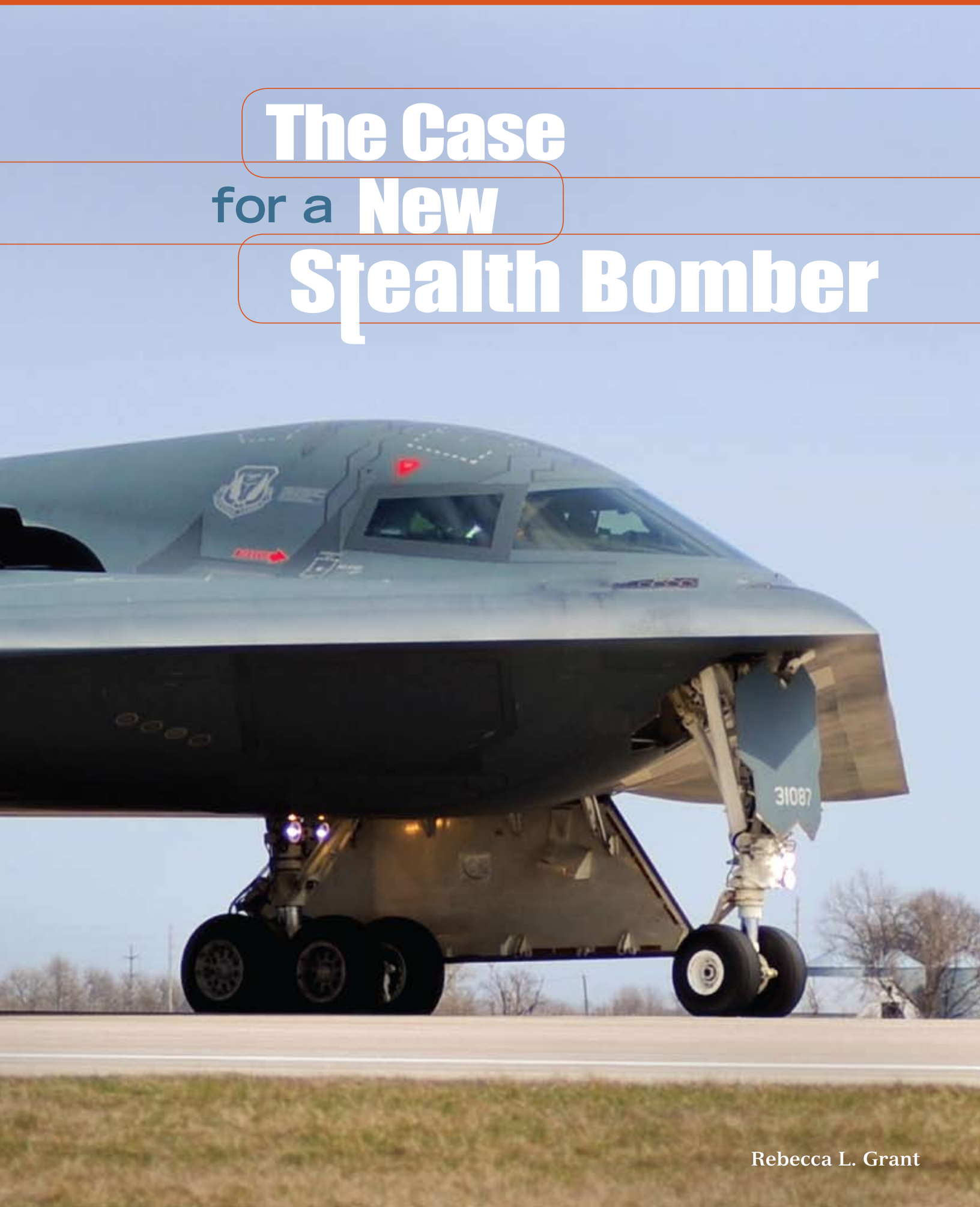
The Case for a New Stealth Bomber



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A New Bomber and US National Security

A nuclear-capable missile launcher under rogue control.

A command center buried in a hillside deep behind enemy lines.

Hostile unmanned air vehicles at an inland airfield loading suspected chemical weapons.

A hunted terrorist, identified with a caravan of bodyguards in a remote valley.

A dictator's forces resupplying across a major bridge as they fight to control a rebel province.

Targets like these could demand immediate action in a future crisis. Will the US be ready to react with long-range strike?

The answer is not a firm yes. It's *maybe*.

As 2012 begins, the Air Force's bomber fleet of B-52s, B-1s and B-2s is on the brink of not being able to carry out complex missions or provide credible deterrence in all scenarios.

"The only air-breathing strike platforms the United States possesses today with reach and survivability to have a chance of successfully executing missions more than 1,000 nautical miles into enemy territory from the last air-to-air refueling are 16 combat ready B-2 bomber aircraft," the United States Senate has stated.[i]

That's why a new stealth bomber has emerged as a top national priority.

On January 5, 2012, President Obama laid out a new defense strategy titled *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*.

The strategy marked a historic shift because it moved the Asia-Pacific region to the forefront of defense planning. The new stealth bomber will be essential to deterrence and anti-access strategies there. The document singled out the need to build "a new stealth bomber" as part of ensuring deterrence, assured access and strong partnerships with other nations.

Research on the new bomber is already underway and the rush of support is encouraging. However, over time, the Pentagon, Congress, White House and ultimately the American people contributing their taxpayer dollars will be called on to support the new stealth bomber. They may ask: Why should the Department of Defense commit money to build a new bomber? How will it help carry out US security objectives in a world so different from the Cold War, where rising military powers like China are also key trading partners? Should a manned bomber still be the centerpiece of long-range strike? And if so, what is the right technology strategy for a new bomber program?

This white paper aims to be a guide towards thinking about those vital questions.

