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Center for Strategic and Budgetary Assessments

FY 2016 WEAPON SYSTEMS FACTBOOK

JACOB COHN
JESSE SLOMAN

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ABOUT THE CENTER FOR STRATEGIC AND BUDGETARY ASSESSMENTS (CSBA)

The Center for Strategic and Budgetary Assessments is an independent, nonpartisan policy research institute established to promote innovative thinking and debate about national security strategy and investment options. CSBA's analysis focuses on key questions related to existing and emerging threats to U.S. national security, and its goal is to enable policymakers to make informed decisions on matters of strategy, security policy, and resource allocation.

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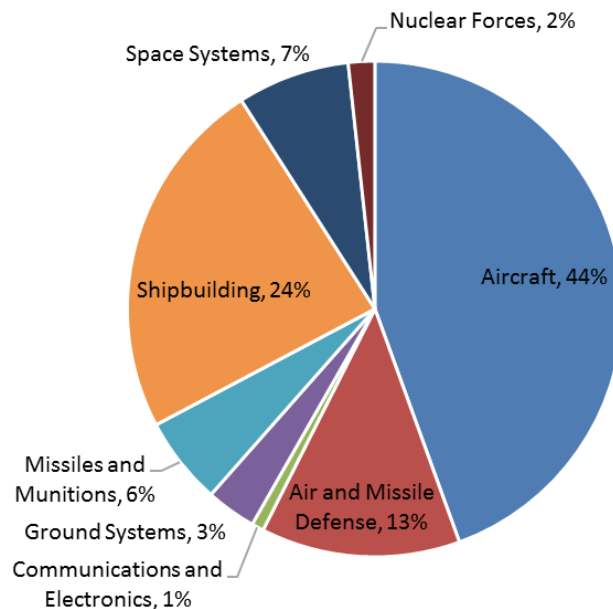
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Introduction

Each year, the Department of Defense (DoD) submits Selected Acquisition Reports (SARs) to Congress detailing the status, plans, and funding requirements for more than 80 major acquisition programs. The most recent SARs, which were submitted in December 2014 and are consistent with the President's FY 2016 budget request, project funding and quantities for major acquisition programs extending more than 30 years into the future. The SARs project that these programs will need \$337 billion over the Future Years Defense Program (FYDP) spanning FY 2016 to FY 2020, and an additional \$453 billion in FY 2021 and beyond.

This report summarizes the program plans and funding for each of the major acquisition programs included in the SARs and four additional programs. The Air Force's Long Range Strike-Bomber (LRS-B); Long Range Standoff Missile (LRSO); and Ground Based Strategic Deterrent (GBSD), the future replacement for the Minuteman III, and the Navy's Ohio-Class Replacement programs do not have SARs, but enough is known about each program to construct a reasonable cost estimate. The LRS-B, LRSO, GBSD and Ohio Replacement programs are among the largest acquisition programs in DoD's portfolio and any discussion of major acquisitions would be incomplete without them. The programs included in this report represent 36 percent of the total acquisition budget in the FY 2016 FYDP. The remaining 64 percent of funding is used for hundreds of smaller acquisition programs not reported in the SARs or other programs too early in development to be included in the SARs.

SELECTED ACQUISITION REPORT FUNDING BY CATEGORY IN 2016 FYDP



The *Weapon Systems Factbook* presents a long-term projection of Department of Defense modernization programs beyond the five-year horizon of the FYDP. By presenting the entire projected life of a program, *the Factbook* identifies trends in program spending, shows the rate of change in future financing, and highlights deviations within a program that may merit further scrutiny. Moreover, it helps highlight what systems or categories of systems will absorb the largest portions of the Department of Defense's modernization budget.

As a reference book, it also provides a big picture look at current and projected major acquisition programs, not the year-to-year variations seen in successive FYDP plans. Finally, it can help identify years or periods where fiscal demands on modernization accounts will be particularly extreme.

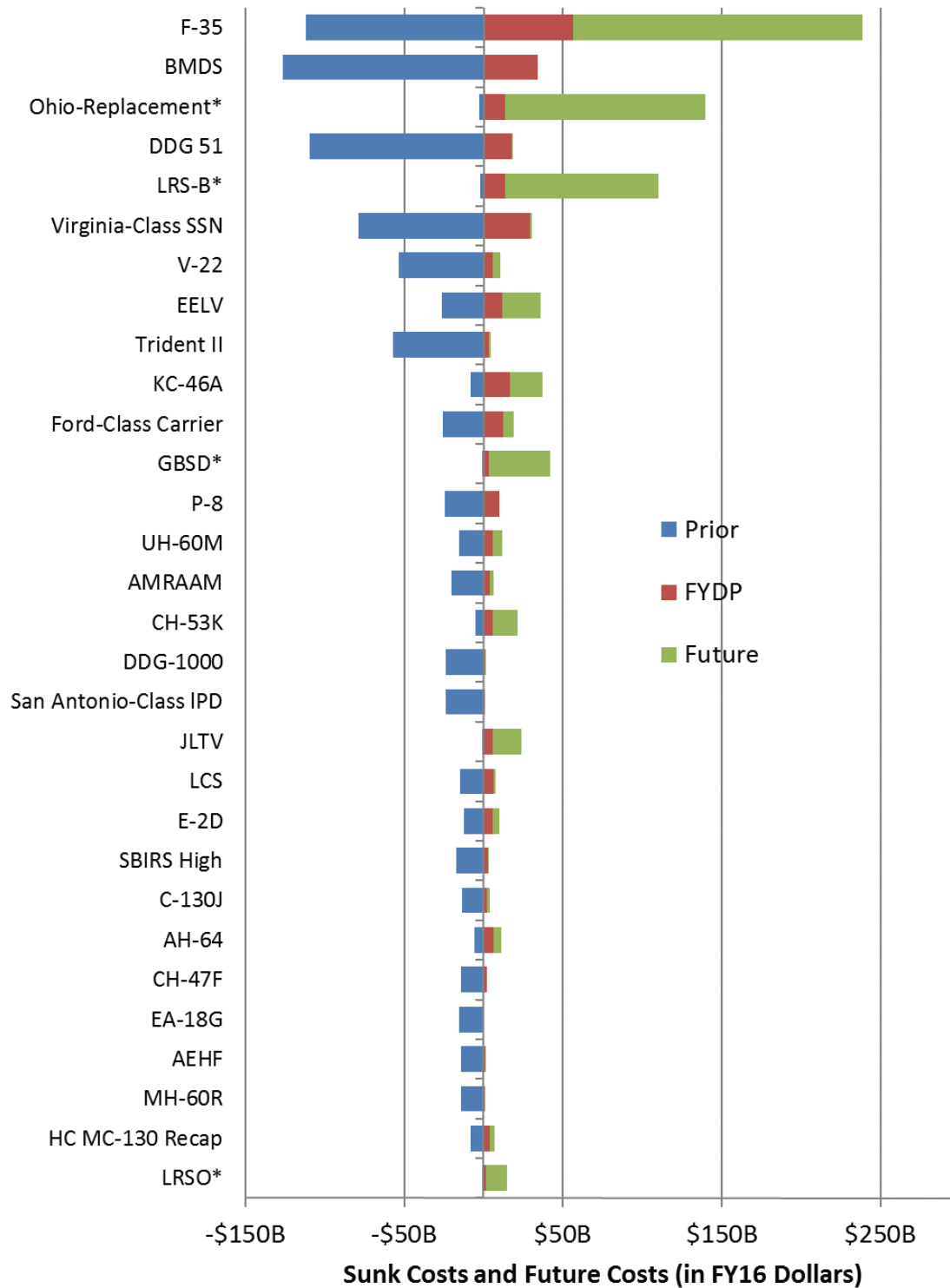
The recently released FY 2017 budget request has altered the planned procurements over the FYDP for several major weapons systems. The request does not, however, provide enough detail to adjust our long-term projections of program costs. Programmatic changes included in the FY 2017 budget request will be incorporated into future editions of this report.

The *Weapon Systems Factbook* report is divided by categories of weapon systems into: aircraft, air and missile defense, communications and electronics, ground systems, missiles and munitions, nuclear forces, shipbuilding, and space systems. The aircraft category is the largest among these, both in terms of the number of programs and the total funding projected. It includes fixed-wing, rotary-wing, and manned and unmanned aircraft for all four Services.

Unless otherwise noted, the cost and quantity figures used in this report are from the December 2014 SARs obtained through a Freedom of Information Act (FOIA) request. The SARs do not include complete funding projections for some programs, as noted throughout the report. Unlike other CSBA budget analyses, cost figures in this report are shown in then-year dollars unless otherwise noted.¹

¹ Then-year dollars are used to show the projected funding levels of programs when a comparison is not being made to any other program. When programs are compared to one another, as in the figure on pp. 3, constant-year FY 2016 dollars are used to adjust for the effects of inflation.

TOP 30 ACQUISITION PROGRAMS BY TOTAL FUNDING²

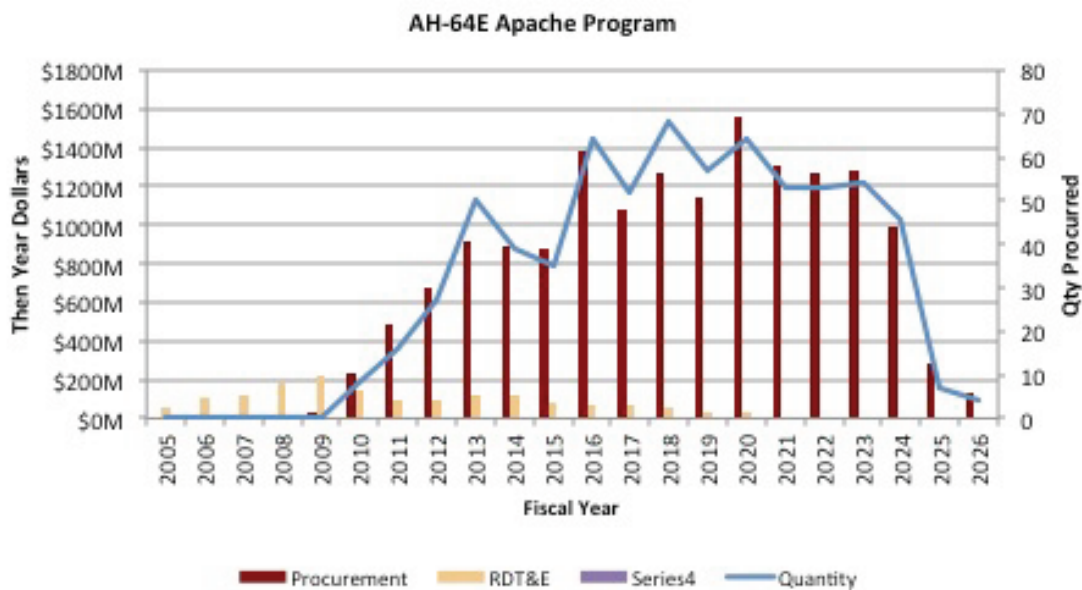


² Programs marked by “*” do not have SARs and are based on CSBA estimates.

Aircraft

AH-64E Apache

The AH-64E Apache Attack Helicopter integrates improved sensors, advanced munitions, and other modernized systems such as an improved engine and transmission. Some AH-64E helicopters are remanufactured versions of existing aircraft and others are newly built through the program. The AH-64E is intended to be fully “network-centric” and interoperable with current and future Army forces, while having a smaller logistics footprint and lower operating costs than previous iterations of the Apache.³ The AH-64E entered full-rate production in March 2014.⁴ A total of \$5.46 billion has been appropriated through FY 2015 for 163 remanufactured and 17 new helicopters. An additional \$6.68 billion was requested over the FY16 FYDP for 298 remanufactured helicopters and 7 new helicopters, and \$5.25 billion is planned for beyond the FYDP for 178 remanufactured and 39 newly built systems.⁵



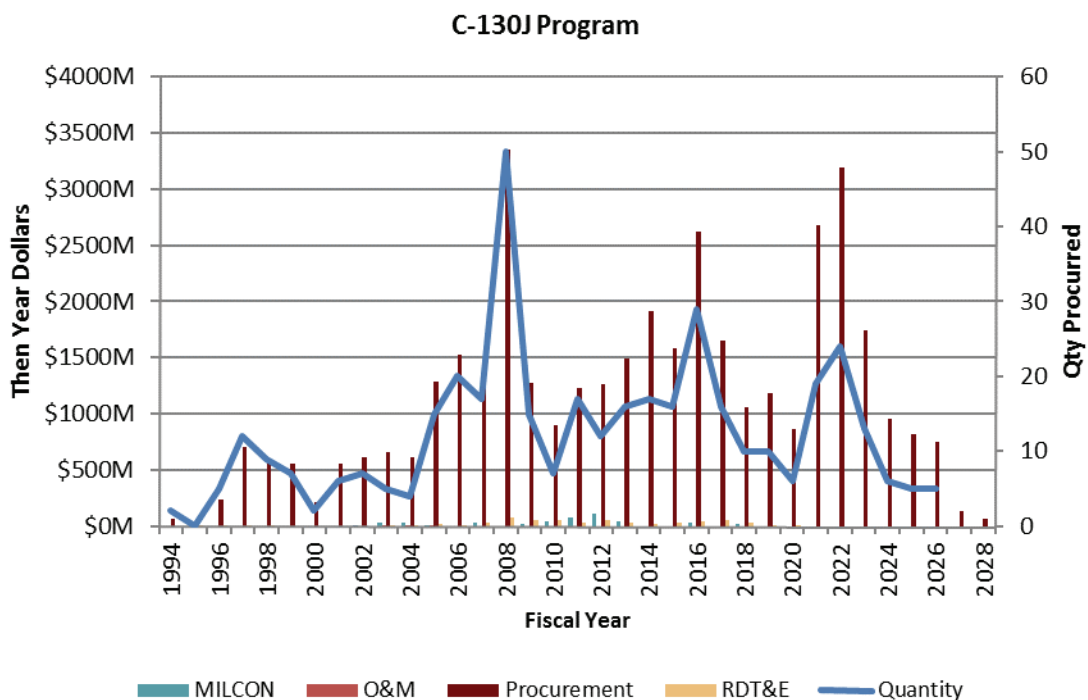
³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AH-64E_New_Build_SAR_Dec_2014.PDF and http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AH-64E_Remanufacture_SAR_Dec_2014.PDF.

⁴ Jon Hemmerdinger, “Apache AH-64E enters full-rate production,” *Flightglobal*, March 5, 2014.

⁵ Five remanufactured helicopters were procured with RDT&E funding, but are not included in the quantity line.

