

The Unaffordable F-35:

Budget History and Alternatives



April 2014

Methodology

All budget numbers contained in this document come from Department of Defense source documents located at <http://comptroller.defense.gov/budgetmaterials.aspx>. The referenced Department of the Air Force and Department of the Navy documents go back as far as FY01 and continue up to and including the FY15 budget request.

These numbers all come from the unclassified version of the budget request and may, therefore, be understated. For instance, although it is the subject of much debate in budget watchdog circles, we accepted as accurate all Air Force, Navy, and Marine Corps estimates of Gross Weapon System Unit Costs.

References to mission capability and/or aircraft modernization plans of various aircraft are quoted from 1) either the same source budget documents or from back-up briefing materials provided to Capitol Hill and to the public on Department of Defense, Department of the Air Force, and Department of the Navy websites, or 2) the website of the prime contractor at <https://www.f35.com/about/capabilities>

Where prices have been "inflated" to current year costs, we used the Bureau of Labor Statistics "Consumer Price Index Inflation Calculator" located at <http://data.bls.gov/cgi-bin/cpicalc.pl>



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Introduction

At least \$8 billion of the Pentagon's budget for fiscal year 2015 is devoted to a single aircraft program: the F-35 Joint Strike Fighter. Already on track to be the most expensive weapon system in history, the F-35 is becoming a black hole in the Pentagon budget. In the face of continuing budget cuts, it is worth considering more conservative investments the military could be making.

The DoD "base" budget request for this year is \$495.6 billion.¹ This single aircraft, one item in the entire U.S. military arsenal, is eating up approximately 1.6% of the *entire Pentagon budget* in FY15.²

Of the total Pentagon FY15 procurement request of \$90.6 billion, \$6.3 billion – just under 7 percent of the entire Pentagon unclassified procurement request – is being spent on procurement of a single aircraft program.

The focus of this analysis is on the affordability of the F-35 and the ready availability of existing alternatives. Problems with the development of the F-35 are well-documented and ongoing. For instance, in its report in January of this year, the Pentagon's Office of Test and Evaluation warned that software development has fallen behind schedule. This, in turn, has a negative impact on the ability to complete development and to flight test the initial combat software package prior to the Marine Corps' stated desire to have operational aircraft in the last half of 2015.

Research and Development

The history of developing high-tech weapons systems for the US Department of Defense (DoD) is littered with programs chronically behind schedule and over budget. Unfortunately, the US taxpayer has grown numb to the idea that nothing is ever going to be as "cheap" as the Pentagon says or take as few years as predicted to reach production. A look back at early assumptions of the F-35 program tells this story in spades.

In early February of 2000, the Pentagon budget for Fiscal Year 2001 (FY01) stated the planned dates for Initial Operational Capability ("IOC") of the F-35 as FY05 for the Air Force, FY06 for the Marine Corps and FY08 for the Navy. After previously slipping several times, in May of 2013 the Pentagon finally announced the new IOCs as FY16 for the Air Force, FY15 for the Marines and FY18 for the Navy. Assuming there are no more delays, this means at least an additional 11 years of spending on Research, Development, Test and Evaluation ("RDT&E") for the Air Force, *nine years* for the Marine Corps, and 10 years for the Navy before a single operational aircraft is in the air.

As a result of the delays, the Air Force will spend more than **\$17.5 billion** in additional RDT&E money in the interim eleven years; the Navy will spend an additional **\$4 billion** prior to having an F-35 that will fly operationally from an aircraft carrier; and the Marine Corps will spend **\$17.6 billion**.³ Combined, **at least \$39.1 billion has been spent on RDT&E that was never in the Pentagon's original program costs for the F-35.** In large part,



F-15E Strike Eagle (Boeing)

that money went to contractors for additional research and several rounds of redevelopment when the contractors failed to meet the F-35 goals set by the Pentagon. There appears to have been no penalty to the contractors for those failures.

Air Force

The Air Force expects the F-35 to be able to conduct nearly all of its aircraft missions.⁴ The prime contractor lists the widely divergent missions the F-35 is expected to meet: air-to-surface, air-to-air, Intelligence, Surveillance and Reconnaissance (ISR), Command and Control, and Electronic Attack.