The Obama Administration's decision to build a new stealth bomber was based on direct experience. The year 2011 held several reminders of why the nation depends on long-range strike as a uniquely useful tool.

- On March 20, 2011, B-2 bombers hit 45 different hardened aircraft shelters in the city of Sirte, Libya to destroy aircraft and helicopters belonging to Moammar Gadhafi as the NATO air campaign began.
- In April 2011, B-2s prepared for an intercontinental mission and stood ready as part of a back-up plan for an attack on the Bin Laden home compound in Pakistan.
- Throughout all of 2011, B-52 and B-2 bombers deployed to Guam as part of a 24/7 bomber presence mission providing deterrence to all regions of the Pacific.
- B-1s completed their tenth year of flying daily armed reconnaissance and overwatch missions in Afghanistan.

USAF Bomber Inventory

System	First Flight	Current Inventory	Primary Aircraft Available
B-52	1954	76	54
B-1	1978*	66	50
B-2	1989	20	16

Despite this strong operational record, the bomber force is approaching low ebb. The inventory is smaller than at any time since the 1930s. Old aircraft are losing their edge. The last new bomber – the B-2 – was designed in the early 1980s but never bought in quantity.

As the table shows, the low number of B-2s is a real limitation.

The bomber inventory is adequate for areas with low air defense threats. Steady upgrades in weapons, communications links, and radars have been made to the bomber fleet.

However, it's questionable whether there are enough bombers with the right capabilities to mount a challenging campaign lasting weeks.

Also, the time is coming when even the B-2s may not be taken seriously as deterrence weapons. The ability of this fleet to fight through enemy missiles and defending fighter aircraft is dwindling. By the end of the 2010s, several nations will be able to put up such stiff defenses that the US will risk losing a unique ability to hold targets at risk.

Going forward, the bomber force is not adequate for:

- A full-scale air campaign
- Isolated strikes against heavily defended targets at deep ranges; or
- Prompt attack of fleeting mobile targets.
- Rapid-response long-range strike where targets across the globe can be struck in 1-3 hours.

The United States relies on forces capable of long-range operations. Think of the aircraft carrier fleet: it was built to extend control across the Atlantic and Pacific, and keep enough carriers so that at least three can be at sea around the world at any time. America's aircraft carrier fleet is far larger than that of any other Navy. Geography is a big part of the reason.

The Navy has been careful not to let this force slip. The Navy began a program to modernize carriers back in the late 1990s with the decisions to build the CVN-78 Ford-class carriers and to purchase F/A-18EF Superhornets and F-35C Joint Strike Fighters for the airwings.

That has not been the case with the bomber fleet. As a result, the US begins this era of multi-polar demands on airpower with a bomber fleet in dire need of a new aircraft.

Bomber Missions

Stealth bombers must be able to take off from bases in the continental United States or from theater bases and still reach their targets.

Future tasks might include a single raid on a vital site, with a variation for multiple locations; and a sustained air campaign. Targets like the northern provinces of Afghanistan or space-launch facilities in China add hundreds of miles to the combat radius each bomber must fly to maintain deterrence.

Dr. Thomas Ehrhard laid out the basics for these missions in a landmark 2009 study of airpower: "To perform this mission in heavily defended airspace, it will also be essential for aircraft to be stealthy, have great endurance, and have access to protected communications."[ii]

With just 20 B-2 bombers in existence, commanders face an insurmountable task. Here are three examples of why.

Quick raids on a single target site. A mission like the attack on the bin Laden compound might have required six B-2s. Assume three are assigned targets to strike – after all this is a "can't miss" opportunity planned for months. One aircraft is sent with the first three as an airborne spare, while another two are on ground alert at Whiteman Air Force Base, Missouri, to launch in case of problems on the mission…or in preparation for a second strike.

Raid on Multiple Sites. Now take the number of sites from one to three and ten B-2s are required. The numbers are pushing the limits of the inventory, especially if B-2s are in a deterrent tasking elsewhere.

Sustained air campaign. Conducting a sustained, 30-day campaign to take down air defenses and strike dangerous targets is an ever bigger problem for this small stealth bomber force. To be effective, the campaign must persist day after day. In NATO's 1999 air war in the Kosovo crisis, the intercontinental missions limited B-2s to no more than two strikes per day. Against a nation the size of China the requirements would be much, much higher. The B-2 force cannot meet them all. The final row shows a likely air campaign or attack against a peer adversary who has a dispersed and extensive fixed target set plus vital mobile targets.

With the B-2 fleet usually three aircraft are at depot in periodic maintenance. Another may be at Edwards AFB for testing with new equipment. Probably no more than 16 B-2s out of 20 could be available in any crisis. On any given day, perhaps three-quarters or 12 of those could fly missions.

	Attack Aircraft	Airborne Spare	Ground Spare	Total B-2s
"Compound"	3	1	2	6
3 Dispersed Sites	6	2	2	10
10 sites	10	2	2	14

These are normal assumptions. No one expects all F-16s to jump into the fight at once. The Navy, for example, can't send all its carriers because some are in maintenance, nuclear reactor core fuel overhaul or other stages of work-up.

Why can't B-52s fly these missions? The fact is that B-52s with conventional weapons have not been tasked to strike the most heavily defended targets during the last 20 years (except with stand-off weapons.) According to the Congressional Research Service, the Air Force itself in 2007 concluded that the B-52 will not be survivable in higher-threat environments by 2015-2020.[iii]


WARNING
Access
Restricted
to
Aircrew

Weighing Manned and Unmanned Options

A new stealth bomber is needed – but must it carry a crew?

