money had been spent without their explicit authority." These opposing views on how the classified nature of the 2018 Bomber program affects the cost of the program were unresolved.

However, most participants agreed that the classified nature of the 2018 Bomber was undercutting Air Force advocacy for LRS. In the words of one participant: since the "funding, performance objectives, etc. are 'black,' there is 'very little public story line on

current plans from the Air Force other than broad mission descriptions and the IOC, with lots of rumors in the trade press.” Since many participants believed that the Air Force needed, as one said, “to make the case in simple, unclassified language,” a few of them suggested that keeping the program “in the black” was simply the Air Force’s underhanded way of making sure that the 2018 Bomber never received the political support it needed.

Obstacles to Fielding the 2018 Bomber

On the questionnaire requesting written submissions, workshop participants were asked: “What will be the one or two biggest obstacles to the Air Force’s current plan to field a 2018 Bomber?” An informal analysis of the 16 questionnaires (with no more than two reasons counted for each participant) yielded the following breakdown of “obstacles”:

- Lack of strong or effective Air Force advocacy – 9
- Not enough money – 9
- Competing requirements (F-35, F-22, tankers, etc.) – 4

All other answers – e.g., lack of mature technology, requirements creep, broken acquisition system, etc. – were cited only once or twice.

###

Appendix 1- Seminar Participants

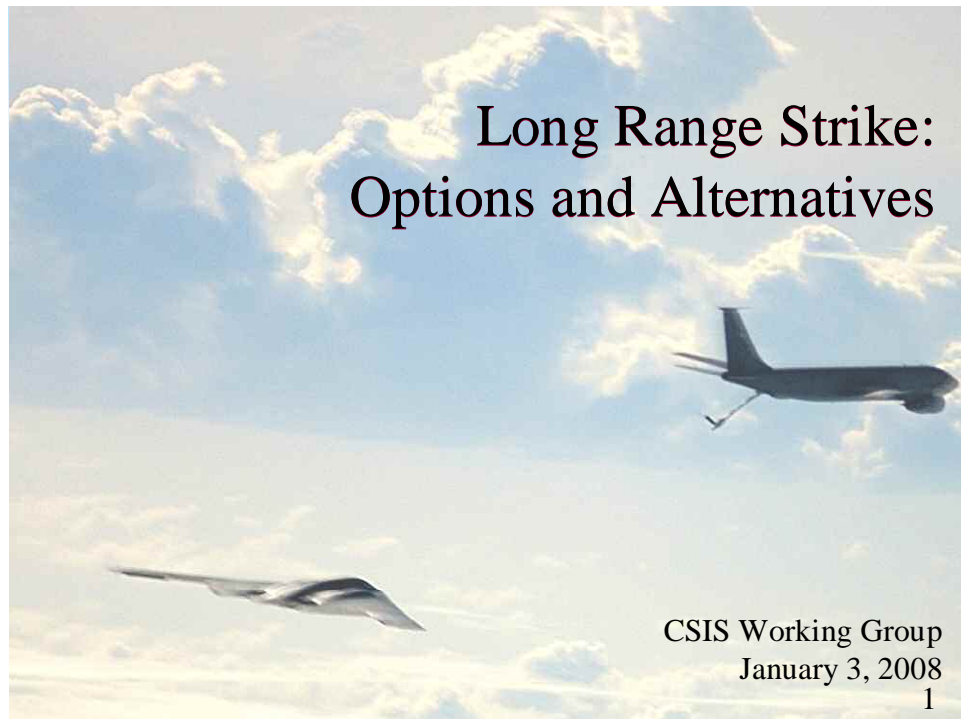
19 December Session

Chris Bowie	Northrop Grumman Corporation
Thomas Ehrahrd	Center for Strategic and Budgetary Assessments
Rebecca Grant	IRIS Independent Research
Robert Haffa	Northrop Grumman Corporation
Michael Isherwood	Northrop Grumman Corporation
Rick Lewis	Burdeshaw Associates
Chip Pickett	Independent Consultant
<i>CSIS</i>	
Clark Murdock	Senior Advisor, International Security Program
Kathleen Hicks	Senior Fellow, International Security Program
David Scruggs	Senior Fellow, International Security Program
John Burgeson	Research Assistant, International Security Program
<i>Air Force Fellows</i>	
Lt Col Anothy J. Murch	Congressional Research Service
Col Jeff Taliaferro	Center for Strategic and International Studies