C-130J Variants

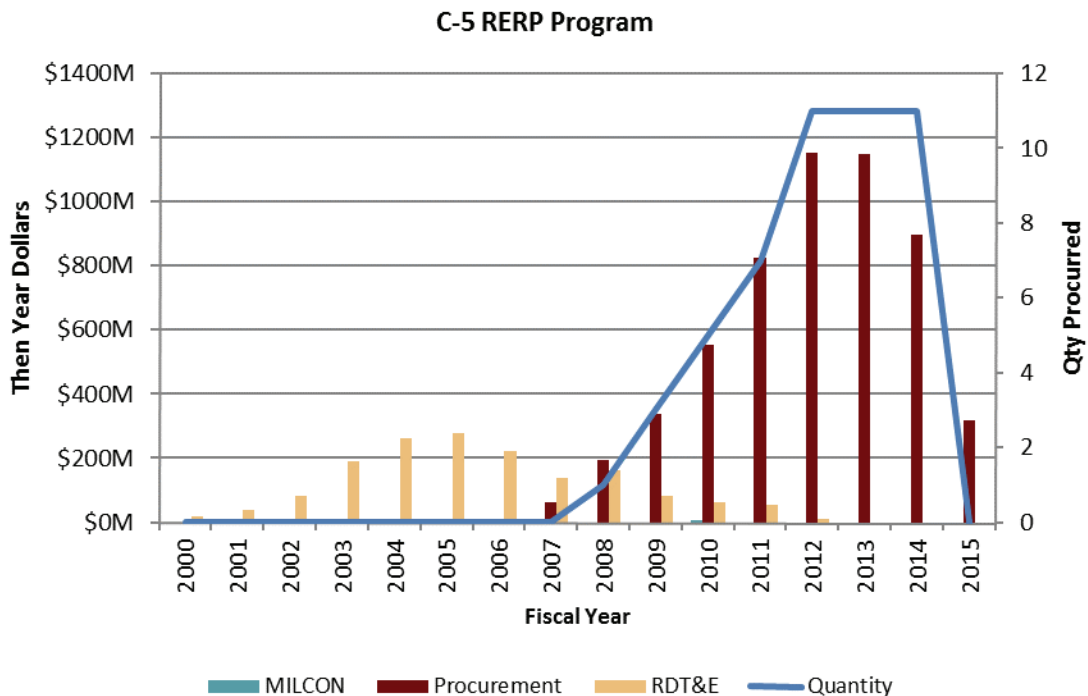
DoD is procuring several variants of the C-130J aircraft. The C-130J aircraft provides medium-range, tactical airlift to transport cargo and personnel within a theater of operations. It can carry more than 40,000 pounds of cargo or up to 84 paratroopers, and the stretched version has 30 percent more useable volume over previous versions. The HC/MC-130J variant provides aerial refueling as well as infiltration, supply, and recovery of specialized tactical ground units. It climbs faster and higher and can take off and land within a shorter distance than previous models. The KC-130J air-to-air refueling variant is being procured for the Marine Corps to replace the KC-130 F/R/T aircraft. The KC-130J can be configured to support refueling, troop transport, cargo delivery, medical evacuation, intelligence, surveillance, and reconnaissance activities, and close air support. A total of \$22.76 billion has been appropriated through FY 2015 for the development and procurement of 137 C-130Js, 71 HC/MC-130Js, and 53 KC-130Js. An additional \$7.56 billion was requested over the FY16 FYDP for 24 C-130Js, 37 HC/MC-130Js, and 10 KC-130Js. Beyond the FYDP, the services project an additional \$10.33 billion in funding for 8 C-130Js, 23 HC/MC-130Js, and 41 KC-130Js.⁶



⁶ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_KC-130J_SAR_Dec_2014.PDF.

C-5 Reliability Enhancement and Re-Engining Program (C-5 RERP)

The C-5 RERP program is the second phase of a two-part modernization effort for the C-5. The first phase adds modernized aircraft avionics and the second phase will improve aircraft reliability and availability by replacing the current engine with a more reliable commercial engine. After the completion of the second phase, each C-5 will be designated a C-5M. Initial operating capability was declared in February 2014 after delivery of the sixteenth C-5M of the 52 currently planned.⁷ A total of \$7.09 billion has been appropriated for the entire program, ending in FY 2015.⁸

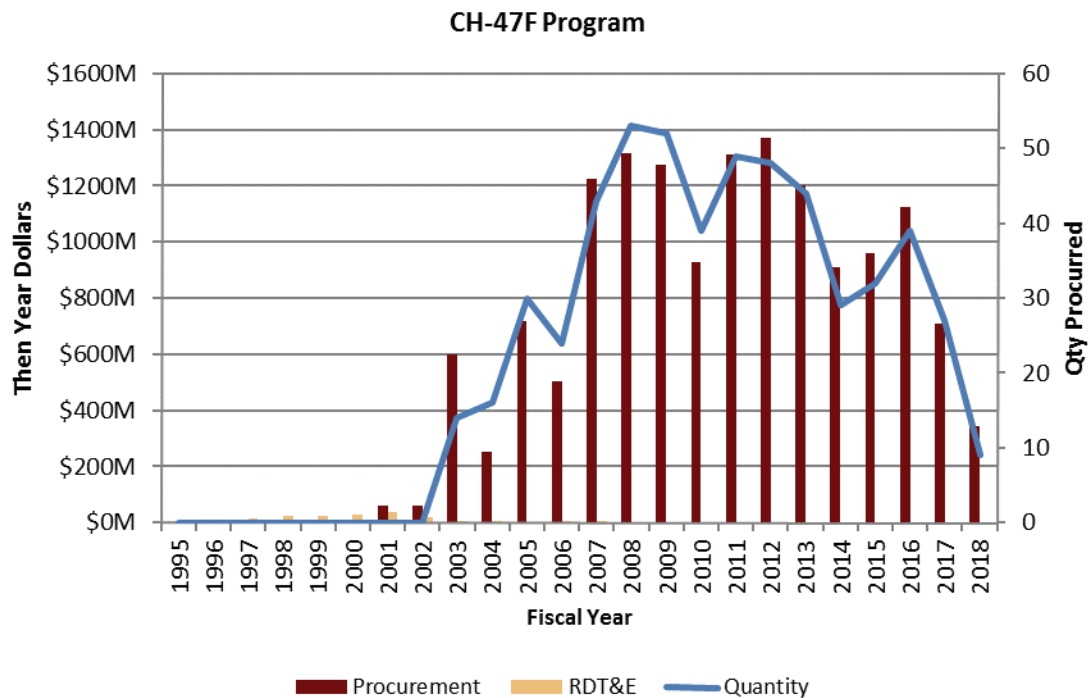


⁷ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_C-5_RERP_SAR_Dec_2014.PDF.

⁸ The modernization of three C-5 aircraft was funded with RDT&E spending and is not reflected in the quantity line.

CH-47F Improved Cargo Helicopter (CH-47F)

The CH-47F is a twin-engine, heavy-lift helicopter used to transport ground forces, supplies, and other battle-critical cargo in support of maneuver, fire support, air defense, and survivability missions. The program is composed of both remanufactured and new aircraft. New structural components and modifications have increased operating efficiency, crew endurance, and decreased the time required to deploy the CH-47F helicopter aboard C-5 or C-17 transport aircraft. The program is on schedule and in full-rate production.⁹ A total of \$12.86 billion has been appropriated through FY 2015 and \$2.18 billion was requested in the FY 2016 FYDP through the end of the program in FY 2018.¹⁰

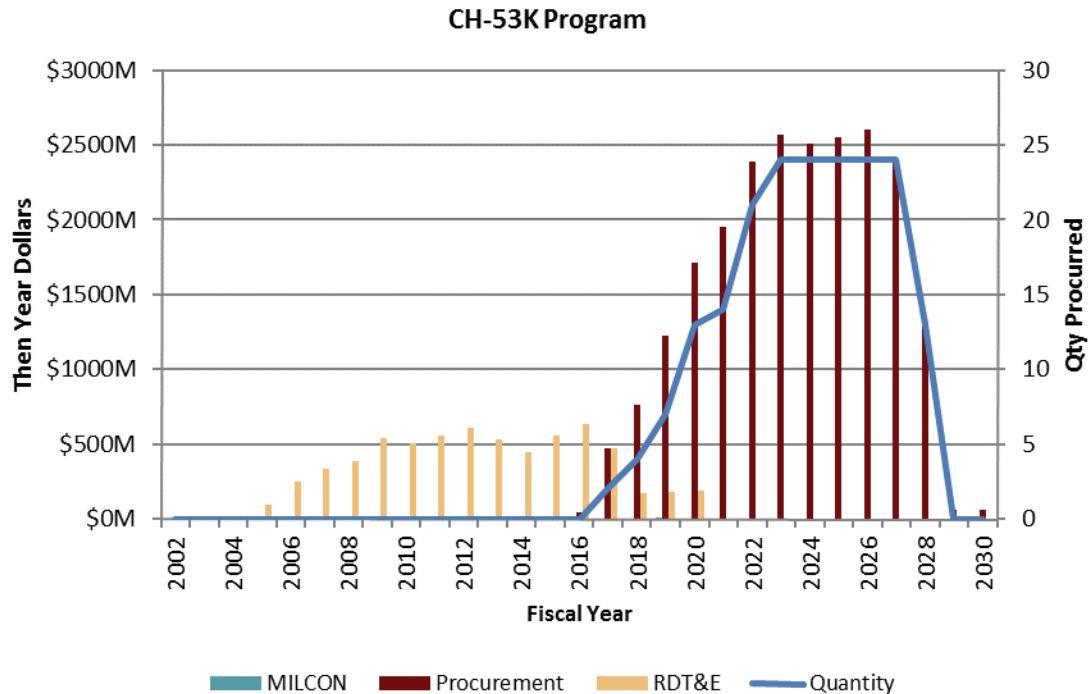


⁹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_CH-47F_SAR_Dec_2014.PDF.

¹⁰ Two CH-47F helicopters were procured with RDT&E funding, but are not included in the quantity line.

CH-53K Heavy Lift Replacement Helicopter (CH-53K)

The CH-53K is intended to replace the heavy-lift function of the CH-53E, providing increased range, payload, survivability, force protection, reliability, maintainability, and coordination with other assets, while reducing total ownership costs. Flight testing began in October 2015 and a Milestone C decision is expected in 2017.¹¹ The program expects to procure 194 helicopters through FY 2028. A total of \$4.85 billion has been appropriated through FY 2015, \$5.87 billion was requested over the FY16 FYDP, and \$18.5 billion is planned for beyond the FYDP.¹²

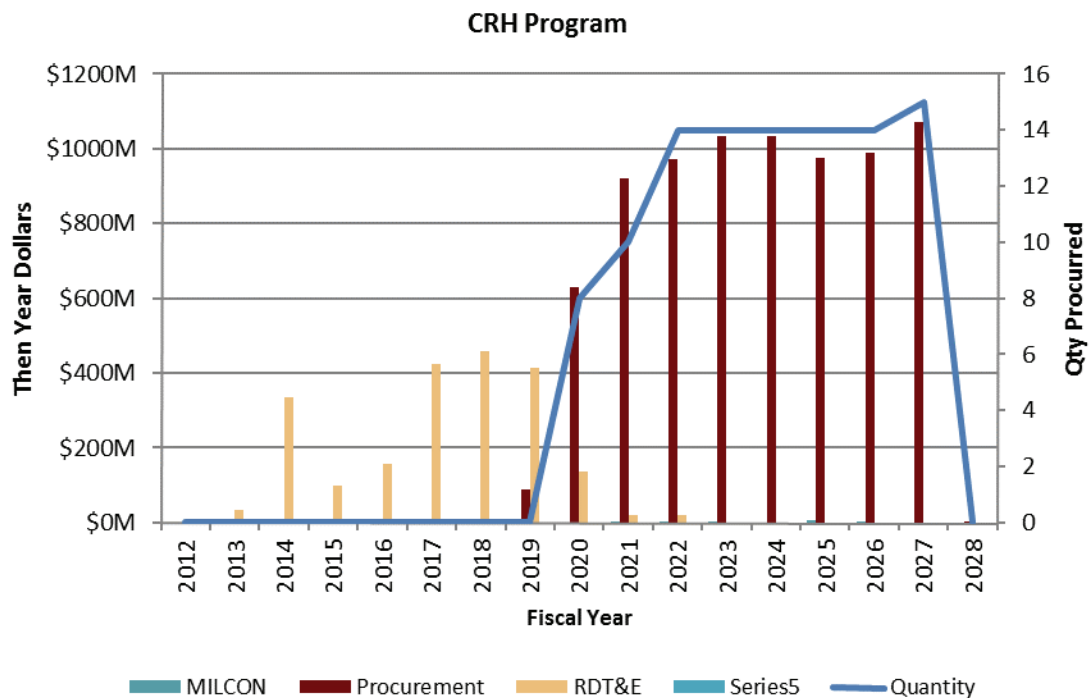


¹¹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/14-F-0402_DOC_17_CH-53KDecember2013SAR.PDF.

¹² Six CH-53K helicopters were procured with RDT&E funding and are not included in the quantity line.

Combat Rescue Helicopter (CRH)

The Combat Rescue Helicopter (CRH) will replace the HH-60G Pave Hawk helicopters performing the search and rescue mission for the Air Force. Onboard defensive systems will allow the CRH to operate in some non-permissive environments and an aerial refueling capability will allow it to fly on airborne alert. DoD waived the requirements for both competitive prototyping and demonstration of technology in a relevant environment, claiming that the program will rely on already proven technology. As such, there is an unknown level of additional risk facing the CRH as the program matures.¹³ Initial deliveries are expected in 2019. A total of \$477 million has been appropriated through FY 2015, an additional \$2.31 billion was requested over the FY16 FYDP, and \$7.05 billion is planned for beyond the FYDP. The Air Force plans on procuring 103 helicopters.¹⁴

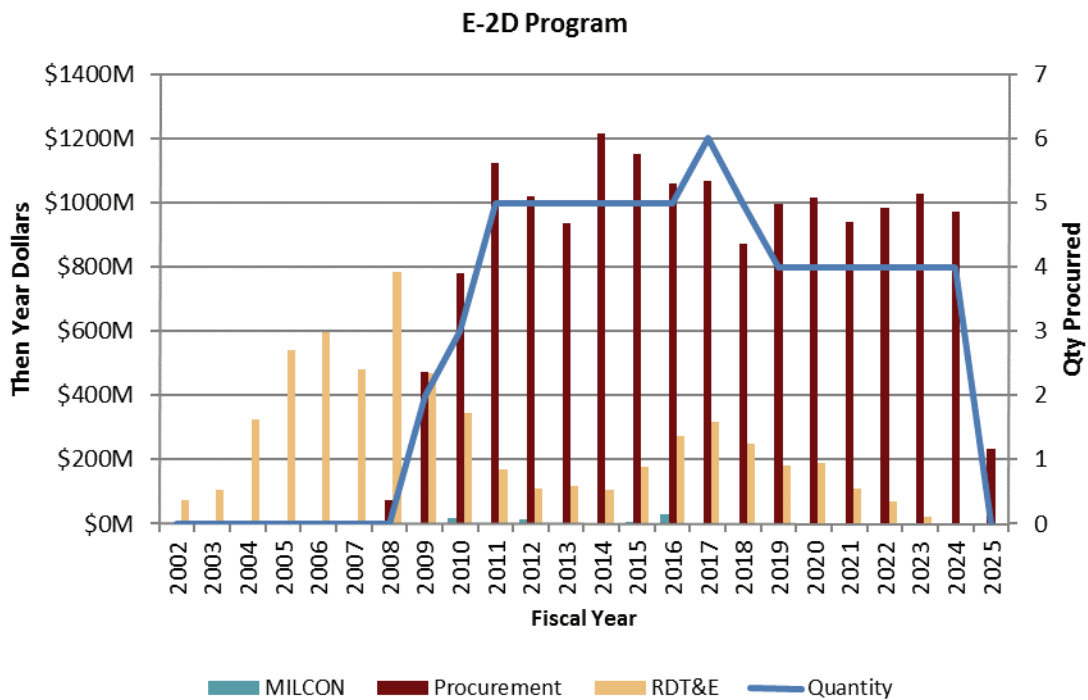


¹³ GAO, *Defense Acquisitions of Selected Weapon Programs* (Washington, DC: GAO, 2015), pp. 71–72, <http://www.gao.gov/assets/670/668986.pdf>.