When the Air Force's satellite Global Positioning System became fully operational in April 1995, it opened extraordinary possibilities for unmanned aircraft. Continuous, highly accurate signals enabled unmanned vehicles to supplement human control with automated routines that greatly increased the reliability of unmanned systems. Soaring demand for reconnaissance led to armed unmanned planes. The Predator and Reaper families became icons of the war in Iraq and Afghanistan. The high-altitude Global Hawk proved capable of nonstop flight from the US to Australia and other global missions.

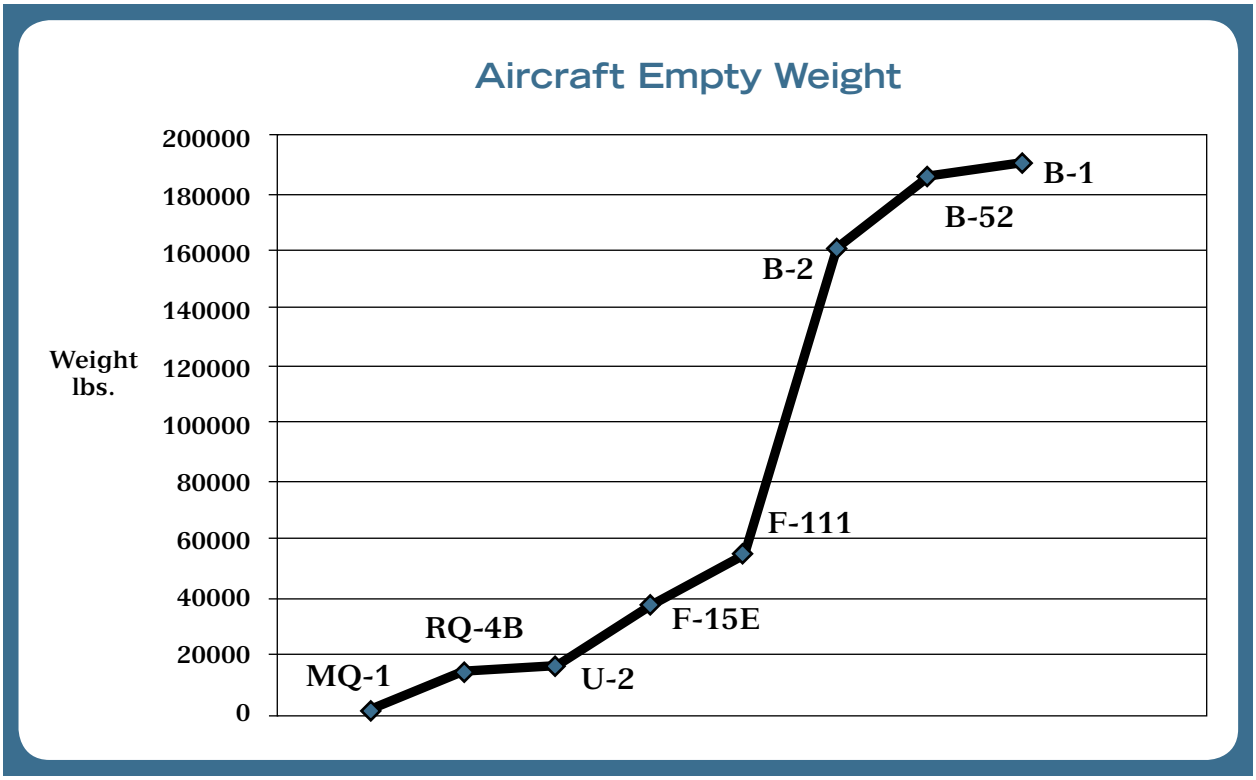
If these unmanned craft could achieve great ranges and precision bombing effects, why not go ahead and design an unmanned bomber? Certainly the advances in design and navigation make it a possibility to build an unmanned bomber. The Department of Defense has expressed interest in an option to pilot the bomber with a crew aboard or remotely. What are the operational pros and cons?

It's important to remember that unmanned vehicles began life as reconnaissance aircraft. Removing the crew made some early drones expendable. Going unmanned also gave today's remotely-piloted aircraft greater endurance. Taking out the weight of the crew compartment enabled the aircraft to stay airborne longer by using less fuel.

For a bomber, the considerations are different. Today's unmanned planes carry valuable sensors but they do not carry either extremely heavy ordnance or nuclear weapons. Bombers do, and that reshuffles the technology trade-offs.

Bombers are relatively heavy. The B-2 is the lightest of the three bombers and it weighs 160,000 lbs. empty of fuel and bombs. Compare that to the 1,130 lbs. empty weight of the earliest Predator or even the 14,950 lbs. of the newest RQ-4B Global Hawk or the U-2 high-altitude spy plane at 16,000 lbs. The weight of cockpit, fittings and crew doesn't matter nearly as much for the long-range bomber as it does for light reconnaissance planes. With a bomber, the weight of the crew compartment is a very small percentage of aircraft weight given the airframe structure,

Manned and Unmanned Aircraft Weight



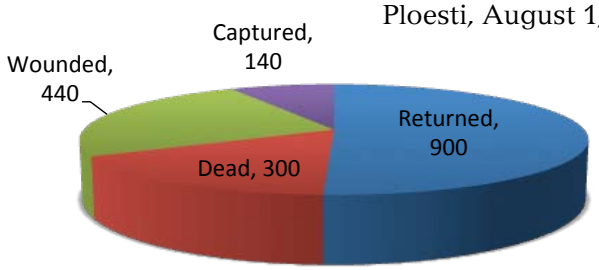
weapons and fuel it carries. As a result, an unmanned option has much less impact on aerodynamic performance and endurance.

On the other hand, bomber crews deliver significant benefits in mission performance. First is their operational reliability – which far exceeds the records for unmanned planes. A bomber crew can also make split-second decisions without the delay of satellite communications. Finally, a bomber crew is trained to find every way to accomplish the mission and to handle a dense threat environment.