3 January Session

Larry Farrell	National Defense Industrial Association
Lou Finch	STR, L.L.C.
Michele Flournoy	Center for a New American Security
Tom Goldman	Boeing
Rebecca Grant	IRIS Independent Research
Andy Hoehn	RAND Corporation
Michael Isherwood	Northrop Grumman Corporation
Rick Lewis	Burdeshaw Associates
James Miller	Center for a New American Security
David Ochmanek	Rand Corporation
Chip Pickett	Independent Consultant
Keith Tucker	Lockheed Martin Corporation
Barry Watts	Center for Strategic and Budgetary Assessments
<i>CSIS</i>	
John Hamre	President and CEO
Clark Murdock	Senior Advisor, International Security Program
John Burgeson	Research Assistant, International Security Program
<i>Air Force Fellows</i>	
Lt Col Anothy J. Murch	Congressional Research Service
Col Jeff Taliaferro	Center for Strategic and International Studies

Appendix 2 – IRIS Brief, January 3, 2008



Purpose

QDR 2006: “Develop a new land-based, penetrating long-range strike capability to be fielded by 2018 while modernizing the current bomber force.”

- No new bomber developed since 1980s
- Projected Initial Operational Capability (IOC) at 2018
 - Replaces previous plan to begin new program in 2019 and field by 2037
 - Legacy fleet will be maintained for at least next 10 years
- Air Force has completed Analysis of Alternatives for next-generation bomber
 - Formal program start in 2009
 - Plan calls for two contractors to demonstrate approach with prospect for first flight in ~2011
- Long range strike program will fill mission needs but compete for dollars with many other aviation programs
 - F-22 and F-35
 - Tanker recapitalization
 - CSAR and mobility programs
- **Today’s Discussion:** evaluation of long range strike mission as national security priority

Long Range Strike

- Strike any target, in any weather, anywhere, at any time, with high precision
- Hold key targets at risk
 - Ploesti, 1943
 - Novi Sad Bridge, 1999
- Nuclear and conventional deterrence
- Add firepower for theater scenarios
 - Persistent direct attack
 - Significant percentage of precision munitions in OIF/OEF
- Provide persistent “indirect fires” support for ground forces
 - Bombers more efficient in many scenarios



*Tasking now met with limited force structure, diminishing capability
USAF force structure may be too heavy on short-range forces*

3

Bomber Inventory and Risk Calculus

B-52H	B-1	B-2
<ul style="list-style-type: none"> • 85 active (9 reserve) • First flight 1954 • Last delivery Oct 1962 • 70,000 lbs payload • Max speed Mach .86 • Fuel: 312,000 lbs. 	<ul style="list-style-type: none"> • 65 in inventory • First flight 1974 (B-1B 1984) • Last delivery Oct 1988 • 75,000 lbs payload (24 x 2000 lb.) • Mach 1.2 at sea level • Fuel: 265,000 lbs. 	<ul style="list-style-type: none"> • 21 aircraft • First flight 1988 • Last delivery Nov 1997 • 40,000 lbs payload • Max speed “high subsonic” • Fuel: 167,000 lbs.

- Air Force decided to keep all 3 bombers after B-2 production termination in 1992
- Deliberate risk calculus
- Undersecretary Paul Kaminski, 1996: “We concluded from the **heavy bomber study** that with 20 B-2s, our bomber fleet size and mix will meet our mission needs.”
- “When we examined the specific industrial capabilities needed for the B-2 and previous bombers, we found there is **not a unique bomber industrial base.**”
 - “The capabilities required to design, develop and produce bombers are **available in the broader military and commercial aircraft industries.** For example, all 54 of the key B-2 suppliers also supply other aircraft and/or other non-aircraft programs.”