¹⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_CRH_SAR_Dec_2014.PDF.

E-2D Advanced Hawkeye Aircraft (E-2D AHE)

The E-2D replaces the E-2C as a carrier-based multi-mission aircraft for command and control (C2) and surveillance. The radar on the E-2D is designed for advanced threat aircraft and cruise missiles in the overland, littoral, and open ocean environments. The E-2D began full-rate production in FY 2013,¹⁵ was declared operational on October 10, 2014, and the Navy plans to replace all legacy E-2C aircraft by 2027.¹⁶ A total of \$11.21 billion has been appropriated through FY 2015 for the development and procurement of the first 30 aircraft. An additional \$6.25 billion was requested over the FY16 FYDP for 25 aircraft, and \$4.36 billion is planned for 20 aircraft procurements beyond the FYDP.¹⁷



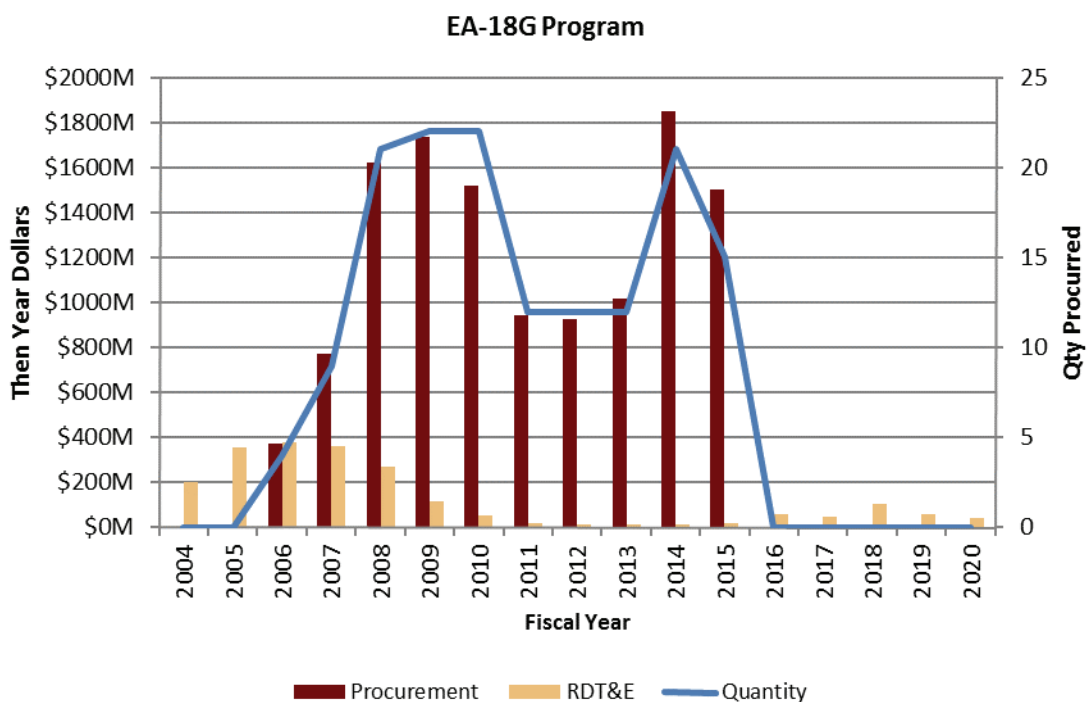
¹⁵ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_E-2D_AHE_SAR_Dec_2014.PDF.

¹⁶ "E-2D Advanced Hawkeye Declared Operational; First Deployment in 2015," *Inside Defense*, October 16, 2014.

¹⁷ Five E-2D aircraft were procured with RDT&E funding and are not reflected in the quantity line.

EA-18G Growler Aircraft (EA-18G)

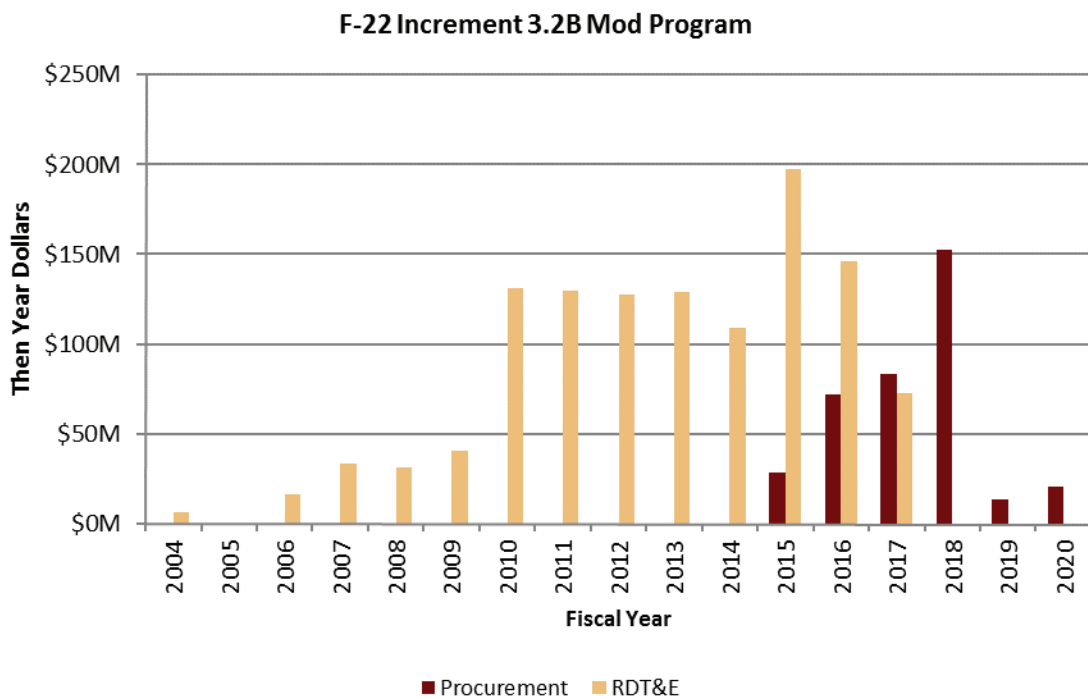
The Growler variant of the F/A-18 aircraft replaces the EA-6B and provides the Navy with the ability to detect, identify, locate, and suppress enemy air defenses and communications. The FY 2016 budget includes an additional purchase of 15 aircraft, bringing the total procurement quantity to 150 and increasing program expenses by 12 percent. The Navy also received three additional aircraft from Boeing in FY 2014 as part of the settlement of unrelated litigation stemming from the cancellation of the A-12 program more than two decades ago. A total of \$14.09 billion has been appropriated through FY 2015, and \$0.31 billion was requested over the FY16 FYDP for the balance of the program.¹⁸



¹⁸ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_EA-18G_SAR_Dec_2014.PDF.

F-22 Increment 3.2B (F-22 Mods)

The F-22 is a stealthy, short-range air-to-air and air-to-ground aircraft. The F-22 modernization program, established in 2003, is intended to upgrade the air-to-ground, information warfare, reconnaissance, and other capabilities of the aircraft to improve performance, reliability, and maintenance. The current increment, 3.2B, enhances electronic protection, geolocation, and intra-flight data link capabilities. It also enables the aircraft to use the AIM-9X and AIM-120D missiles. Full hardware qualification was completed in October 2014, software development is in progress, and the first two test aircraft have been modified.¹⁹ A total of \$980.2 million has been appropriated through FY 2015 and an additional \$561 million was requested over the FY16 FYDP to complete the program.²⁰

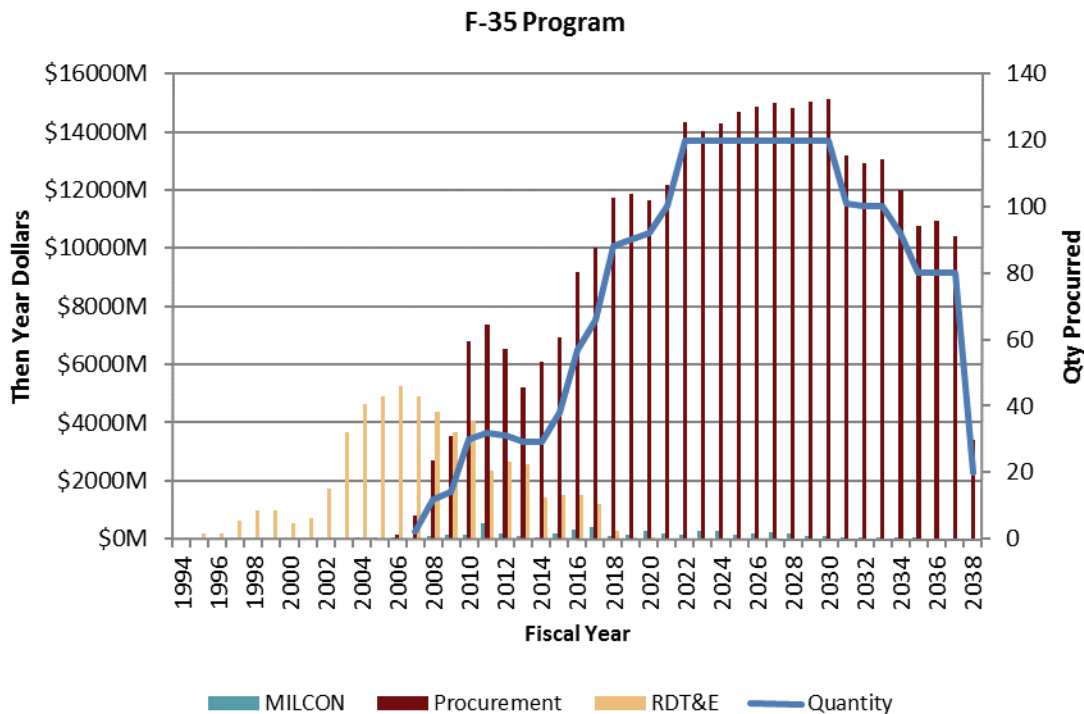


¹⁹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_F-22_Inc%203-2B_Mod_SAR_Dec_2014.PDF.

²⁰ About \$600 million of the development cost was spent under the F-22 baseline program and is not accounted for in this SAR. GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 81–82.

F-35 Joint Strike Fighter (JSF)

The F-35 is a joint program to develop a family of fifth-generation strike fighter aircraft for the Air Force, Navy, and Marine Corps. It is the single largest acquisition program in DoD. The F-35 is intended to replace the A-10, F-16, AV-8B, and F/A-18C/D, while complementing the F/A-18/E/F and F-22A. The F-35 fleet was placed under temporary flight restrictions because of an engine malfunction on June 23, 2014.²¹ While the cause has been identified and Pratt and Whitney will cover engine repair costs, the flight restrictions imposed after the incident have delayed operational testing. Additionally, the F-35's Autonomic Logistics Information System (ALIS) is still under development and poses a potential technical risk to the program. The F-35B achieved IOC in July 2015, the F-35A is scheduled to achieve IOC in August 2016, and the F-35C is expected to achieve IOC in August 2018.²² A total of \$99.53 billion has been appropriated through FY 2015, which includes procurement funding for 231 aircraft. An additional \$58.58 billion was requested over the FY16 FYDP for continued development and testing and the procurement of 393 aircraft. Beyond the FYDP, DoD projects it will need \$233.02 billion to procure the remaining 1,833 aircraft currently planned.²³



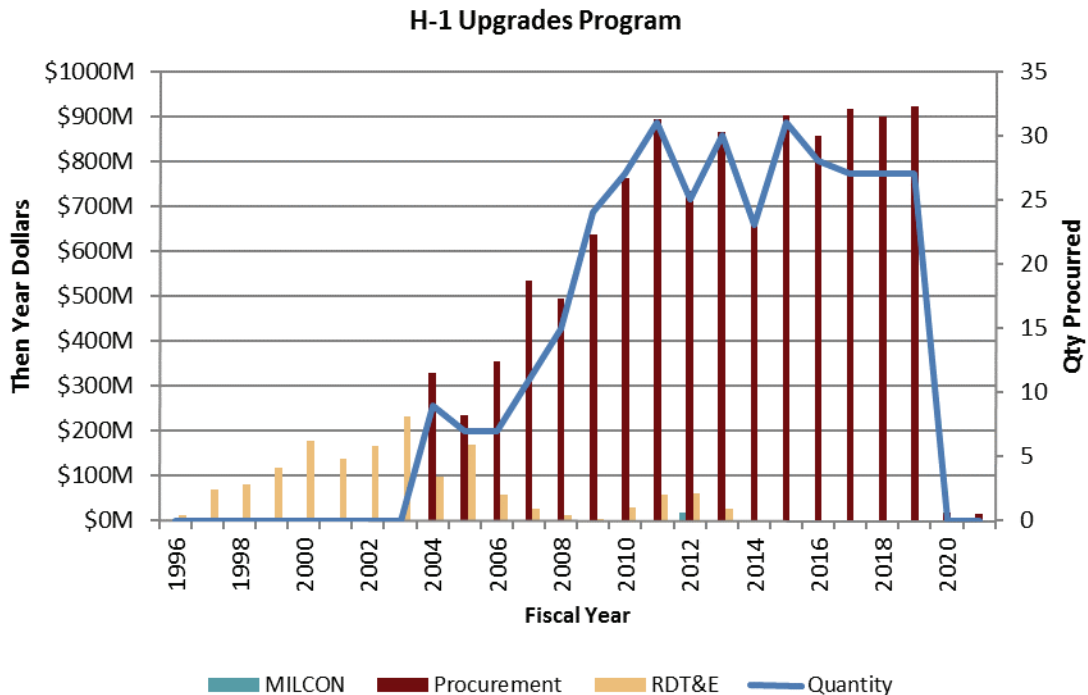
²¹ "Flight Restrictions Kept in Place for F-35 Operational Aircraft," *Inside Defense*, July 30, 2014.

²² DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_F-35_SAR_Dec_2014.PDF.

²³ 14 F-35 aircraft were procured with RDT&E funding, but are not included in the quantity line. \$5.19 billion was contributed to RDT&E efforts by foreign partners through FY 2015, and an additional \$66.5 million will be contributed over the FYDP. The foreign contributions are included in the chart and figures above.