They take risks to do it, of course. Bomber crews go into hostile airspace with less of the protections available to fighters: less speed, less agility, no guided missiles to knock out enemy fighters. High loss rates have claimed the lives of many bomber crews throughout history.

On August 1, 1943, 178 B-24 Liberator bombers took off to bomb a Third Reich synthetic fuel plant at Ploesti, Rumania. 41 planes were lost with 300 of their crew killed and 140 captured.

B-24 Crew Losses at Ploesti, August 1, 1943



Aircrew Losses at Ploesti

The remaining 127 bombers returned with 440 wounded men aboard, a casualty rate of 34% just for those who made it home. The target at Ploesti was one that no other military force in its day could reach.

Ploesti stands as a reminder that long-range bombers will be called upon to take the highest risks because of their singular abilities. What then, is the best way to provide them the maximum in mission capability and self-defense?

Stealth has been the answer since the 1980s. Stealth factors in visual, infrared, and acoustic signature as well as control of emissions. But the primary design driver is predicting and controlling how an aircraft reflects radar waves. Enemy surface-to-air missiles, for example, are alerted by a series of radar readings. First come the long-range, early warning radars. Their low frequencies emit long waves which lap over a plane and blip its approach in the form of returned radar energy.

Long-range, low-frequency radar waves are not enough to guide an air defense missile. SAM batteries use shorter-wavelength radars in higher frequencies for fire control. Here is where stealth design focuses on diverting enough of the radar energy to produce a poor return until the attacking aircraft is very close.

These basic principles have been known to radar engineers and missile and aircraft designers since the 1960s. Does stealth still work?

Yes, because the physics have not changed. Stealth seeks to degrade radar tracking by throwing off the waves to create a tactical advantage. Good stealth design decreases effective radar detection ranges. High altitude helps by attenuating radar-tracking lobes. Speed improves all matters by putting the aircraft at risk for a shorter time period.

Radar is not the only tracking mechanism. Infrared energy such as the heat of an airplane in the atmosphere or its hot jet engines can be tracked, too. Stealth aircraft are also designed to minimize infrared return.

Adversaries try to counter stealth with more powerful radars. That works, to a point, but it's no reason to abandon stealth and return to the blaring radar reflection of old designs like the B-52. Just the reverse.

Stealth is already proven in combat. Two of the biggest air defense challenges stemmed from the 1991 Gulf war and NATO's 1999 Kosovo air war. In both, stealth aircraft proved their unique value by attacking heavily-defended targets on their own. F-117s attacked targets across Iraq and in downtown Baghdad. They struck 40% of the strategic, fixed targets with no losses. In 1999, the B-2 bombers were the first to use all-weather precision Joint Direct Attack Munitions. Flying solo mission routes, B-2s typically attacked two or three different targets with their weapons load of 16 2000-lb. JDAMs. The only stealth aircraft lost in combat was an F-117 shot down on March 27, 1999 by a Serbian SA-3 surface-to-air missile.

Stealth has been so successful that no major new combat aircraft are being designed without stealth as an integral feature. The only non-stealth strike aircraft still in production for the US is the Navy's F/A-18EF, which was designed as an update of a 1970s design with advanced avionics and improved reliability. Russia's PAK-FA fighter program and China's J-20 both incorporate stealth features.

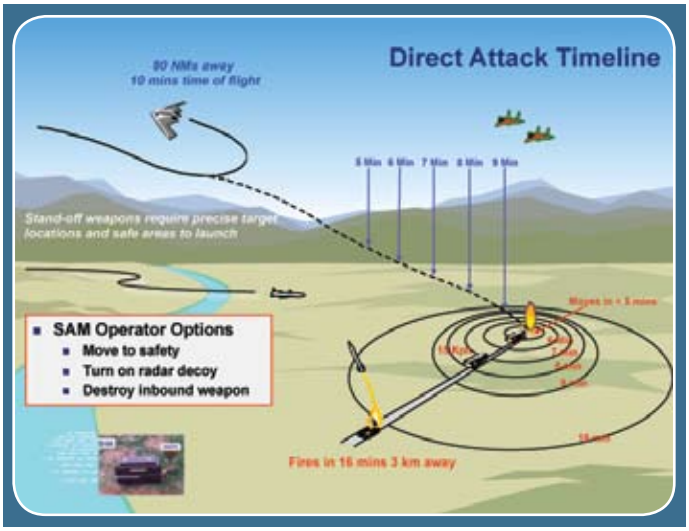
If doubts remain, look no further than the Pentagon's biggest program: the F-35 Lightning Joint Strike Fighter. The Air Force, Navy, Marine Corps and several international air forces have all committed to stealth as the leading feature of their mainstay combat aircraft.

The next bomber will equally feature stealth as a primary design trait. It will also incorporate all possible electronic countermeasures and other features for survivability. Modern-day stealth is not a point solution. It remains a tactical blend of survivability measures built into the aircraft and planned into its missions by its crew.

Choosing the Bomber

The decision to build a new stealth bomber came only after extensive analysis of whether other contenders in the long-range strike mission portfolio could do the mission instead. Options included air-launched and sea-launched cruise missiles, ICBMs, aircraft carriers and new, unmanned aircraft as potential players in long-range strike.

Analysis showed that a new stealth bomber built for direct, penetrating attack was the best course. Two reasons stood out. First, a new bomber will have greater ability to attack difficult mobile and deeply-buried targets. Second, it is more cost-effective than missiles over a long campaign and the system in-service lifespan.



Take the case of a moving target such as a rogue missile launcher. The crucial equation is how long the missile takes to cover the distance from launch to target impact. If it's more than 5 minutes the target has a good chance to move beyond the blast radius of the warhead. Surface-to-air missile crews and crews of Scud-type short-range ballistic missiles train to hide, move and shoot. Indications of an incoming missile are like firing a starting gun for a race they know well and practice to win.