4

Risk Environment

Air attack access is
key ingredient for
credible
deterrence

Yesterday...Serbia and Iraq

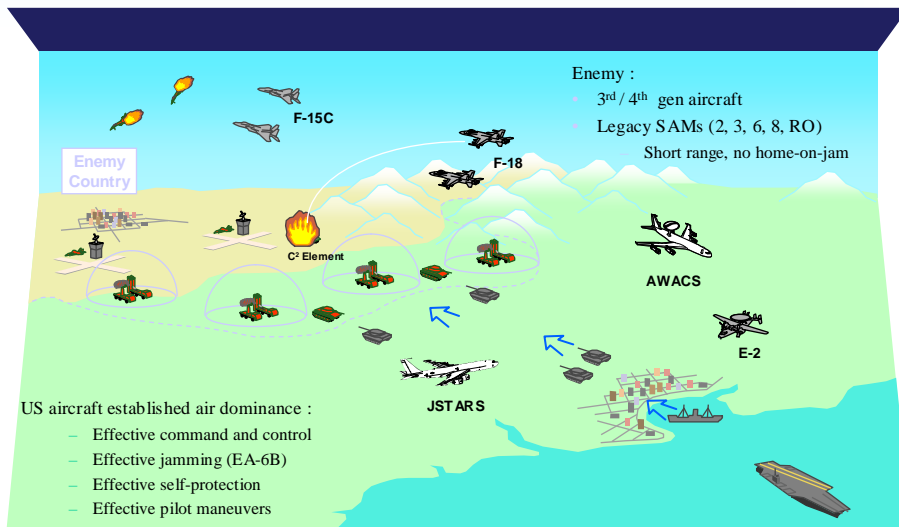
- Persistent mobile SAMs
 - SA-2, SA-3, SA-6s, Rolands
- Rollback campaigns
 - Kosovo 1999: 894 SAM launches in 78 days
 - Peak: 43 launches on Day 39
 - Iraq 2003: 2884 SAM launches in 25 days
 - Peak: 190 launches on Day 15
- Minimal Red air
 - Peak was 17 Jan 91: 54 Iraqi combat air patrols (~100 aircraft)
 - Several MiG-29 sorties 1999
 - No significant Red air in OIF/OEF

2010 and beyond...China?

- 100 SAM battalions
 - Recent purchase of 8 battalions of S-300 upgraded SAMs with range of 200 km+
 - Can be placed on ships
- Dense Red air
 - Up to 700 fighters based near coast
 - Su-30 and Su-33 purchases
 - ~1200 F-10 advanced 4th Gen fighters in production
 - DIA estimates similar to Typhoon, Rafale
- Complete radar coverage of all borders (Oct 2007)
 - Work on AWACS-like system based on IL-76
- China “access” demands simultaneous offense against SAMs and Red air

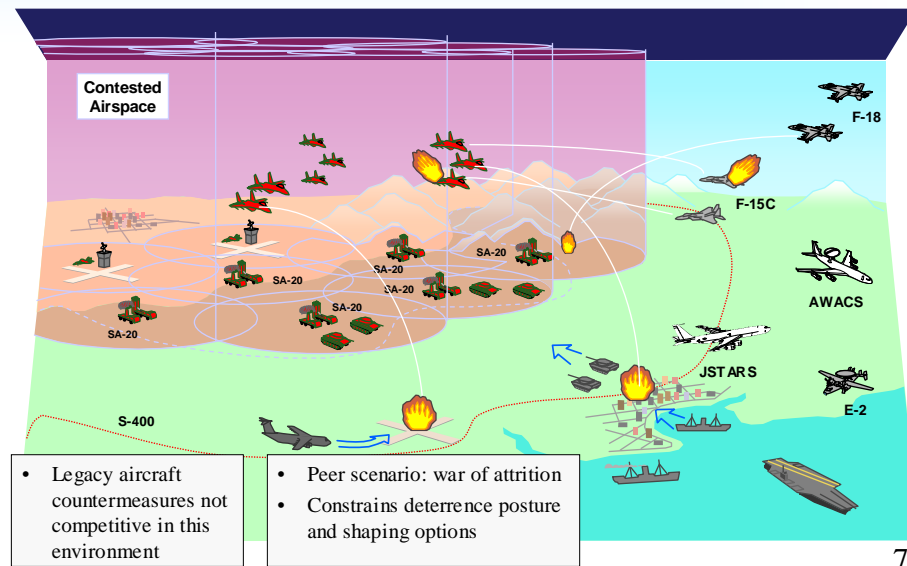
5

Past: Desert Storm, Kosovo, and OIF Low Threat Airspace



6

Now: Lethal Combination of SA-20s and SU-35s

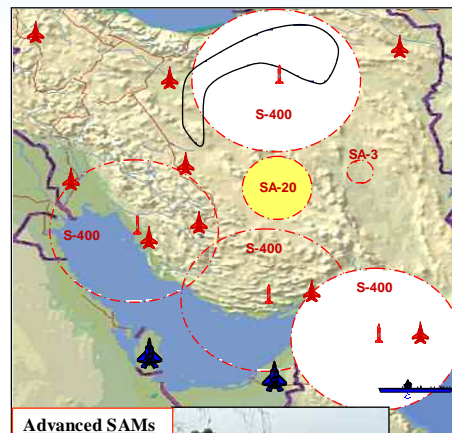


7

Future Challenges

- F-15Cs (A/A), F-16CJs (SEAD), F-15Es (A/G), F-18E/Fs, and EA-6Bs (SOJ) would fail to establish access against double digit SAMs and 4th generation fighters without experiencing high attrition
- F-22s have demonstrated superior performance in this environment
 - F-35 capability will also be outstanding
- Bomber force not able to conduct persistent operations
- For air campaign OR to hold special targets at risk