Air Force budget documents state the F-35 is, "the next generation strike fighter which entails increased aero performance, stealth signature and countermeasures. Its advanced avionics, data links and adverse weather precision targeting incorporate the latest technology available."

What else can you get for \$8 billion?

Other Things That Cost About \$8 billion in the FY15 Budget Request

FEDERAL DEPARTMENT or PROGRAM	FY15 BUDGET REQUEST In billions
The Army Reserve*	\$8.0
All Capital Shipbuilding except VIRGINIA class submarine	\$8.6
Missile Defense Programs (RDT&E)	\$8.2
Military Family Support Programs^	\$9.0
Military personnel working in Military Health Services	\$8.6
Military Construction and Family Housing	\$6.5
Department of the Army RDT&E	\$6.6
Department of Commerce	\$8.8
Environmental Protection Agency	\$7.9
National Science Foundation	\$7.3

*Includes Military Personnel, Operation & Maintenance, Military Construction Appropriation levels, and estimated Procurement funding excluding National Guard and Reserve Equipment Appropriation (NGREA) funding

^ Includes Child Care and Youth Programs, Morale, Welfare and Recreation, Warfighter and Family Services, Commissaries, DoDEA Schools, and Military Spouse Employment

In its FY15 request, the service has devoted 100 percent of its combat aircraft procurement budget to this one plane. The Air Force's "Gross Weapon System Unit Cost" for the F-35 is \$149.7 million per aircraft in FY15. ⁶ It wants to buy 26 F-35s in the coming fiscal year. Therefore, in procurement of "Gross Weapons Systems" (airplanes) only, Air Force's budget documents identify an investment of more than \$3.8 billion. ⁷ When all the procurement, research and development and modifications to aircraft already in service are tallied, the Air Force is devoting more than \$4.6 billion to the F-35 this year. The new hangars with the infrastructure to support the requirements of these aircraft as well as new school buildings to teach the pilots and ground crew who will be flying and maintaining the planes and handling the ordnance will cost an additional \$66 million, bringing the total costs to more than \$4.7 billion.

What else could \$4.7 billion buy?

After thirteen years of war that focused spending and modernization on the Army and Marines, the Air Force is struggling within the Pentagon budget process for attention to its force structure. The Air Force lists its core missions as: 1) Air and Space Superiority, 2) Intelligence, Surveillance and Reconnaissance (ISR), 3) Rapid Global Mobility, 4) Global Strike (including nuclear deterrence), and 5) Command and Control. Air Force budget documents list modernization efforts the Air Force deems critical to each of these core missions. Of greatest interest to this analysis is the modernization efforts listed under "Air and Space Superiority" and "Global Strike."

New Combat Aircraft Procurement

The U.S. currently flies the most advanced fighter aircraft in the world. Two of the most successful fighter aircraft in modern warfare are the F-15 Eagle and the F-16 Falcon. The F-15 Eagle runs the gamut from early "A" models to the most recent F-15E Strike Eagle. Back in 2001, the Air Force described the F-15E as retaining all the capabilities of earlier F-15 models and adding, "the systems necessary to meet the requirement for all weather deep penetration and night/under-the-weather air-to-surface attack." In the FY02 budget, the Air Force listed flyaway cost as \$75 million. Inflated to 2014 dollars, a highly capable F-15E Strike Eagle would cost the Air Force \$99 million each – roughly \$50 million a copy (or one-third) cheaper than what the Air Force is listing as this year's unit cost for an F-35.

In 2001, the Air Force described the F-16 Fighting Falcon "as the world's premier multi-mission fighter":

It is a fixed-wing, high performance, single-engine fighter aircraft. ...the F-16 has proven itself in combat in a variety of air-to-air and air-to-surface missions such as defense suppression, armed reconnaissance, close air support, combat air patrol, forward air control, and battle air interdiction (day/night and all-weather). Also during these years the aircraft has evolved in its capabilities to exploit the advances made in computer, avionics systems, engine and structures technologies. The F-16 has been selected by 20 air forces around the world. USAF and foreign military sales production will continue well into the 21st century."