Direct attack by a bomber has several advantages. Synthetic aperture radar aboard the bomber can identify targets and reconfirm their precise location on the way in. A 2000 lb. JDAM launched at closer range can greatly increase the probability of success by giving the missile battery crew much less time to react.

A bomber launching a weapon from 80 miles away, for example, gives the target much less time to move.

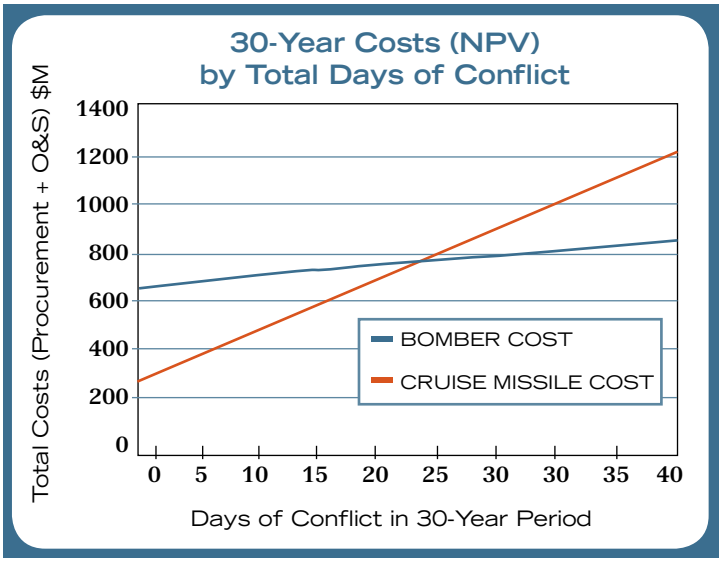
Of course, more than one missile could be launched at each target. Layering six or eight missiles to impact in a pattern around the mobile launcher might cut off some of its routes of escape. However, the use of extra weapons will ripple to demand more missiles and more aircraft to launch them. Risk and costs increase over time.

Nor are missiles suitable for hardened, deeply buried targets. Take the case of the attack on the Novi Sad Bridge in Yugoslavia during the 1999 NATO air war. Other aircraft including F-117s had attempted to drop the bridge. B-2 planners determined one main structure supported the center of the bridge. They targeted it with six 2000-lb. JDAMs, a weapon possessed only by the B-2 at that time. Two more JDAMs were targeted on one end of the bridge. A solitary B-2 put the bridge under water with one pass.

Dropping heavy, fixed targets like bridges takes more ordnance than a suborbital vehicle or missile can deliver. Bridges don't even move: they are easy to identify and restrike. Multiply the ordnance across a number of fixed, hard targets and the utility of a bomber with persistent restrike potential becomes plain indeed.

Stand-off missiles have their uses. But at present, they are not a replacement for the full bomber mission set.

Consider the cost calculations. A recent RAND Project Air Force study also found cruise missiles cost more than bombers over the long term. Their calculations showed that given more than 20 days of combat over a 30-year period, "penetrating stealth bombers cost less than expendable missiles for similar missions."[iv]



The New Bomber

Will the new bomber become part of the nuclear Triad? Air Force officials have deferred the decision, for now.

The bomber will need three distinct attributes to make it into the Triad. First it must pass a series of flight tests demonstrating it can safely launch dummy nuclear weapons "shapes" that mimic actual nuclear bombs and missiles. The tests verify the wiring, command and control and even the physics of how the bomb separates from its rack in the airplane. All this mandates a special flight test program and this is what the USAF has put off for the time being.

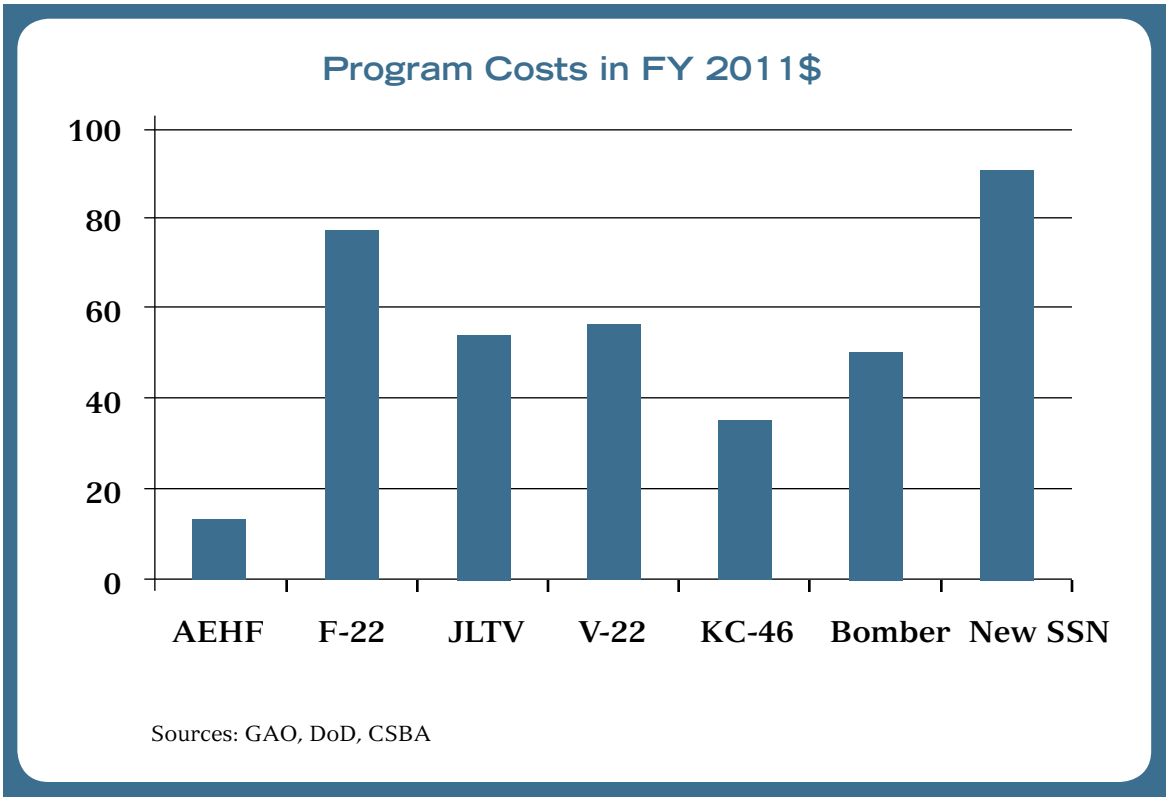
The second and third requirements cannot be deferred because they must be built in from the start. The second requirement is for secure communications allowing commanders to talk to the bomber's crew in flight to ensure a last-minute ability to recall the bomber. The third requirement is for nuclear hardening of the aircraft's systems. On-board electronics especially must be built to withstand nuclear blast effects. The skin, structure and even cockpit windows also have to protect crew and airplane. For obvious reasons, most of the nuclear hardening has to be incorporated in the design from the outset.