H-1 Upgrades (4BW/4BN)

The H-1 upgrade program provides increased maneuverability, speed, and payload capability to the AH-1Z attack helicopter and the UH-1Y utility helicopter. To date, 268 helicopters are scheduled to be procured or remanufactured through FY 2016, with a further 81 over the rest of the program. The H-1 program is also pursuing foreign military sales opportunities, and Pakistan has been approved to acquire 15 AH-1Z helicopters with initial deliveries scheduled for August 2018.²⁴ A total of \$8.96 billion has been appropriated through FY 2015, \$3.61 billion was requested over the FY16 FYDP, and \$16 million is planned for beyond the FYDP.²⁵

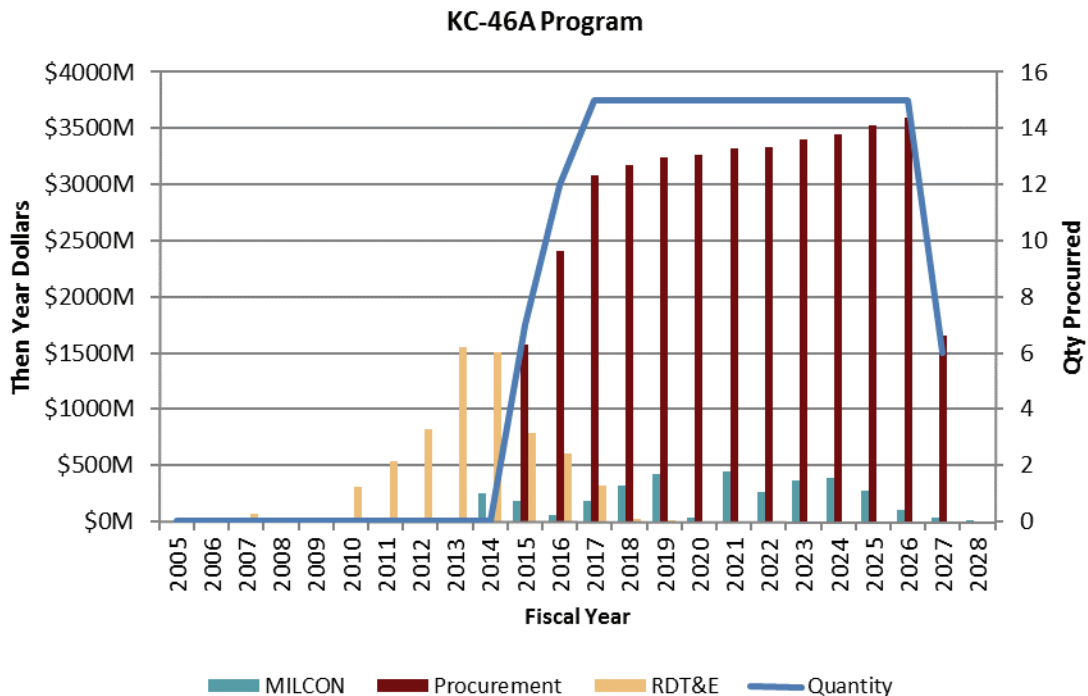


²⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_H-1_Upgrades_SAR_Dec_2014.PDF.

²⁵ Four H-1 helicopters were upgraded through RDT&E funding, but are not included in the quantity line.

KC-46 Tanker Modernization Program (KC-46A)

The Air Force's KC-46A is a Boeing 767 modified for use as an aerial refueling tanker to support U.S. and allied aircraft. This program is the first of three planned phases to replace the KC-135 tankers, replacing roughly one-third of the KC-135s in service. It will provide increased refueling capacity and efficiency as well as improved cargo, aeromedical evacuation, and defensive capabilities.²⁶ Boeing has begun production of the 4 development aircraft, and a total of 179 aircraft are planned. The program is undergoing flight testing and a low-rate initial production decision should occur in 2016. The Air Force is only liable for up to \$4.9 billion on the engineering and manufacturing development contract, with Boeing required to absorb any cost overruns. The contract is currently estimated to be a maximum of \$6.4 billion.²⁷ Boeing could try and recoup this investment in future production contracts. A total of \$7.65 billion has been appropriated through FY 2015. The Air Force requested \$17.12 billion over the FY 2016 FYDP for 72 aircraft, and \$24.14 billion is planned for beyond the FYDP to procure an additional 96 aircraft.²⁸



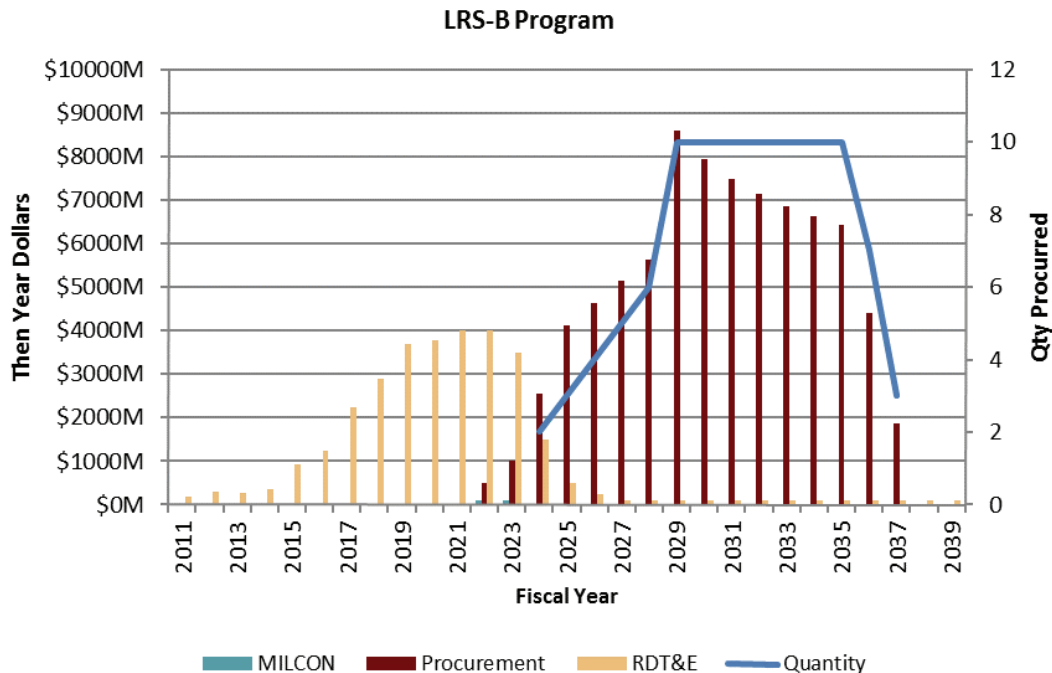
²⁶ Joakim Kasper Oestergaard Balle, "Boeing KC-46 Pegasus," *AeroWeb*, Barr Group Aerospace, October 23, 2015, <http://www.bga-aeroweb.com/Defense/KC-46-Tanker.html>.

²⁷ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_KC-46A_SAR_Dec_2014.PDF.

²⁸ Four KC-46A aircraft were procured with RDT&E funding and are not included in the quantity line.

Long Range Strike-Bomber (LRS-B)

The Air Force initiated funding for the LRS-B program in the FY 2013 budget. It is intended to be a long-range, all-aspect/broadband stealth aircraft that is nuclear-capable and optionally manned. LRS-B is considered a special access program and thus does not report detailed program information in unclassified documents. While a formal cost estimate has not been released and the program is not included in DoD's most recent SARs, the Air Force has revealed some information. From the inception of the program the Air Force has stated that the average procurement unit cost will be capped at \$550 million, in FY 2010 dollars, for a projected buy of up to 100 aircraft beginning in the mid-2020s.²⁹ The FY 2016 budget also shows annual RDT&E funding ramping up from \$1.25 billion in FY 2016 to \$3.79 billion in FY 2020. Assuming RDT&E costs begin to level off in FY 2021 and gradually decline in subsequent years, the total development cost would be roughly \$30 billion. Assuming procurement funding begins in the early 2020s and grows gradually to full rate production of 10 aircraft per year in the late 2020s, a total buy of 100 aircraft would be completed in the mid-2030s at a total procurement cost of roughly \$80 billion in then-year dollars (the equivalent of an average procurement unit cost of \$550 million in FY 2010 dollars). Thus the total cost of the program would be roughly \$112 billion in then-year dollars.³⁰ The contract was awarded to Northrop Grumman in October 2015. GAO denied the protest filed by the rival Boeing-Lockheed Martin consortium in February 2016.³¹



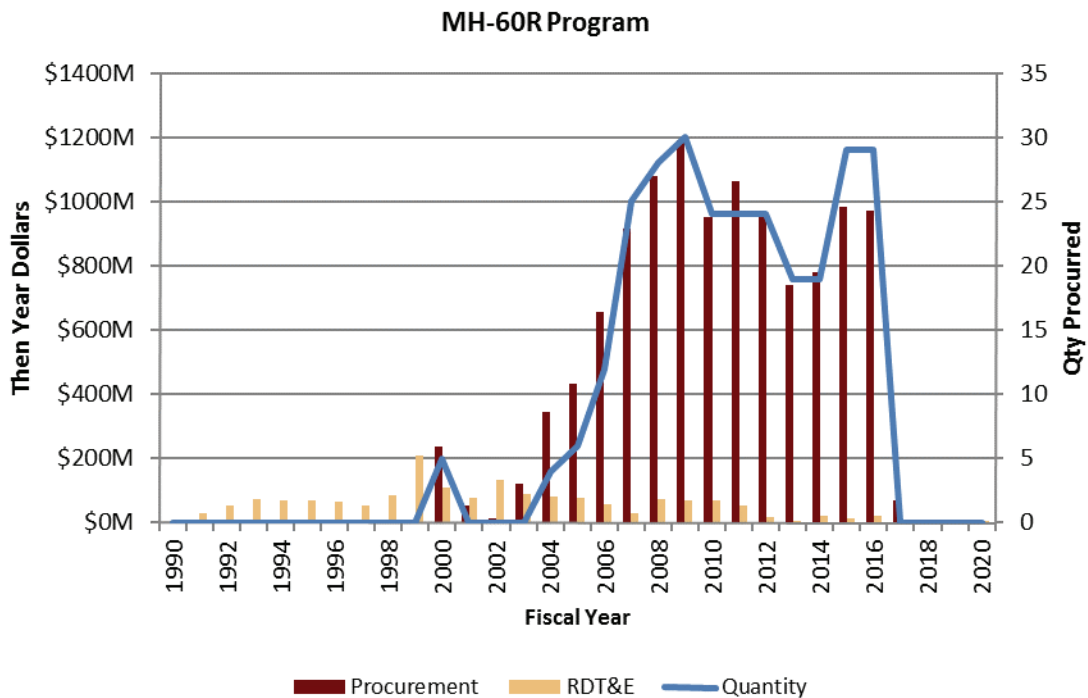
²⁹ Department of the Air Force, "AF Moves Forward with Future Bomber," news release, July 12, 2014.

³⁰ This estimate is derived from Todd Harrison and Evan B. Montgomery, *The Cost of U.S. Nuclear Forces: From BCA to Bow Wave and Beyond* (Washington, DC: Center for Strategic and Budgetary Assessments, 2015).

³¹ Christian Davenport, "GAO Denies Boeing's Protest of Stealth Bomber Award," *The Washington Post*, February 16, 2016.

MH-60R

The MH-60R is a Navy variant of the Army's UH-60 Blackhawk helicopter, used for anti-submarine warfare and surface warfare, search and rescue, logistics, transportation, and medical evacuation. The MH-60R replaces the SH-60B and SH-60F helicopters and provides improved avionics, sonar, radar, and defensive capabilities. In FY 2016 the Navy restored 29 helicopters to the MH-60R program, bringing the total procurement quantity to 278.³² FY 2016 is the final year of MH-60R procurement. A total of \$12.22 billion has been appropriated through FY 2015 and \$1.08 billion was requested over the FY16 FYDP.³³

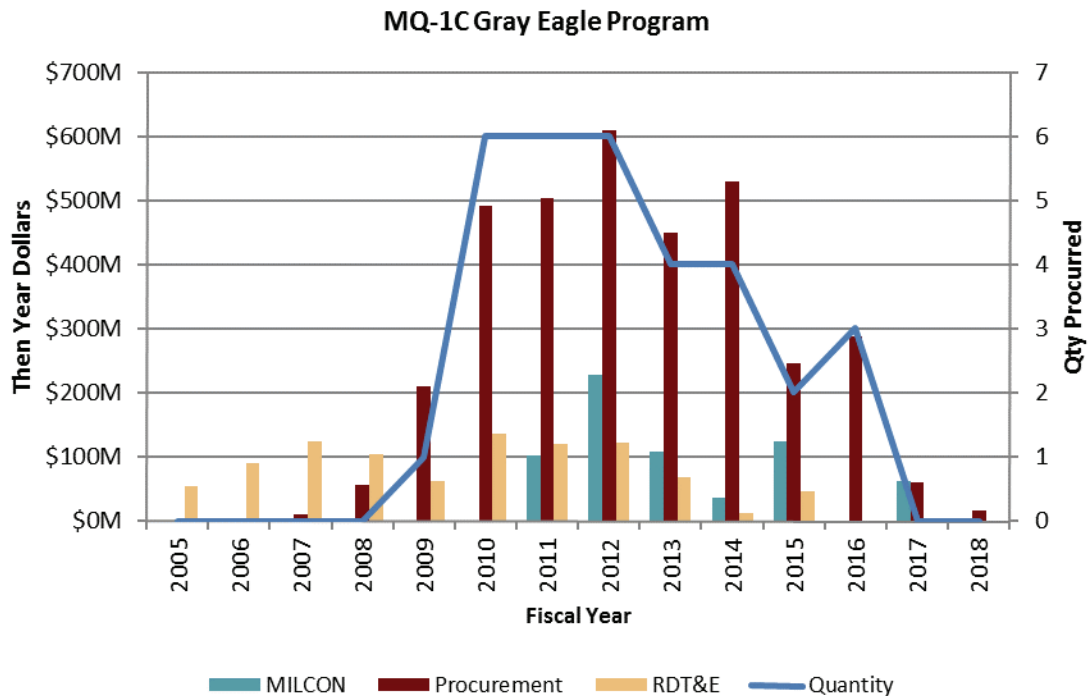


³² Two MH-60R helicopters were procured with RDT&E funding, but are not included in the quantity line.

³³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MH-60R_SAR_Dec_2014.PDF.