Coverage of 5 SA-20 or 4 S-400 Battalions
(Cost about \$1B)



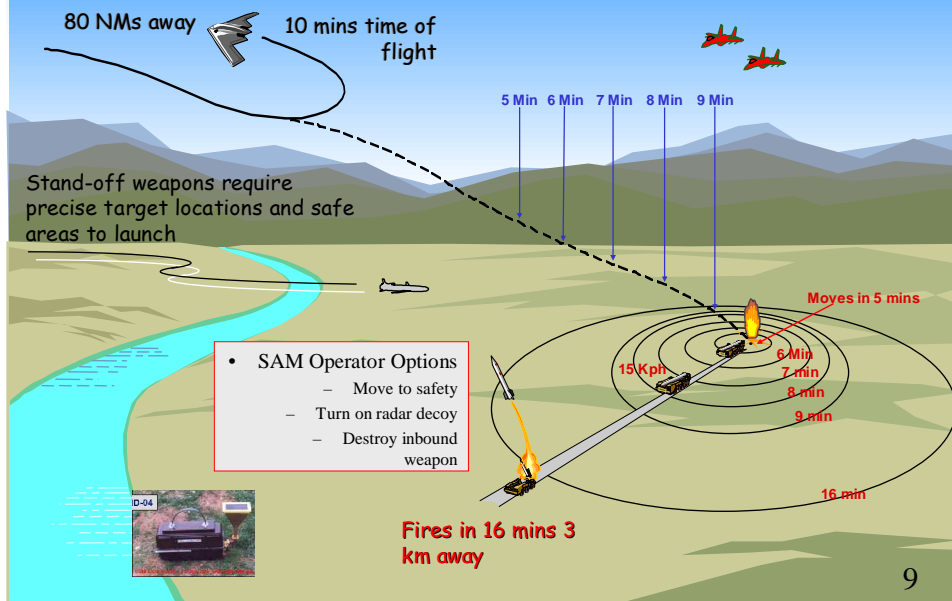
Advanced SAMs

SA-10 A/B
SA-20
SA-12
S-400/500
HQ-9



8

Stand-Off Weapons Often Ineffective



Recent Statements

- “We can stand off now with some of the finest aircraft ever built....But against a fifth-generation defensive system, this is not going to work for us. We need to be able to penetrate. We need to be able to capitalize on those attributes of an Air Force, which are range and payload and persistence. **So this takes us to a new bomber.**” – Gen Moseley, April 4, 2006
- “In 2018, the B-2 will be nearly 30 years old, and newer technologies are required to ensure access to denied areas in the 2015-2020 time frame due to rapid advances in foreign threats.” – Air Combat Command
- “For the next-generation bomber, we will not have a budget to really move forward with the money that we need to do integration of the currently existing technologies that are out there until FY10.” – Ms. Sue Payton, Assistant Secretary of the Air Force for Acquisition

2018 Bomber so far...

- ~100 aircraft total buy
- Demonstration flight 2011
- 28,000 lbs. payload
 - May also carry air-to-air missiles
- Combat radius at least 2000 nm (unrefueled)
- High altitude operations
- Max speed “high subsonic”
- Very low observable – improved stealth materials
- Nuclear mission
- Manned cockpit
- Advanced AESA radar and other systems

2018 Bomber: Operational Questions

Supersonic vs. subsonic

- Traits of supersonic profiles
 - Speeds of Mach 1.3 to Mach 1.7 assist with dash speed to avoid or break-off engagement
 - Mach 1+ speeds incur infrared signature penalties
 - Stealth materials unproven beyond Mach 2+
 - Aircraft must reach Mach 3 to Mach 4 for big survivability gains
- Subsonic attributes
 - Most efficient fuel consumption
 - Subsonic profile essential for persistence mission
 - Near-term engine derivatives