DoD has pegged the target price for a new bomber at $550 million. "Although average unit costs for a penetrating bomber could be significantly less than the $2 billion paid for each B-2, finding $40–50 billion for a new program will still be a difficult challenge for DoD, especially in today's economic climate," wrote Mark Gunzinger in a recent analysis of long-range strike options.[v]

The potential cost of a bomber program is substantial. However, it's in line with other acquisition programs. The new KC-46 tanker based on a commercial 767 will cost about $35 billion. Other recent and prospective programs are shown in the chart.

There is much that can be done to control costs. However, analysis shows the most important cost decisions are not about short-changing capability in the design phase. The real cost drivers come much later with decisions about how many aircraft to buy each year and what the total buy will be. Low total buys and slow yearly rates add costs and decrease amortization of research and development sunk costs.

The GAO found that for a portfolio of 56 major defense programs active in 2010, the biggest cost



Array of Program Costs

growth came late in the program, with 65% of the average program's cost growth materializing after production start. Numbers of aircraft, ships, satellites, etc. bought per year and the total program buy affect the overall price-tag more than other factors. The GAO cited the sharp rise in F-22 costs as part of this trend. Conversely, the reduction in cost on the Navy DDG-51 destroyer, which came about as the Navy bought more, offers another proof of the power of quantity to reduce price.

In the end, the cost of the new bomber won't be certain until the Pentagon picks a design and sets the schedule and yearly quantities, probably sometime after 2018, and Congress approves and funds it.

Advanced technology programs are challenging – and that's not just an attribute of today. Schedules slipped and costs grew back in the 1950s when the U.S. military was developing jet bombers, ballistic missile submarines, integrated nationwide air defenses, and satellites. Barry Watts and Todd Harrison of CSBA found in a landmark 2011 study of the defense industry that "cost-change ratios and schedule slippage during the 1950s were not dramatically better than they are today." According to Watts and Harrison, a study led by Andrew Marshall in 1959 found cost growth in selected defense programs ranging from a low of 167% to a high of 257%. Compare that with the 174% cost growth for the Marine Corps V-22 tiltrotor aircraft or the 189% for the early F-22 program and it's clear that program cost growth was "substantially greater in the 1950s than it is today." Not surprisingly, Watts and Harrison also found that schedule slippage was not "appreciably worse" in the 2000s than in the 1950s.[vii]

Sound acquisition principles and program discipline are non-negotiable, of course. But the key for the next five years is to assure the next bomber has the right design attributes to make it effective, survivable and able to deliver the best technology available.

Next Steps in Stealth Bomber Design

The USAF, industry and Pentagon officials who supervise the process should focus now on making the best possible design trades. Here, the USAF is starting a bit behind the game due to the ups and downs of the program. The last Analysis of Alternatives for long-range strike was released in 2007.

Five years later, has technology changed? Programs like F-35, the Navy X-47 demonstrator and others may have new lessons to offer for bomber design. The Air Force Research Laboratory has also invested in advanced engine work by a team at Rolls Royce North America and another at General Electric. The new engine designs "combine a variable cycle core with an ultra-high pressure ratio combustor, producing an engine vastly more efficient at both subsonic and supersonic speeds," according to one report.[viii]

Perhaps these premier engine-makers along with Pratt & Whitney may have breakthroughs in engine technology ready in time for a new bomber.

What should the new bomber look like? Below are some parameters for the design trades.

- Four engines…for extra range and payload margin
- 2500 nm combat radius
- Sized for up to 30,000 lb. payload
- Configured to accept a directed energy weapons module as technology matures
- Efficient engines, perhaps with supersonic dash capability to improve rapid response and survivability
- Capability for self-defense with new types of missiles
- Communications to offload non-traditional ISR and bomb damage assessment

This list of parameters is provided to stimulate discussion. What the bomber program needs most is for Air Force operators to take a fresh look at threats and requirements….and then leave engineers unfettered in making their trades and formulating proposed solutions. It's the Air Force's job to set the right system requirements for a system that will reach full capability after 2020 and be expected to keep doing its job until sometime after 2050. Fretting about so-called "exquisite" capabilities is no substitute for analysis in these decisions.

All parties are committed to a sound acquisition strategy for this new bomber. Knowledge-based practices is the term in vogue for a set of program management practices centering on comprehensive evaluation of technology maturity across the total system design. It prioritizes good management steps such as careful attention to critical design review. Most of these practices have long been known to the aerospace industry.