MQ-1C Gray Eagle Unmanned Aircraft System

The Army's MQ-1C Gray Eagle is an upgraded and armed version of the Air Force's MQ-1 Predator unmanned aircraft.³⁴ It is used for reconnaissance, surveillance, target acquisition, and attack missions. A Gray Eagle platoon typically consists of four MQ-1C unmanned aircraft and associated ground support systems. In FY 2015, Congress appropriated \$49 million for the modification of 19 MQ-1C aircraft to extend their operational range. The program has begun planning for further operational testing to support the desired modifications.³⁵ A total of \$4.64 billion has been appropriated through FY 2015, and an additional \$424.9 million was requested over the FY16 FYDP. Procurement of the Gray Eagle ends in FY 2018.³⁶



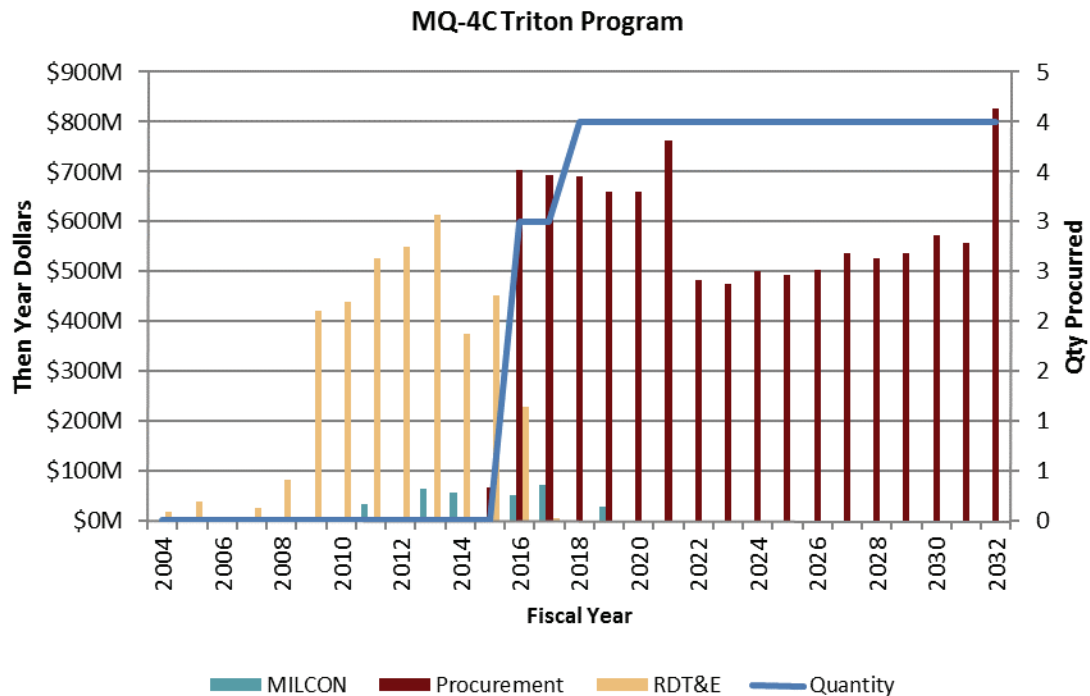
³⁴ General Atomics Aeronautical, "Gray Eagle™ UAS," 2014, http://www.ga-asi.com/products/aircraft/gray_eagle.php.

³⁵ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MQ1C_Gray_Eagle_SAR_Dec_2014.PDF.

³⁶ Two Gray Eagle units were procured with RDT&E funding, but are not included in the quantity line.

MQ-4C Triton Unmanned Aircraft System

The Navy's MQ-4C Triton, formerly known as the Broad Area Maritime Surveillance (BAMS) program, is designed to provide persistent maritime intelligence, surveillance, and reconnaissance. It is based on the Air Force's RQ-4B Global Hawk and will operate from five land-based sites. Future planned improvements include a signals intelligence collection capability and an upgraded systems communication relay. The Navy has completed the operational assessment of the MQ-4C³⁷ and the program is expected to reach Milestone C in 2016.³⁸ A total of \$3.77 billion has been appropriated through FY 2015, \$3.79 billion was requested over the FY16 FYDP, and \$6.77 billion is planned for beyond the FYDP to procure a total quantity of 66 MQ-4Cs.³⁹



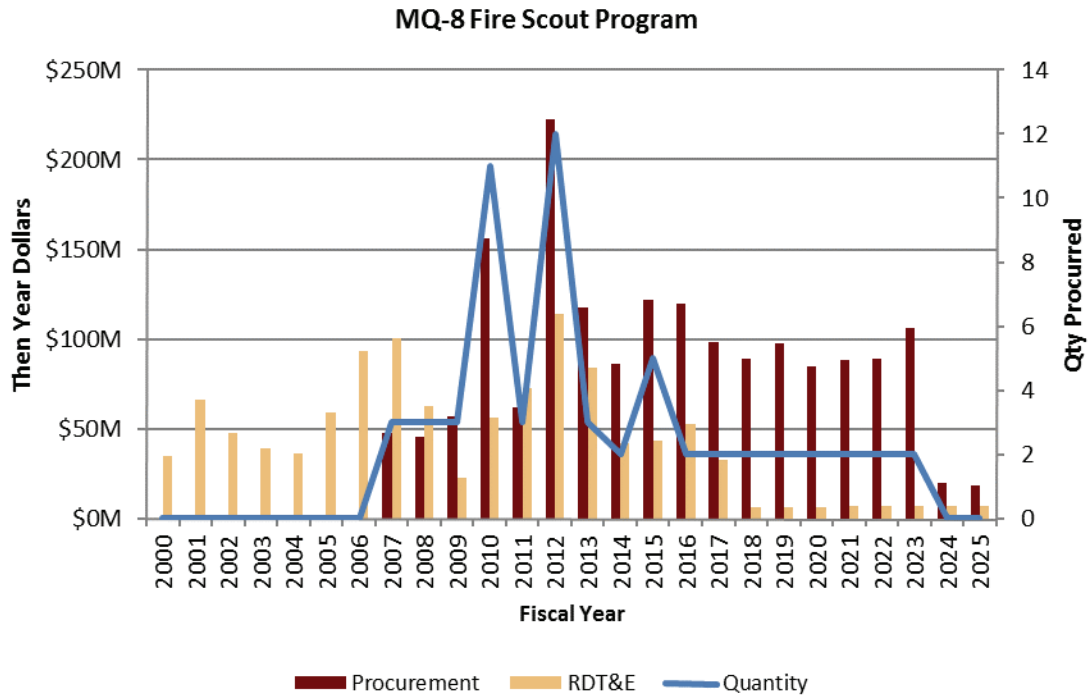
³⁷ Lee Hudson, "Triton completes operational assessment," *Inside Defense*, February 16, 2016.

³⁸ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MQ-4C_Triton_SAR_Dec_2014.PDF.

³⁹ Four Triton aircraft were procured with RDT&E funding, but are not in the quantity line.

MQ-8 Fire Scout

The MQ-8 Fire Scout is designed to provide surveillance and targeting information for ground, air, and sea forces. Among other uses, it is intended to support the Littoral Combat Ship surface warfare, mine countermeasures, and anti-submarine warfare mission packages.⁴⁰ The MQ-8B model is smaller and has a maximum endurance of 5.5 hours with a 300-pound payload. The MQ-8C model is larger and has a maximum endurance of 12 hours with a 300-pound payload.⁴¹ The first operational system was delivered to the Navy in late 2014.⁴² The total planned purchase of the MQ-8 has been reduced by 66 aircraft, from 125 in the FY 2015 budget to 51 in the FY 2016 budget. A total of \$1.89 billion has been appropriated through FY 2015 for development and procurement of 45 MQ-8Bs, \$0.59 billion was requested for additional development work over the FY 2016 FYDP, and \$0.36 billion is requested after the conclusion of the FYDP.⁴³



⁴⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MQ-8_Fire_Scout_SAR_Dec_2014.PDF.

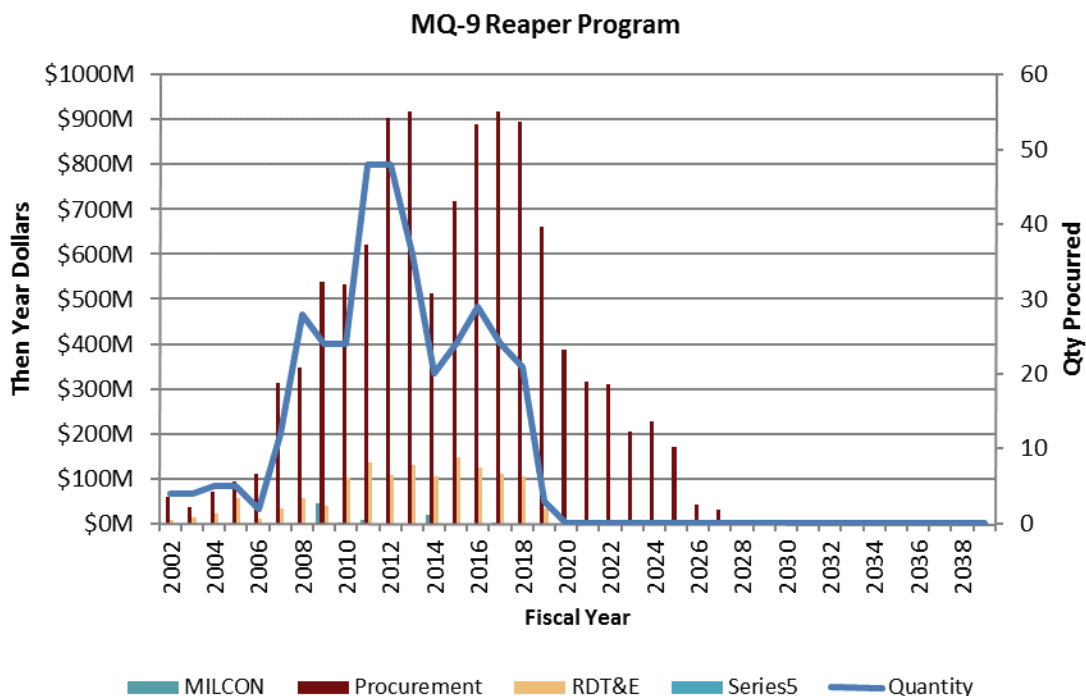
⁴¹ Naval Air Systems Command, "MQ-8 Fire Scout," <http://www.navair.navy.mil/index.cfm?fuseaction=home.display&key=8250AFBA-DF2B-4999-9EF3-0B0E46144D03>.

⁴² "Fire Scout Delivered," *Inside Defense*, December 3, 2014.

⁴³ Nine MQ-8s were procured with RDT&E funding, but are not reflected in the quantity line.

MQ-9 Reaper Unmanned Aircraft System

The Air Force's MQ-9 Reaper, based on the Service's MQ-1 Predator, is a multirole, medium-altitude unmanned aircraft for surveillance and strike missions in permissive airspace. Each MQ-9 Reaper system consists of four aircraft and the associated control equipment. It can carry laser and GPS-guided bombs and Hellfire missiles.⁴⁴ Production lines transitioned to the Block 5 design in mid-2015 despite ongoing thermal management problems that, when operating in hot weather, can result in batteries overheating and missions being aborted.⁴⁵ A total of \$6.82 billion has been appropriated through FY 2015 for 284 aircraft, and an additional \$4.13 billion was requested over the FY16 FYDP for 77 aircraft.⁴⁶ No additional procurements are projected beyond the FYDP, but an additional \$1.36 billion is planned for continued upgrades.⁴⁷



⁴⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MQ-9%20Reaper_SAR_Dec_2014.PDF.

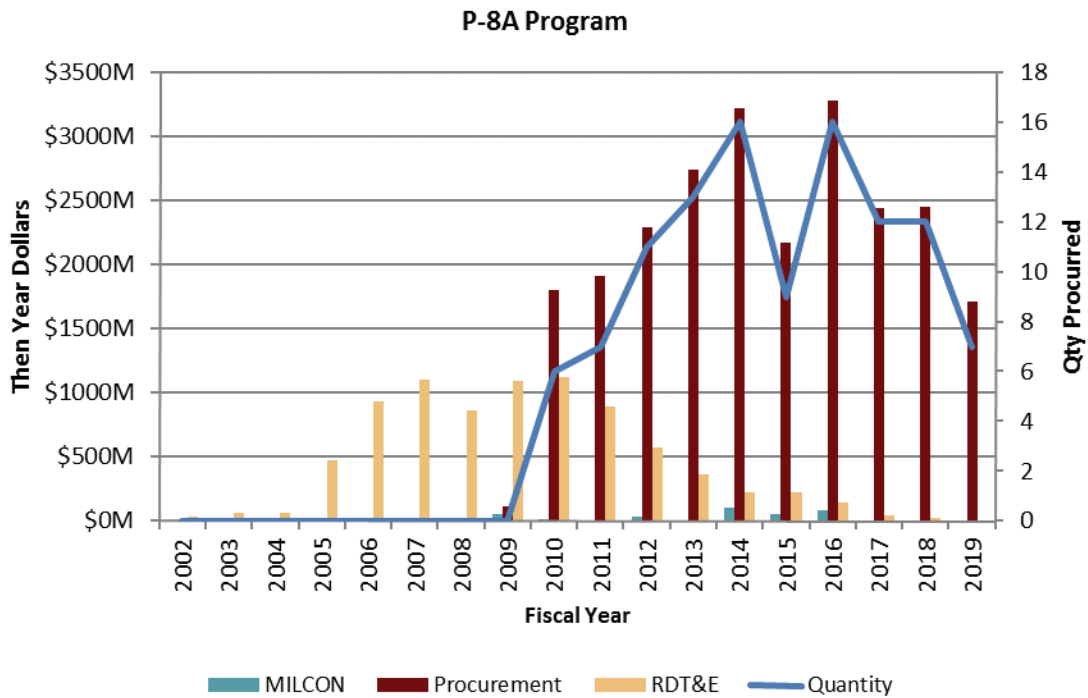
⁴⁵ Leigh Giangreco, "Thermal and power management issues persist on MQ-9 Reaper," *Inside Defense*, February 5, 2016.

⁴⁶ Three Reaper aircraft were procured with RDT&E funding, but are not included in the quantity line, which counts numbers of aircraft procured and not number of systems (the ground control stations are not counted).

⁴⁷ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MQ-9%20Reaper_SAR_Dec_2014.PDF.

P-8A Poseidon Multi-Mission Maritime Aircraft

The Navy's P-8A Poseidon is being procured to replace the P-3C Orion for antisubmarine warfare, anti-surface warfare, and intelligence, surveillance, and reconnaissance missions. The P-8A is based on the Boeing 737 airframe and is produced in the same production line as commercial 737s.⁴⁸ In its FY 2015 request, the Navy reduced the planned procurement of aircraft by 14 to bring the total planned purchase to 109 P-8s. A total of \$22.5 billion has been appropriated through FY 2015 and \$10.18 billion was requested over the FY16 FYDP. No additional funding is planned after the FYDP.⁴⁹

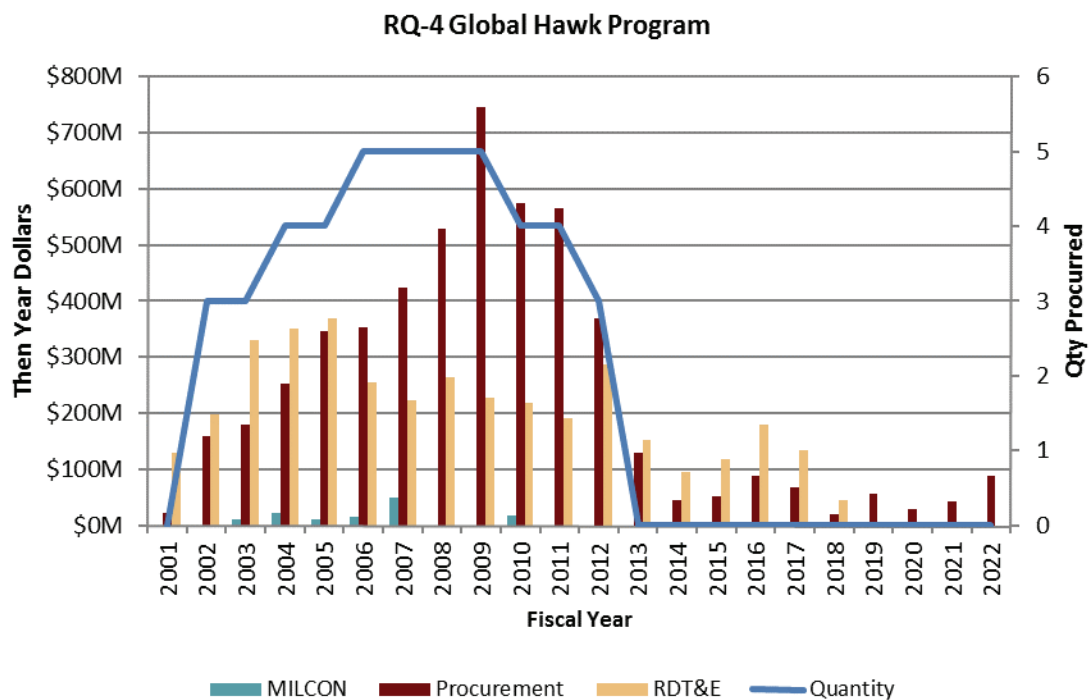


⁴⁸ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_P-8A_SAR_Dec_2014.PDF.