Tasking

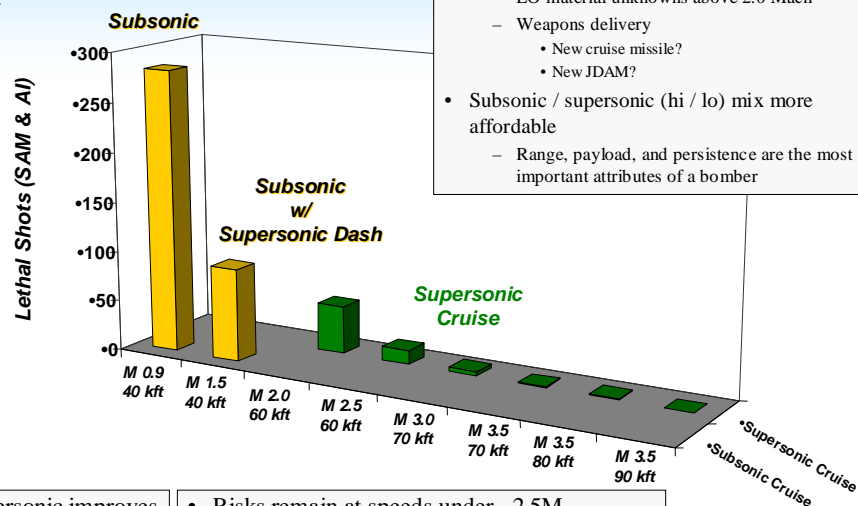
- Mobile target tasking vs fixed targets
 - Mission profile for anti-access attack of SAM belts
 - Mission profile for “wolfpack” mission ranging deep into hostile airspace

Information integration

- Requires information platform with most advanced radar, communications and data and sensor sharing systems
 - Operational concept for employment with F-22, F-35, EA-18G and other jammers
 - Prospect for utilizing JSF sensor suite and software development for quicker integration, risk reduction and ROI

11

Supersonic Bomber?

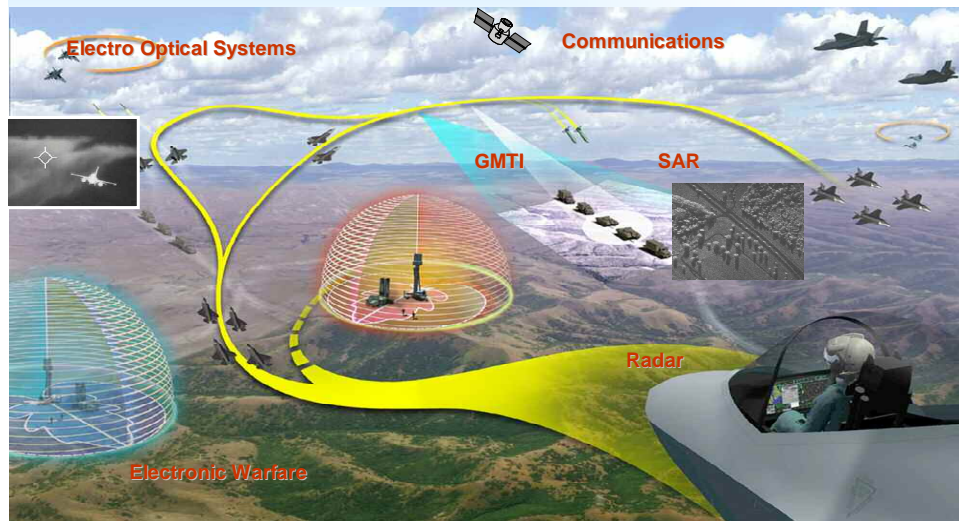


- Supersonic improves survivability
- High altitude also assists

- Risks remain at speeds under ~2.5M
- “Impervious” speed + altitude begins at Mach 3+ and 70K ft
- Supersonic cruise cuts range to less than half

12

F-35 / New Bomber Capabilities



- Off-Board Connectivity to support a Fused Common Operational Picture
- Precision RF Emitter Location and Targeting
- Low Observable & Highly Survivable

13

Mission Alternatives

- **Upgrade of existing bomber fleet**
 - Pro: Lower costs, possibility to integrate advanced hypersonic weapons to extend stand-off range
 - Con: B-2 force structure typically limited to handful of aircraft; night-time only force
- **Intermediate-range bomber (fighter derivative)**
 - Pro: supersonic speed attainable, many targets within range, moderate cost to program start
 - Con: sacrifice range and payload, leaves key percentage of targets beyond range
- **Navy UCAS from CVN-78 aircraft carriers**
 - Pro: prospective ~1500 nm range from mobile bases, maximum endurance, new CVN-78 design with electronic catapults suits UAV operations
 - Con: payload limited, UCAS program in demonstration only
- **Rapid global strike with conventional ballistic missiles**
 - Pro: Survivable system for strike within ~ 1 hour, no aircrew at risk, ballistic re-entry impervious to air defenses
 - Con: big margin of error for tracking mobile and relocatable targets, limited number of missiles for re-attack, political questions

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