An F-16 cost \$23 million in FY01, roughly \$30.5 million today. It is 80 percent cheaper than the \$149 million currently listed for an F-35.

With a standard operational mix of one-third F-15s and two-thirds F-16s, and a budget equal to the \$4.6 billion procurement request for the F-35, the Air Force could instead buy 48 new F-16s and 24 new F-15s for \$3.7 billion. That would leave almost \$1 billion to devote to an array of other high priority aircraft needs. For instance, the Air Force might continue modernizing the A-10 to continue the close air support role that Russian President Vladimir Putin's recent excursion suggests may not be so obsolete after all.⁸ In-service aircraft also come with existing infrastructure and training already purchased by the Air Force. So the new military construction and training costs that are part of the logistical "tail" of any new aircraft would also be saved.



F-16 Falcon (Lockheed Martin)

Ongoing Combat Aircraft Modernization

Instead of buying new aircraft, the Air Force could accelerate existing plans to modernize the combat aircraft currently in the inventory:

F-22 Raptor. The F-22A Raptor is described by the Air Force as "...the most advanced operational fighter aircraft in the world."⁹ The Air Force maintains a program to modernize its entire fleet of Raptors to, "...ensure its ability to dominate in every environment. ... maintaining a positive glide path toward sustaining air dominance within highly-contested environments. ... To stay ahead of evolving threats and remain the world's premiere air dominance fighter, modernization of the F-22's combat capabilities is a major area of emphasis." The total price tag to modernize the F-22 fleet is listed as approximately \$3.7 billion. In FY15, the Air Force requests \$180.2 million. The Air Force states they have spent \$2.17 billion through FY14 on modernizing the Raptor, **leaving approximately \$1.5 billion to complete this modernization effort.**

F-15 Eagle. The Air Force has an ongoing program to modify its F-15C/D aircraft. The plan is to modernize 179 of the total 230 with both offensive and defensive improvements to radars and warning survivability systems. According to Air Force budget documents, this modernization, "...vastly improves F-15 survivability through installation of a new radar warning receiver, internal jammer, and an integrated countermeasures dispenser system.

These efforts enable the 'Long-Term Eagle Fleet' to operate effectively for decades to come." Total price tag to modernize 179 F-15s is listed as \$3.9 billion. In FY15, the Air Force requests \$387 million. The Air Force states they have spent \$1.5 billion through FY14 on this program, **leaving approximately \$2.4 billion to complete this modernization effort.**

F-16 Falcon. The F-16 Fighting Falcon is the most ubiquitous and successful multi-role fighter aircraft program in the world. The most current of the life extension programs for the F-16 is intended to add 8-10 years of service life to each airframe. The Air Force budget prices the improvement program at \$962 million overall, but does not state how many airframes are modernized for that amount. In FY15, the Air Force requests \$12.3 million. The Air Force states they have spent \$660.5 million through FY14 on this program, **leaving approximately \$301.5 million to complete this modernization effort.**

The Air Force's budget documents indicate that *all currently planned modernization for the F-22, the F-15 and the F-16* could be purchased for \$4.2 billion. This is well within the more than \$4.6 billion the Air Force is asking Congress to devote to procurement and research and development of the F-35 in just the coming fiscal year.

F-22 Raptor (Lockheed Martin)



Related data: FY15 Budget Request, Air Force, F-35 related

Service	Line Item, (Quantity if Applicable), and Line Number	Budget request in thousands
Air Force	F-35(26), procurement Combat Aircraft Line #1	3,553,046
Air Force	F-35 advance procurement Combat Aircraft Line #2	291,880
Air Force	F-35 Modifications, procurement Tactical Aircraft Line #28	187,646
Air Force	F-35 Engineering and Manufacturing Development R&D Line #49	4,976
Air Force	F-35 Engineering and Manufacturing Development R&D Line #75	563,037
Air Force	F-35 Squadrons	
	R&D Line #140	43,666
Procurement, Research and Development Subtotal, Dept. of the Air Force		\$4,644,251
Service/Location	Military Construction Project	Budget request in thousands
Air Force/ Nellis AFB, NV	F-35 Weapons School Facility	8,900
Air Force/ Luke AFB, AZ	F-35 Aircraft Mx Hangar–Sqdn #2	11,200
Air Force/Nellis AFB, NV	F-35 Aircraft Mx Unit – 4 Bay Hangar	31,000
Air Force/Luke AFB, AZ	F-35 Flightline Fillstands	15,600
Military Construction Subtotal, Dept. of the Air Force		\$66,700
Dept. of the Air Force Subtotal		\$4,710,951