⁴⁹ Five P-8A aircraft were procured with RDT&E funding, but are not included in the quantity line.

RQ-4A/B Global Hawk Unmanned Aircraft System

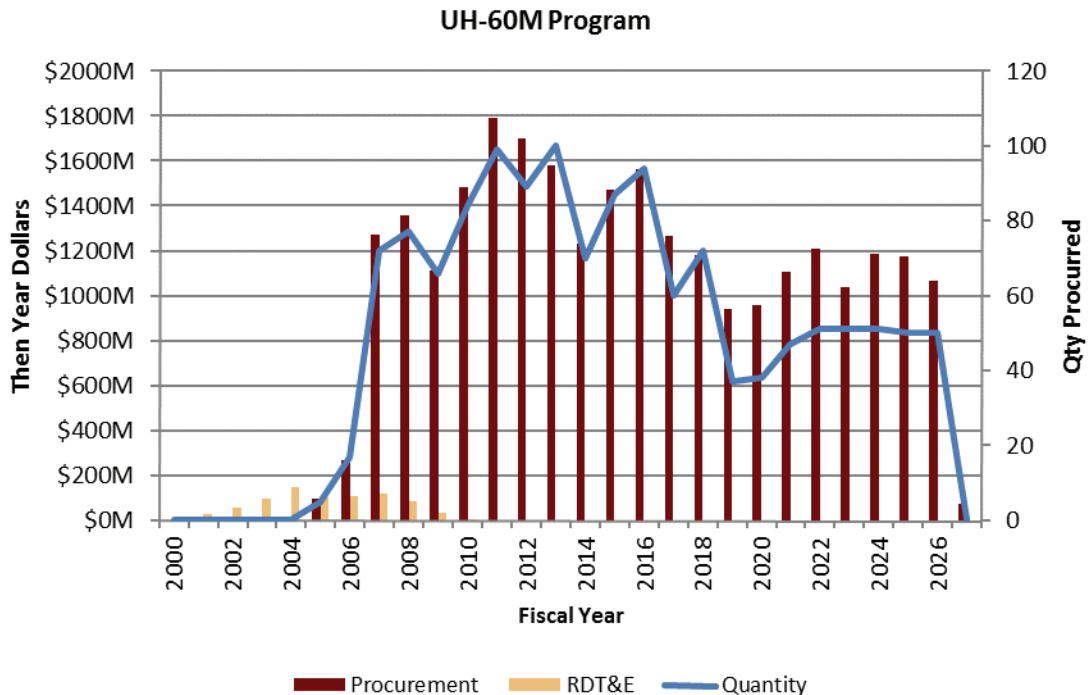
The Air Force's Global Hawk is an unmanned long-endurance high-altitude intelligence, surveillance, and reconnaissance aircraft. The RQ-4B is still in service with the Air Force and comes in three configurations. The Block 20 aircraft carry an imagery intelligence payload and have been converted to also serve as a communications node. The Block 30 aircraft are equipped with both imagery and signals intelligence payloads, and the Block 40 aircraft have advanced air-to-surface radar for wide-area surveillance of fixed and moving targets. Procurement of Global Hawk ended in FY 2013 with a total of 45 aircraft. Continued funding supports ongoing upgrades of the system. A total of \$8.27 billion has been appropriated through FY 2015, \$621.8 million was requested for the FY 2016 FYDP, and \$131.1 million is planned for beyond the FYDP.⁵⁰



⁵⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_RQ-4AB_Global_Hawk_SAR_Dec_2014.PDF.

UH-60M Black Hawk Helicopter (UH-60M)

The UH-60 Black Hawk is the Army's utility helicopter for air assault, aeromedical evacuation, and general transportation needs. It is also used by the Air Force. A maritime version, the SH-60 Sea Hawk, is employed by the Navy. The M variant includes upgraded engines, rotor blades, and instrumentation. Full-rate production began in 2007, and DoD plans to buy a total of 1,375 helicopters.⁵¹ A total of \$14.15 billion has been appropriated through FY 2015 for 766 helicopters, \$5.91 billion was requested for 301 helicopters over the FY 2016 FYDP, and \$6.84 billion is planned for 300 helicopters beyond the FYDP.⁵²

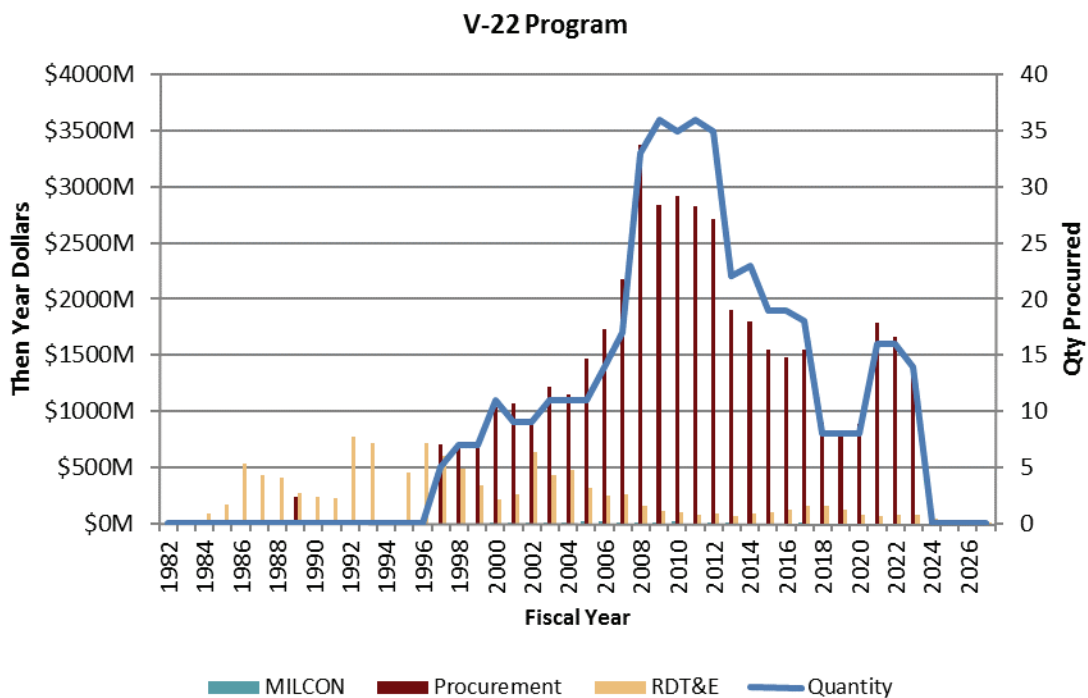


⁵¹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_UH-60M_Black_Hawk_SAR_Dec_2014.PDF.

⁵² Eight UH-60M helicopters were procured with RDT&E funding, but are not in the quantity line.

V-22 Osprey Joint Services Advanced Vertical Lift Aircraft (V-22)

The V-22 is a tilt-rotor helicopter capable of vertical takeoff and landing as well as long-range cruise like that of a turboprop fixed-wing aircraft. The V-22 can fly up to 2,100 nautical miles on a single refueling. The MV-22 variant replaces the Marine Corps' CH-46E and will supplement the Navy's H-60 for transport of troops, equipment, and supplies. The Air Force's CV-22 variant replaces the MH-53 Pave Low for long-range special operations missions. As of February 2014, a total of 273 V-22s have been delivered out of a projected buy of 458.⁵³ A total of \$43.25 billion has been appropriated through FY 2015, and \$6.26 billion is requested for the FYDP for the procurement of 61 aircraft. An additional \$5.24 billion is planned for beyond the FYDP to complete the program and procure the final 46 aircraft.⁵⁴

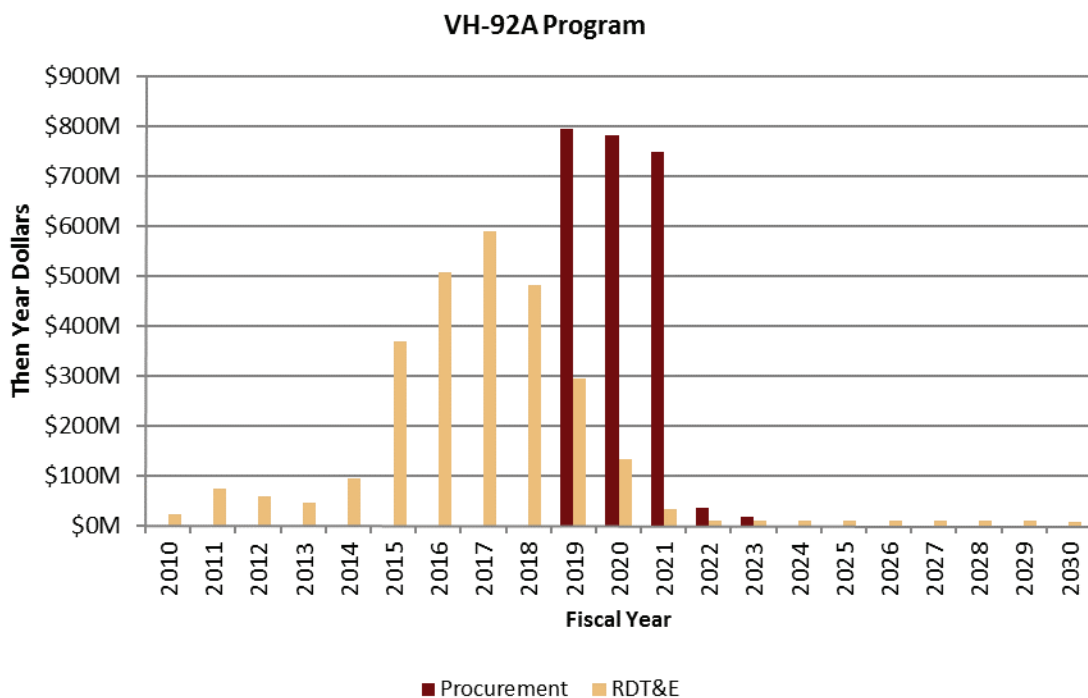


⁵³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_V-22_SAR_Dec_2014.PDF.

⁵⁴ Two V-22 aircraft were procured with RDT&E funding, but are not included in the quantity line.

VH-92A Presidential Helicopter (VH-92A)

The VH-92 Presidential Helicopter is designed to provide safe transport to the President and other senior U.S. leaders. The VH-92 is intended to replace the VH-3D Sea King currently flown by Marine Helicopter Squadron One (HMX-1) and will be a heavily modified variant of Sikorsky's S/H-92 civilian and military medium-lift helicopter. The VH-92A conducted its first flight in December 2015 and is expected to be fielded in 2020. The program is a successor to the VH-71 helicopter replacement program that was cancelled in 2009 after falling six years behind schedule and doubling in cost.⁵⁵ A total of \$0.66 billion has been appropriated through FY 2015, and \$3.58 billion is requested for the FYDP for the procurement of 12 aircraft.⁵⁶ An additional \$0.92 billion is planned for beyond the FYDP to complete the program and procure the final 5 aircraft.⁵⁷



⁵⁵ Richard Whittle, "Marine One, Take 2: No Bright Ideas!" *Breaking Defense*, May 5, 2015.

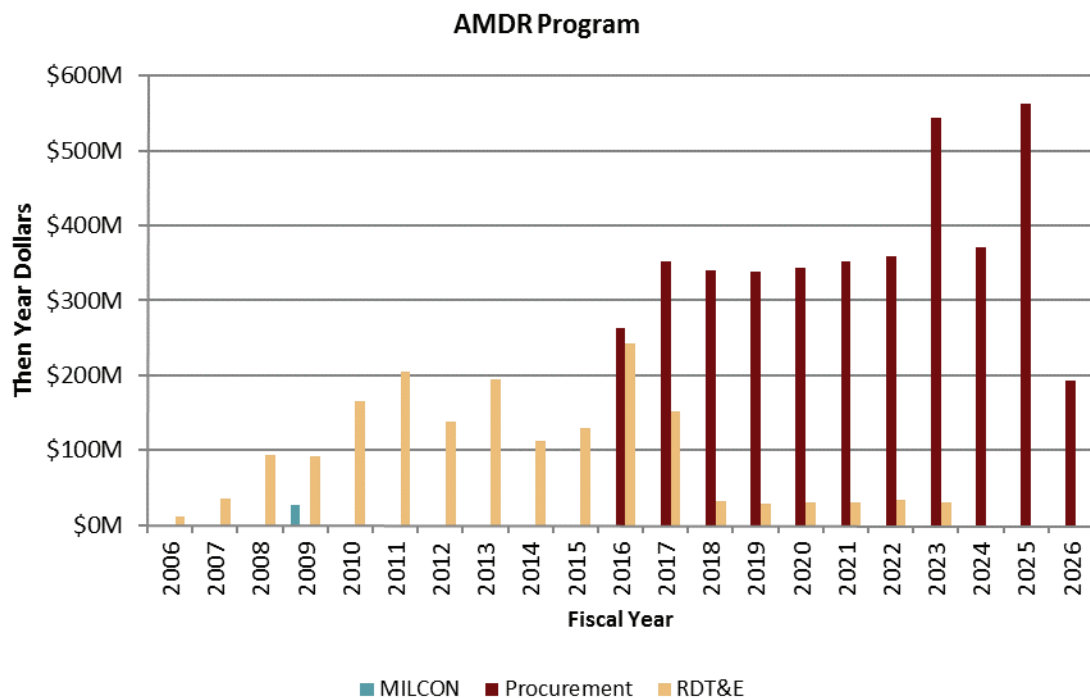
⁵⁶ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_VH-92A_SAR_Dec_2014.PDF.

⁵⁷ Six aircraft were procured with RDT&E funding, but are not included in the quantity line.