That said, it would be a big help to appoint a long-term configuration steering group made up of Air Force, OSD and industry representatives who can weigh design trades and prioritize requirements. Decisions always crop up. Some are driven by threat analysis, such as the early 1980s decision to add high-speed, low-altitude flight to the B-2 mission profile. Others fall out from engineering and system design, such as the F-35 weight reduction plan of the mid-2000s.

Almost certainly, the new stealth bomber program will face unforeseen systems engineering challenges and should be able to call on a trusted team of experts to guide those choices without rancor or data disputes. The key is to identify who will "own" the disruptions and who can arbitrate them in a high-stakes situation.

Time to Invest in a New Stealth Bomber?

All these considerations do not directly address one vital question: is this the right time to invest in a new bomber?

The answer goes back to the introductory discussion of changes in defense strategy. Analysis of operations already showed high demand for bombers in regional plans for scenarios ranging from full-scale theater war and deterrence to one-off raids like the attack on the Bin Laden compound. Simply put, the US is already short of what it needs to deter, respond to a raid, and supply forces for a war.

REASON 1:
Demands of Multi-polar Strategy. In a multi-polar world the US must be nimble enough to stretch its power in several directions at once. That does not necessarily mean getting embroiled in more conflicts, especially those demanding 100,000 ground forces for stability operations. What it means is that some forms of military power – bombers high on the list – will have to be sized to act at many different places at once. That provides a form of conventional deterrence by forestalling mischief in one region spurred by having long-range strike forces focused on another area. A multi-polar world is not necessarily a peaceful one. Financial crises impacting Europe, North America and even the growing economies of Asia indicate how quickly tensions might shift. Perhaps most important, this will be a period of uncertainty that feels uncomfortable after a long, predictable Cold War followed by two decades of blanket American military supremacy.

REASON 2:
Tasking in Air Campaign. The second reason is more technical. Recent campaigns indicate bombers will be needed in a campaign when adversaries construct layered air defenses or when targets are difficult to find. Bombers will not be flying missions just for a few nights. They are likely to be tasked on a continuing basis as they were during Operation Desert Storm in 1991.

REASON 3:
Credible conventional deterrence. The third reason stems from the second. Credible conventional deterrence against a nation like China will demand a bomber force large enough to attack many different targets – and have a second wave in reserve. Like China's ancient garrison of Terra Cotta warriors, the bomber force has to be big enough to impress. Bare minimum handfuls do not do the trick.

REASON 4:
Attrition. Attrition is the technical term used by the Air Force to project combat and training losses in an aircraft fleet over the years the aircraft will be in service. In the past, the Air Force bought 10% to 15% extra in aircraft such as the F-16 to account for estimated losses. The practice has all but stopped in the last ten years. "Attrition" has become a forgotten notion over the last 20 years due to the superiority of American aircraft. However, the new bomber will have a 30-year service life. Attrition is likely again to be a factor as adversary air defenses thicken.

Impact on the Industrial Base

The last long-range bomber competition took place from 1980 to 1981 and pitted a team from Lockheed against a team from Northrop. Northrop won and quickly added Boeing, Vought and other major subcontractors and selected General Electric for the engines. Competition worked because both entrants had been vying to outdo each other on stealth programs for several years before they tackled proposals for the new bomber. Their design teams also brought a range of experience from work at other companies and on projects ranging from missiles and radars to the Apollo moon landing program.

Today, three American companies have the technical capability to be the prime contractor for the new bomber: Boeing, Lockheed Martin and Northrop Grumman. All three are highly diversified companies pursuing many other high-technology products for a variety of commercial and defense customers. They are capable competitors because of their work on fighter and unmanned aircraft programs and because they have invested in-house to sustain advanced technology design skills.

The Pentagon has acknowledged how critical the next bomber program is to stimulating innovative design within industry. That applies to the prime contractors but also to engine manufacturers, major subcontractors like BAE, Honeywell, and Raytheon, and smaller industry stalwarts such as Goodrich, Moog, Parker Hannifin and dozens more.

"Long-range strike programs require the cultivation and retention of large military airframe design and manufacturing know-how along with the ongoing evolution of other key technologies and disciplines, such as stealth, composite materials and advanced avionics," said a report from the Aerospace Industries Association.

"Additionally, technical issues related to electronic warfare and the integration of weapons strike capabilities must also be addressed."[x]

Expect a healthy surge in aerospace jobs once a prime contractor is selected. The B-2 bomber head count rose from less than 1000 at time of contract award in 1981 to nearly 6500 at its peak in 1987, just before first flight. Northrop added approximately 1000 jobs per year during this system design phase.[xi] Suppliers added thousands more.

The value of jobs on a bomber program is not primarily to create an economic boon. The ramp-up in engineering and related disciplines is the heart of the American aerospace "industrial base" that must be preserved to ensure future military capability. At the beginning of a program, the surge comes in engineering specialties, as teams translate the winning design into the detailed array of systems needed to build and fly the first aircraft. Structures engineers spar with radar phenomenology specialists who contend with aerodynamicists who must all work to integrate electrical systems for communications, navigation, flight controls and so on. A second wave follows as the new bomber transitions to manufacturing. Now the prime and top suppliers go through the same process of hiring and expansion to design assembly lines, fabricate parts, etc.[xii]

Job totals may not be as high for the next generation bomber. Nor will the timing of job creation benefit any near-term election cycles. Yet there is one certainty: a full bomber program will invigorate critical strike aircraft design skills, and that's a contribution to national security in its own right.

The Air Force and the New Stealth Bomber

The new stealth bomber is backed by strong commitment from the U.S. Air Force. Secretary of the Air Force Michael Donley and Chief of Staff General Norton Schwartz guided the bomber program into place after the cancellation of an earlier long-range strike program during budget cuts in early 2009. Highlights from the timeline below show how Air Force senior leadership solidified consensus on the need for a new stealth bomber.