Navy and Marine Corps

The Department of the Navy, which purchases aircraft for both the naval service and the Marine Corps, devotes almost one-quarter of its combat aircraft procurement budget to the F-35 this year. The Navy's two different "Gross Weapon System Unit Cost" numbers for FY15 are \$344.8 million for the carrier variant, and \$217.2 million for the short take-off and vertical landing (STOVL) variant.¹⁰ The plan is to procure two carrier variant and six STOVL variant F-35s in the coming fiscal year. Therefore, in procurement of "Gross Weapons Systems" (airplanes) only, Navy budget documents identify an investment of more than \$3.3 billion. And, like the Air Force, the Navy also devotes some scarce military construction dollars to preparing bases to receive the new system. The unclassified total for the Navy investment in the F-35 in FY15 is \$3.36 billion.

What else could \$3.4 billion buy?

The Navy and Marine Corps mix of combat aircraft includes F/A-18 E/F Super Hornets, EA-18G Growlers, E-2D Advanced Hawkeyes, V-22 Medium Lift aircraft, the P-8 Poseidon and at least three different helicopters. As a whole, the naval service avoids the trap the Air Force has pursued of putting all efforts at modernizing its combat aircraft into a single airframe. The Marine Corps, however, is closer to the Air Force in its greater reliance on the F-35 airframe for the future of its tactical aviation mission. The Marines plan to have the F-35 replace both its short take-off and vertical landing (STOVL) mission currently flown by the AV-8B Harrier as well as the missions performed by Marine Air Wings currently flying carrier- and land-based F/A-18s.

New Combat Aircraft Procurement

A debate lingers in the Navy about the cost-to-benefit ratio of purchasing more F/A-18E/Fs or transitioning to a carrier based F-35. In FY13, the last budget year with a significant Super Hornet buy, the Navy said, "F/A-18E/F can ... accomplish specific fighter or attack missions. This capability allows the Operational Commander more flexibility in employing his tactical aircraft in a dynamic scenario. The primary design mission for the F/A-18E/F is a strike fighter which includes the traditional applications, such as fighter escort and fleet

air defense, combined with the attack applications, such as interdiction and close air support. Since the same airframe systems are used on attack missions as well as fighter missions, excellent fighter and self defense capability is retained.”

The Super Hornet's "Gross Weapon System Unit Cost" is \$70.5 million for the last production year (FY13) as listed in the Navy's most recent budget request. The Navy could save a lot of money by purchasing Super Hornets rather than either variant of the F-35. **Total cost for 8 Super Hornets: \$564 million.**

Looking at the unclassified documents stating the Navy's requirement for F-35s through FY19, if unit costs remain the same (doubtful, but impossible to accurately gauge) the table below indicates what the Department of the Navy will spend on F-35s in the Future Years Defense Program (FYDP):

Variant	Total airframes FY15-19	Gross Weapon System Unit Cost, FY15 (in millions)	Total Cost, FY15-19 (in millions)
F-35C (carrier)	36	\$344.8	\$12,412.8
F-35B (STOVL)	69	\$217.2	\$14,986.8
Total, F-35B and C			\$27,399.6

Navy budget documents state there is a total requirement of 408 V-22, with 126 airframes still to be purchased. Total cost for 126 V-22s is \$10.24 billion. The budget also indicates a total requirement of 117 P-8 Poseidon patrol aircraft, with 64 airframes still to be purchased. Total cost for 64 P-8s is \$17.33 billion. For the \$27 billion between now and FY19, the Navy could complete the purchase of **the entire remaining identified requirements for the V-22 and the P-8.**

Ongoing Combat Aircraft Modernization

The Navy also has robust modernization plans for at least six different platforms beyond the F-18: the P-3 patrol aircraft is being replaced by the P-8, the venerable H-1 helicopter frame is being modernized to Y and Z variants, two versions of the MH-60 (R&S) are in production, the V-22 medium lift aircraft continues in procurement, and the E-2D Advanced Hawkeye is being updated.