Air and Missile Defense

Air and Missile Defense Radar (AMDR)

The Navy's AMDR is a next-generation radar for ballistic missile and air defense. The Navy is planning to install a 14-foot variant of the AMDR on the DDG-51 Flight III, which is the maximum size this ship can accommodate. The AMDR is designed to be scalable, and a 20-foot or greater radar would be necessary to meet the Navy's desired performance for integrated air and missile defense.⁵⁸ Low-rate initial production is expected to begin in 2017. A total of \$1.2 billion has been appropriated through FY 2015 for AMDR. An additional \$2.1 billion was requested over the FY16 FYDP, and \$2.5 billion is planned for beyond the FYDP.⁵⁹

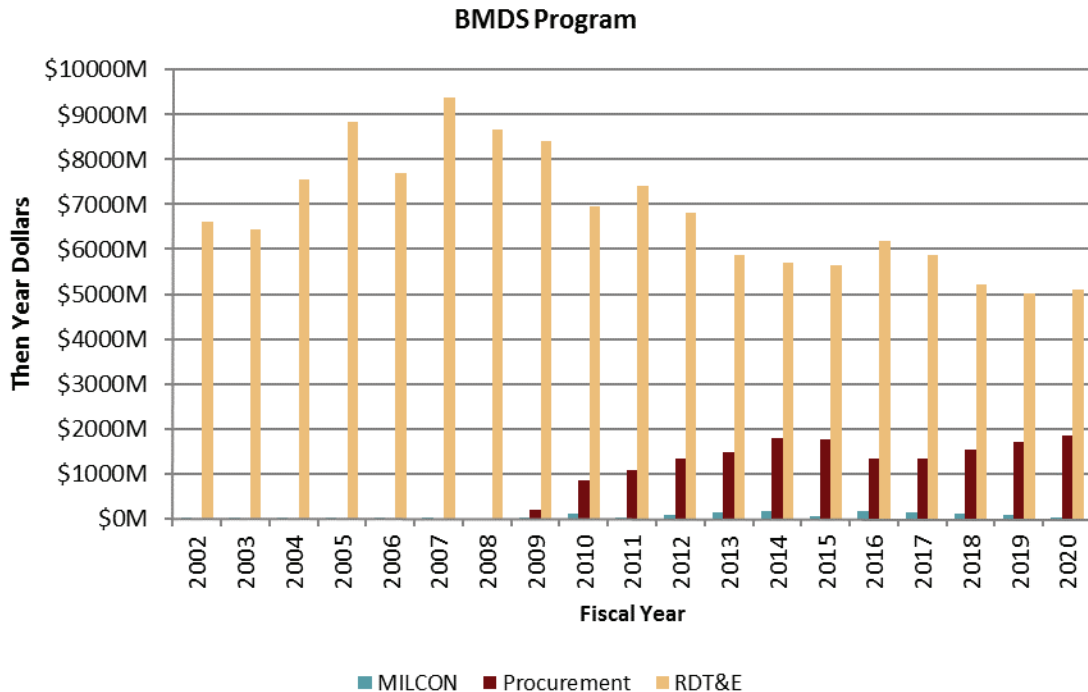


⁵⁸ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 63–64.

⁵⁹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AMRAAM_SAR_Dec_2014.PDF.

Ballistic Missile Defense System (BMDS)

BMDS is a defense-wide program to develop and deploy a layered BMDS to defend the United States and its allies, and partners from ballistic missile attacks. The program currently supports ground-based interceptors for homeland defense, forward-based Army-Navy Transportable Radar Surveillance & Control-Series 2 (AN/TPY-2) radars to track missile launches, Terminal High Altitude Area Defense (THAAD) batteries to protect deployed forces, and Aegis Ballistic Missile Defense equipped ships.⁶⁰ The program also supports the European Phased Adaptive Approach (EPAA) to protect NATO allies and deployed troops. In 2015, Phase II added an Aegis Ashore system in Romania and the SM-3 Block IB missile.⁶¹ Phase III is scheduled for 2018, which will include Aegis Ashore in Poland and SM-3 Block IIA missiles.⁶² A total of \$111.1 billion has been appropriated through FY 2015 and \$35.7 billion was requested over the FY16 FYDP. The SAR does not project any funding beyond the FYDP, but spending will likely continue at roughly the current rate for the foreseeable future.



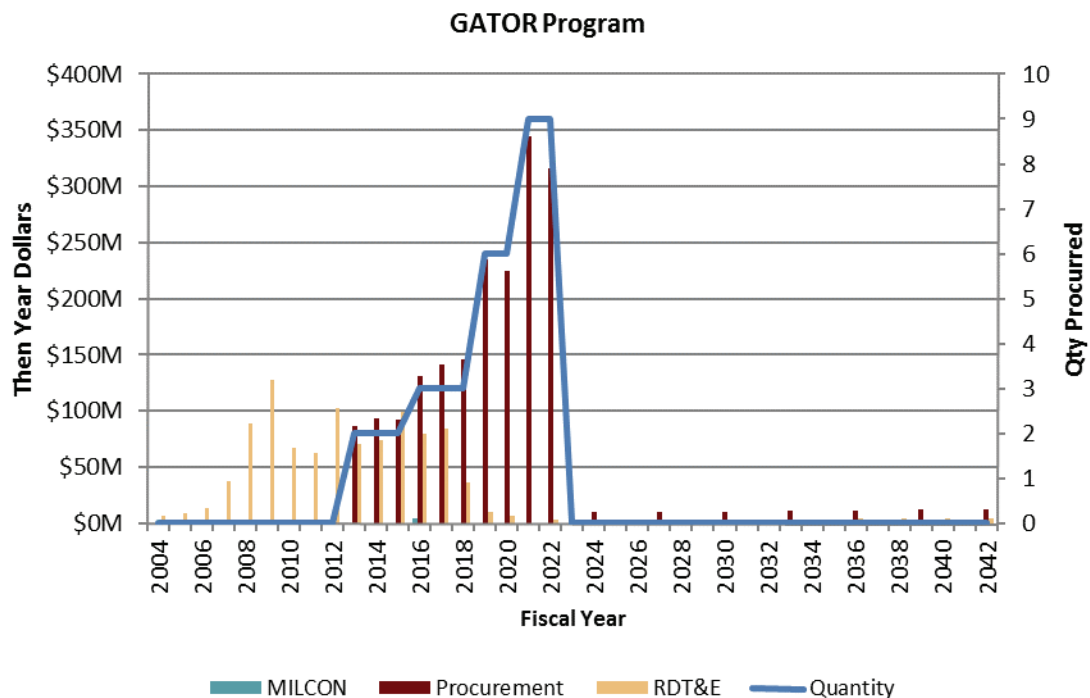
⁶⁰ The Aegis Weapon System is a centralized and automated command-and-control system designed to detect and destroy enemy missiles and aircraft. It is based on the AN-SPY-1 radar that can perform search, track, and missile guidance functions for more than 100 targets simultaneously. See U.S. Navy “Aegis Weapon System,” 2013, http://www.navy.mil/navydata/fact_display.asp?cid=2100&tid=200&ct=2.

⁶¹ Ryan Maass, “Aegis Ashore Missile Defense System Goes Online in Romania,” *UPI*, December 18, 2015.

⁶² DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_BMDS_SAR_Dec_2014.PDF.

Ground/Air Task Oriented Radar (G/ATOR)

The Marine Corps' G/ATOR program is an active electronic scanned array designed to detect cruise missiles, air-breathing targets, rockets, mortars, and artillery. G/ATOR is a block acquisition program with the follow-on blocks primarily providing software upgrades.⁶³ A low-rate initial production contract was awarded in March 2014.⁶⁴ However, the program may be delayed due to challenges involved in a decision to use a different type of gas in the system's semiconductors.⁶⁵ A total of \$1.04 billion has been appropriated through FY 2015, and \$1.1 billion was requested over the FY16 FYDP. The SAR projects that an additional \$0.78 billion will be needed beyond the FYDP.



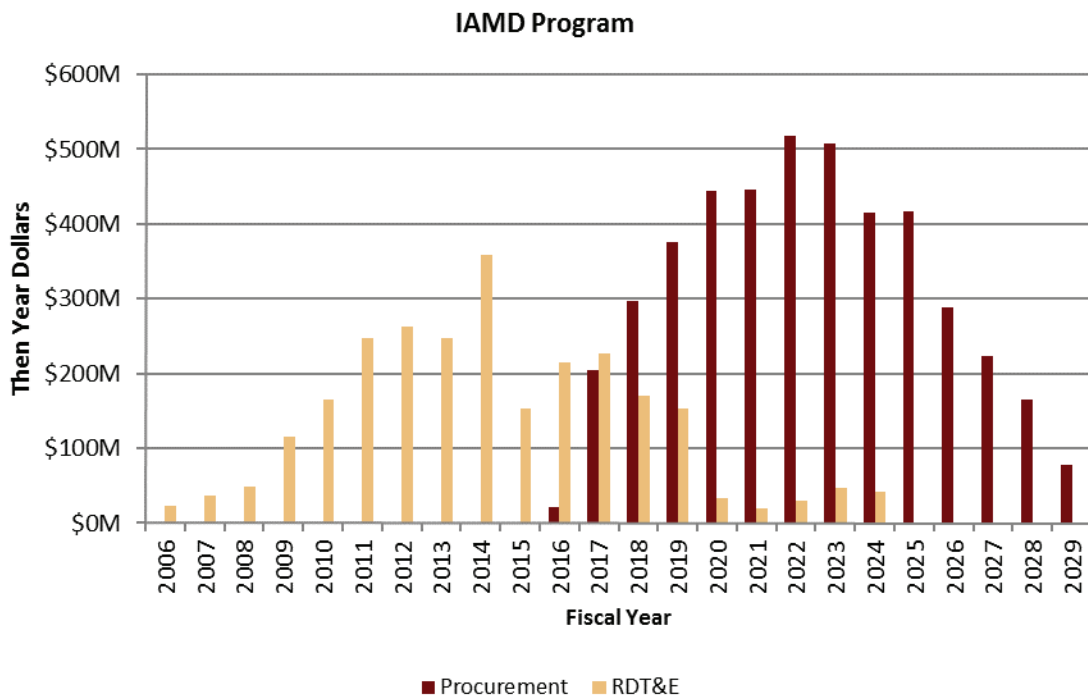
⁶³ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 91–92.

⁶⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_GATOR_SAR_Dec_2014.PDF.

⁶⁵ Megan Eckstein, "Marines' G/ATOR Radar May Face 1-Year Delay in IOT&E If Budget Cuts Can't Be Mitigated," *USNI News*, November 3, 2015.

Integrated Air and Missile Defense (IAMD)

The Army's IAMD program will network sensors, weapons, and a common command system to protect against air and missile threats. It will transform air and missile defense efforts to a "plug and fight" architecture that integrates sensors, weapons, and command and control. A Patriot radar, connected to the IAMD system, conducted the first successful target track of an airborne target in November 2014. Additionally, since the IAMD program is designed to integrate the capabilities of several other acquisition programs, its progress is dependent on the success of those programs. To mitigate this risk, the IAMD program has focused on simplifying program software and adopting an incremental delivery schedule.⁶⁶ The low-rate initial production decision is scheduled for late 2016. A total of \$1.65 billion has been appropriated through FY 2015, \$2.14 billion was requested over the FY16 FYDP, and \$3.2 billion is planned for beyond the FYDP.⁶⁷

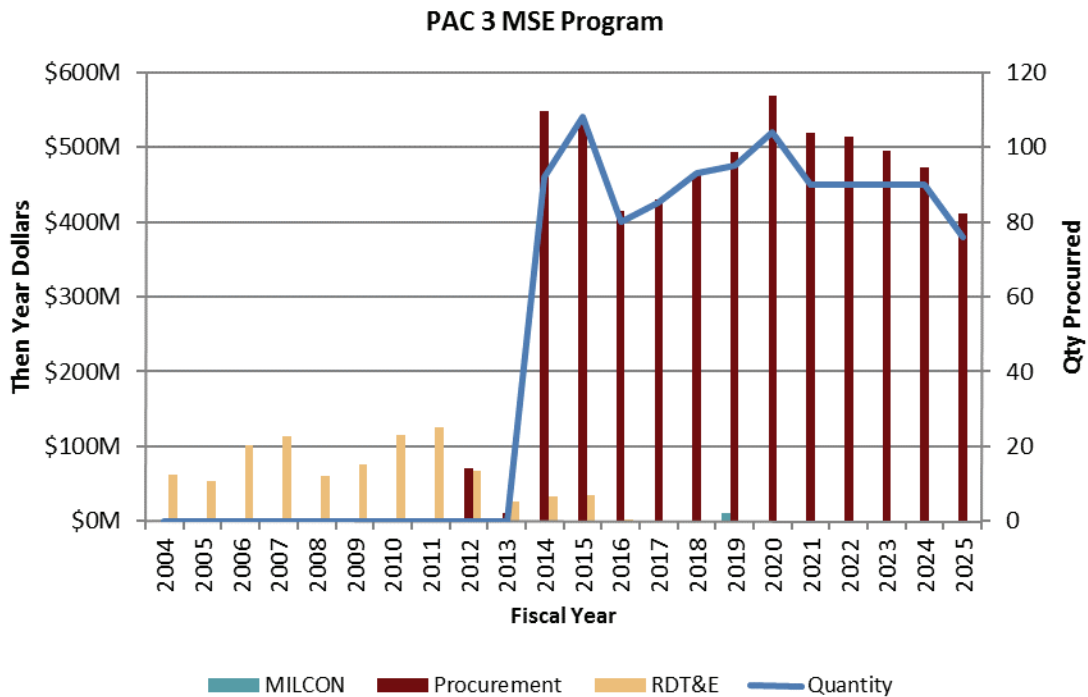


⁶⁶ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 93–94.

⁶⁷ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_IAMD_Draft_SAR_Dec_2014.PDF.

Patriot Advanced Capability-3 Missile Segment Enhancement (PAC-3 MSE)

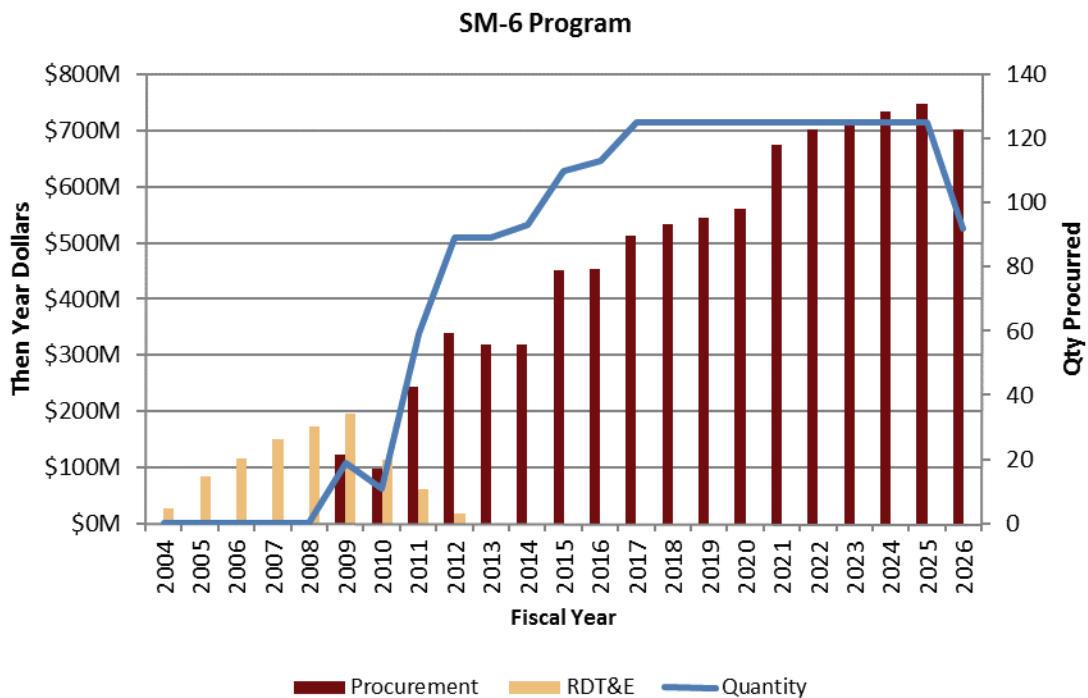
The PAC-3 missile is a high velocity hit-to-kill surface-to-air missile designed to intercept and destroy theater ballistic missiles, cruise missiles, and aircraft. The PAC-3 MSE is a follow-on to the PAC-3 missile. The PAC-3 MSE's improved performance is due to an improved solid rocket motor, more responsive control surfaces, and upgraded guidance software. The PAC-3 MSE is being integrated into existing Patriot systems, requiring only minor modifications to the existing hardware and utilizing the existing software. The system is expected to achieve initial operational capability in late 2016. A total of \$2.03 billion has been appropriated through FY 2015, \$2.38 billion was requested over the FY 2016 FDYP, and an additional \$2.41 billion is planned for beyond the FYDP.⁶⁸



⁶⁸ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_PAC_3_MSE_Draft_SAR_Dec_2014.PDF.