February 2006. The Department of Defense Quadrennial Defense Review instructs the Air Force to: "Develop a new land-based, penetrating long-range strike capability to be fielded by 2018 while modernizing the current bomber force."

April 2007. An official Air Force Analysis of Alternatives recommends a manned bomber fielded in 2018 as the Next Generation Bomber.

January 2008. Boeing and Lockheed Martin announce they are partnering on the Next Generation Bomber Program. *Aviation Week's Defense Technology International* Editor Bill Sweetman reports that Northrop Grumman is also at work on a bomber, citing a corporate announcement of a restricted programs award.

April 2009. Secretary of Defense Robert Gates cancels the Next Generation Bomber Program. "We will not pursue a development program for a follow-on Air Force bomber until we have a better understanding of the need, the requirement, and the technology," Gates says as part of a series of major budget cuts.

September 2009. At an Air Force Association conference, Secretary of Defense Gates opens the door to a new program by stating: "I am committed to seeing that the United States has an airborne long-range strike capability….a prospective B-3 if you will."

September 2010. Air Force Chief of Staff Norton Schwartz focuses on a "penetrating bomber" to be the centerpiece of a new DoD Long Range Strike family of systems. "The future will call for at least as much if not more deterrence capability than the service currently wields," Schwartz says.

December 2010. The Joint Requirements Oversight Council approves the requirement for a new stealth bomber. This major step carries endorsement by the Vice Chairman of the Joint Chiefs of Staff General James Cartwright, USMC, and Service Vice Chiefs and clears the way for a new formal bomber program.

February 2011. The Pentagon announces that the Fiscal Year 2012 budget and five-year plan will include funds for a long-range strike program. Analysts believe the funding is sufficient for two or three industry teams to submit new bomber designs.

May 2011. Undersecretary of the Air Force Erin Conaton announces the USAF is establishing a program office for the new stealth bomber and expects to buy approximately 80-100 aircraft.

October 2011. Air Force General C. Robert Kehler, Commander, United States Strategic Command, testifies that STRATCOM has "responsibility to offer options to the President to do conventional long range strike."

December 2011. "We see great value in the continuous bomber presence," says General Gary North, Commander, U.S. Air Forces Pacific. "It has become a staple of our force posture and integrates well into the planning construct."

Conclusion

A new stealth bomber is endorsed by the White House, Congress and the Pentagon as a critical component of national security. Work on a new bomber cannot be deferred. "The previous program of record assumed development and production timelines of roughly 10-12 years," noted CRS airpower specialist J.J. Gertler in a 2010 report. Officials talk about introducing a new bomber in the mid-2020s. According to this schedule, that leaves no time to wait or "slip" the program.

Consider it from the Pentagon's perspective. According to a recent article, their "doomsday" scenarios for the next decade or two include an aggressive and militant China; a 1.2 million-man North Korean army driving south as the government collapses; and even a radical Pakistan brandishing nuclear weapons.[ix] Any US president contemplating crises like these would want the most effective options possible to discuss with close international allies. A new stealth bomber can provide the joint force with far more options.

The 70th Anniversary of Pearl Harbor has now passed. Remember the intent of that attack: simply to knock out enough US capability in the Pacific to foreclose US options and keep America out of the way of a rampaging empire across the seas. Eventually, America's carrier airplanes, Marines, Army soldiers and long-range bombers regained their footing in power projection and swung the balance of the war.

The key for the 2020s and beyond is a bomber force that does not tempt any other nation to try to cut off US options. That's an investment well worth making.

Endnotes

[i] Senate Report for FY 2010 Authorization Bill, S. 1390, SEC. 124. NEXT GENERATION BOMBER AIRCRAFT.

[ii] Thomas P. Ehrhard, *An Air Force Strategy for the Long Haul*, CSBA, 2009, pp. 43-44.

[iii] J.J. Gertler, *Air Force Next-Generation Bomber: Background and Issues for Congress*, December 22, 2009, p. 15.

[iv] Thomas Hamilton, "Comparing the Cost of Penetrating Bombers to Expendable Missiles over Thirty Years: An Initial Look," RAND, WR-778-AF, August 2010 at http://www.rand.org/pubs/documented_briefings/DB385.html.

[v] Mark Gunzinger, *Sustaining America's Strategic Advantage in Long-Range Strike*, CSBA, Washington, DC, September 2010.

[vi] GAO, March 2011, GAO-11-233SP Assessments of Selected Weapon Programs, p. 13

[vii] Barry Watts and Todd Harrison, *Sustaining Critical Sectors of the Industrial Base*, CSBA, 2011, pp. 22-24.

[viii] Steven Trimble, "Pratt and Whitney Lifts Wraps on PW9000 Future Military Engine," *Flight Global*, February 25, 2010.

[ix] Anna Mulrine, "Doomsday War Games: The Pentagon's 3 Nightmare Scenarios," *Christian Science Monitor*, December 7, 2011.

[x] Aerospace Industries Association, *The Unseen Cost: Industrial Base Consequences of Defense Strategy Choices*, Arlington, VA, July 2009.

[xi] Christopher Hernandez, *Challenges and Benefits to the Implementation of Integrated Product Teams on Large Military Procurements*, Sloan School of Management, Master of Science in Management, MIT, June 1995. p. 74. Accessed at http://dspace.mit.edu/bitstream/handle/1721.1/11162/34382442.pdf?sequence=1

[xii] For a full discussion of critical skills see: Hernandez, *op. cit.*, pp. 95-97.
Hernandez asks: "So what does the team or better yet, the firm, do with the pyrotechnics expert when he is done with the cockpit? This is a skill that every company developing aircraft needs. It is one to be preserved and developed, but most importantly retained."

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