For the remaining approximately \$2.8 billion the Navy currently plans to spend on F-35s just in FY15 it could instead fund 10 percent of its remaining V-22 requirement (\$1 billion), 10% of its Advanced Hawkeye requirement (\$874 million), 10% of its H-1 modernization program (\$473 million), 10% of its MH-60R (\$113 million) and MR-60S (\$24.5 million) requirements and still have more than \$300 million left over. *In other words, without purchasing the F-35, the Navy could complete its current modernization plan for existing combat aircraft in 10 years.*

Related data: FY15 Budget Request, Department of the Navy, F-35 related

Service	Line Item, (Quantity if Applicable), and Line Number	Budget request in thousands
Navy	Joint Strike Fighter, Carrier Variant (2) procurement Combat Aircraft Line #5	610,652
Navy	Joint Strike Fighter, Carrier Variant, advance procurement Combat Aircraft Line #6	29,400
Navy	F-35 CV Series, Modification of Aircraft, Line #64	20,502
Marine Corps	Joint Strike Fighter, Short Take Off Variant (6) procurement Combat Aircraft Line #7	1,200,410
Marine Corps	Joint Strike Fighter, Short Take Off Variant, advance procurement Combat Aircraft Line #8	143,885
Marine Corps	F-35 STOVL Series, Modification of Aircraft, Line #63	285,968
Navy	Joint Strike Fighter, Engineering and Manufacturing Development R&D Line #136	516,456
Marine Corps	Joint Strike Fighter, Engineering and Manufacturing Development R&D Line #135	513,021
Procurement, Research and Development Subtotal, Dept. of the Navy		\$3,320,294
Service/Location	Military Construction Project	Budget request in thousands
Navy/Unspecified	F-35 Operational Training Facility	22,391
Navy/Unspecified	F-35 Facility Addition and Modification	16,594
Navy/NAS Fallon, NV	Facility alteration for F-35 Training Mission	3,499
Military Construction Subtotal, Dept. of the Navy		\$42,484
Dept. of the Navy Subtotal		\$3,362,778

Endnotes

¹ Does not include Overseas Contingency Operations, DoD related spending at the Department of Energy, and other items.

² These numbers are what can be found in the unclassified portion of the Pentagon budget. There may be more, there probably is more, but that is beyond the reach of this analysis.

³ Because research and development for the Marine and Navy variants of the F-35 were in the same budget line item until FY11, and from FY12 into the future it was funded in two budget line items, it is more complicated.

⁴ *Except* tanking, airlift, combat search and rescue, and some aspects of global strike.

⁵ Historic research and development costs are very hard to pin down as some early research tracks don't pan out or end up contributing to another system altogether.

⁶ Unit costs are notoriously hard to estimate, and there are many schools of thought on what constitutes a true "fly away" cost.

⁷ These numbers get complicated as the service *subtracts* some prior year advance procurement with one hand and then *adds* current year advance procurement with the other.)

⁸ In one of the more controversial elements of the Air Force budget request, the A-10 aircraft, ably performing the close air support mission in recent history, would be retired. The FY15 budget documents show that more than \$900 million has been invested recently in modernization of the A-10 to include wing replacements. Almost \$1 billion has been spent to make the A-10 viable in modern warfare; but this recent investment in modernization would be wasted as the service shovels all available combat aircraft funds into the F-35.

⁹ Criticism of the F-22 is beyond the scope of this study. However, it is a tool in the Air Force arsenal and the costs associated with its research, development and procurement have already been spent on behalf of the American taxpayer.

¹⁰ The Navy notes in its budget tables, development of both variants prior to FY11 was done in a single budget line item and it is impossible to tell how the department has assigned these developments costs individually between the two models.