Standard Missile-6 (SM-6)

The SM-6 Extended Range Active Missile (ERAM) is a sea-based surface-to-air missile designed to intercept aircraft and cruise missiles. The Defense Department recently revealed that the SM-6 can also be fired in an anti-surface warfare mode, providing Navy warships with an advanced anti-ship missile.⁶⁹ It is deployable from AEGIS cruisers and destroyers. The SM-6 ERAM is a multi-block program intended to keep pace with evolving threats through block upgrades. The SM-6 ERAM Block I achieved initial operating capability in November 2013. A total of \$2.83 billion has been appropriated through FY 2015 to support the purchase of 470 missiles, \$2.6 billion is requested for the FYDP for 613 missiles, and \$4.27 billion is planned for beyond the FYDP to complete the total buy of 1800 missiles.⁷⁰



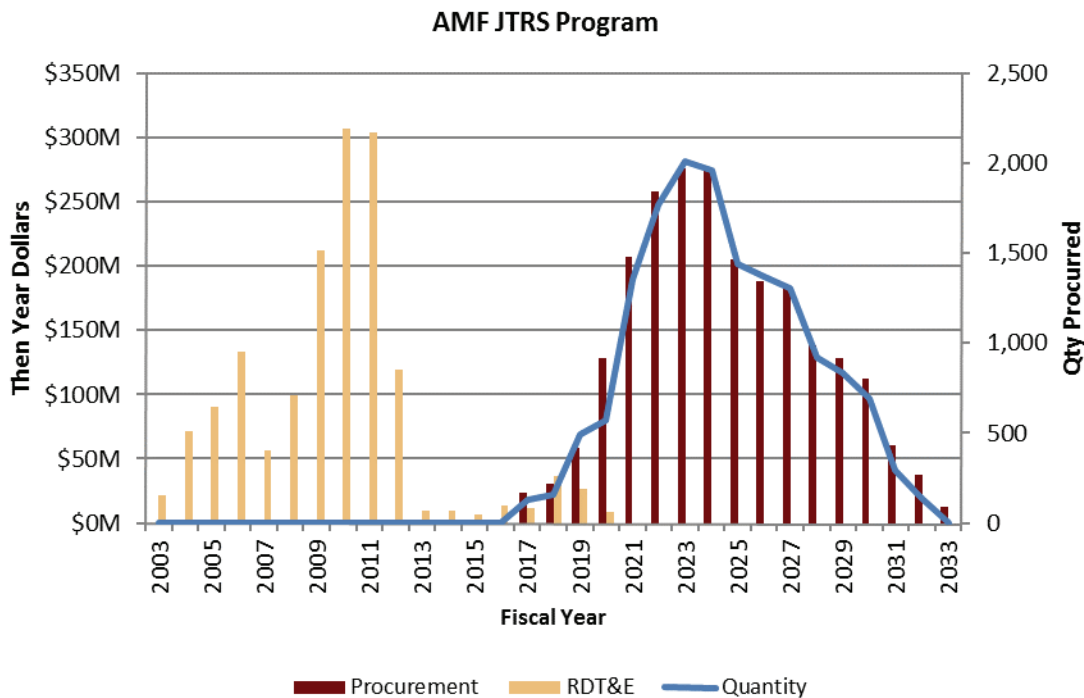
⁶⁹ Sam LaGrone, "SECDEF Carter Confirms Navy Developing Supersonic Anti-Ship Missiles For Cruisers, Destroyers," *USNI News*, February 4, 2016.

⁷⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_SM-6_SAR_Dec_2014.PDF.

Communications and Electronics

Airborne and Maritime/Fixed Station Joint Tactical Radio System (AMF JTRS)

The AMF JTRS program was restructured in 2014 to adopt a non-development acquisition approach and to divide the program into two subprograms. Each subprogram will acquire an industry-developed software-defined radio, the Small Airborne Link 16 Terminal (SALT), which will integrate Army aviation assets into the common air picture, and the Small Airborne Networking Radio (SANR), which will connect commanders to Army aviation assets. The SANR subprogram expects to award a production contract in October 2017. The Capability Production Document (CPD) associated with the SALT subprogram is being revised, which will cause the it to experience schedule breaches. The subprogram is preparing a program deviation report.⁷¹ A total of \$1.44 billion has been appropriated through FY 2015 and \$336.3 million was requested over the FY16 FYDP. An additional \$2.08 billion is planned for beyond the FDYP to procure more than 15,000 radios.⁷²

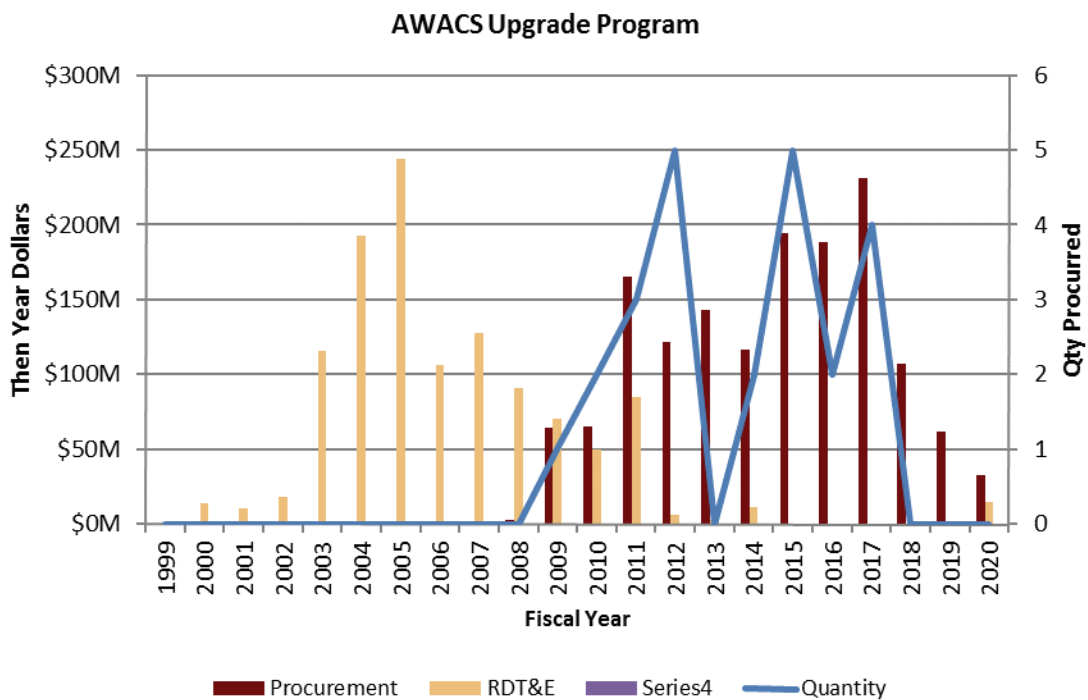


⁷¹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AMF_JTRS_SAR_Dec_2014.PDF.

⁷² 212 additional units were procured with RDT&E funding, but are not included in the quantity line.

Airborne Warning and Control System Block 40/45 Upgrade

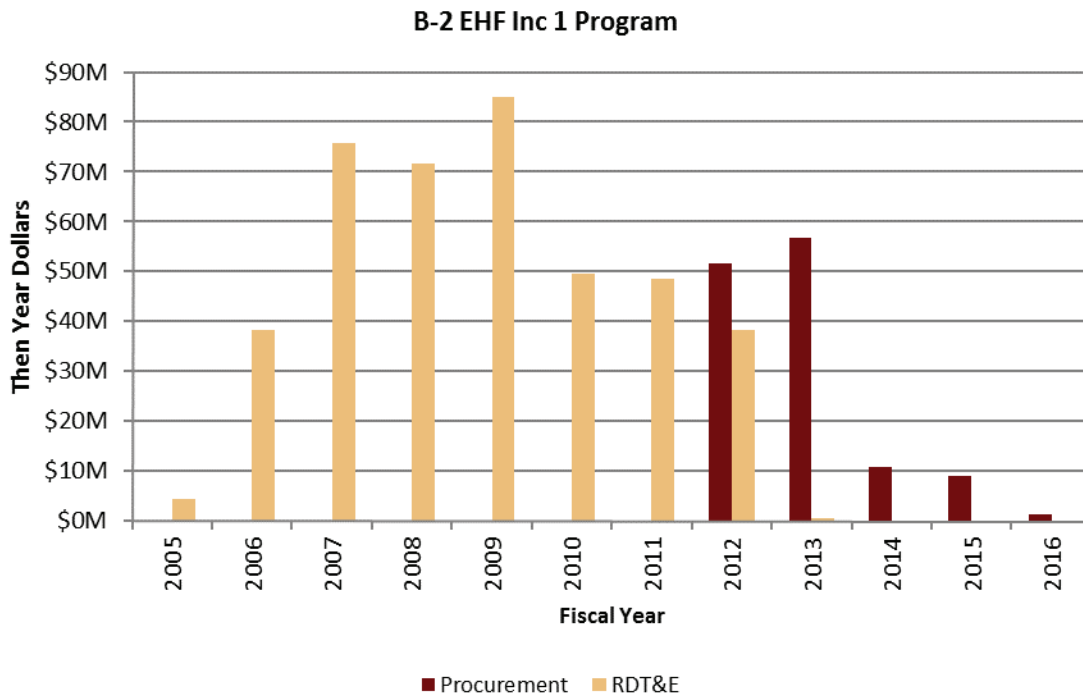
AWACS aircraft provide a mobile battle management, wide area surveillance, and command and control capability. The AWACS Block 40/45 upgrade program will improve target tracking capabilities and the radar's ability to distinguish friend from foe. It includes updated data processing, data link, and battle management tools. In FY 2013, the Block 40/45 upgrade program reported a significant Nunn-McCurdy breach primarily due to reducing the quantity of aircraft being upgraded from 31 to 24. Six of the planned upgraded aircraft, now designated the E-3G, have been delivered, allowing the Air Force to declare initial operating capability. A total of \$2.02 billion has been appropriated through FY 2015 and an additional \$635.8 million was requested over the FY16 FYDP.⁷³



⁷³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AWACS_Blkc40_45_SAR_Dec_2014.PDF.

B-2 Extremely High Frequency (EHF) SATCOM and Computer Increment 1

The B-2 EHF program will upgrade the B-2 to be compatible with the future Advanced Extremely High Frequency (AEHF) satellite constellation. Increment 1 installs an upgraded protected satellite communications terminal compatible with both the AEHF constellation and the legacy MILSTAR constellation. It also provides the necessary fiber optic structure and processing power to support future B-2 upgrades.⁷⁴ A total of \$539.9 million has been appropriated through FY 2015, and an additional \$1.6 million was requested in the FY 2016 FYDP through program completion in FY 2017.⁷⁵

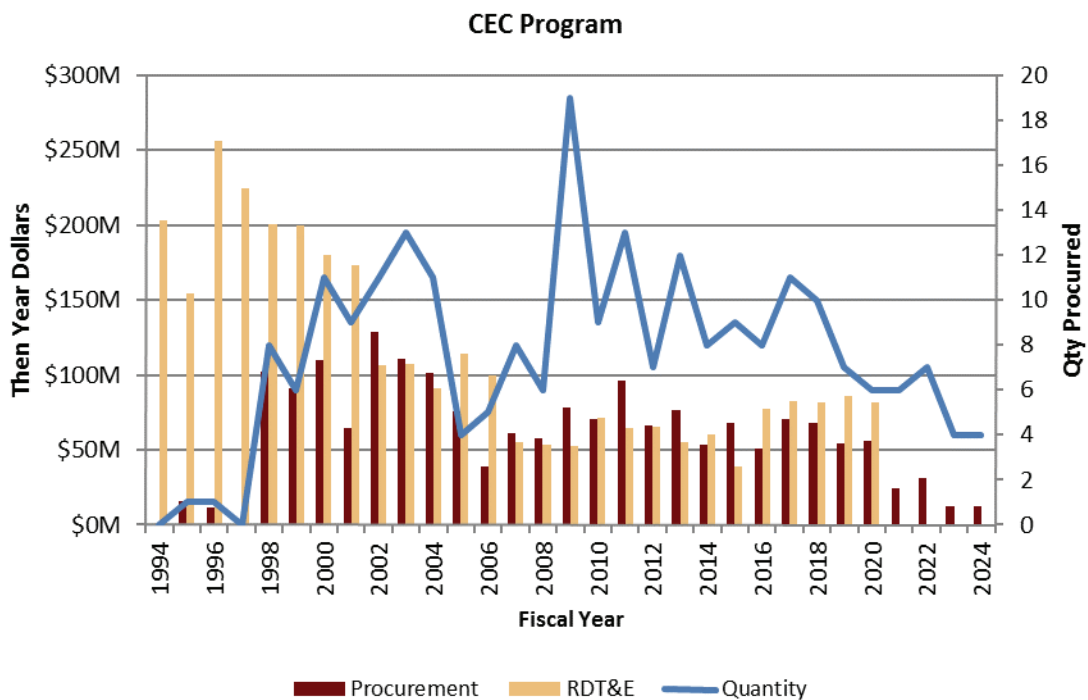


⁷⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_B-2_EHF_Inc_1_SAR_Dec_2014.PDF.

⁷⁵ Funding for four of the 20 planned upgrades were paid for through RDT&E funding. That expenditure is reflected in the graph, but the quantity is not.

Cooperative Engagement Capability (CEC)

The CEC is a Navy-led program to increase overall naval air defense capabilities by integrating sensors and weapons into a single data distribution network to improve situational awareness and increase intercept ranges. The CEC program is developing shipboard, airborne, Marine Corps ground mobile, Army JLENS, and foreign military sales variants. Both the shipboard and airborne variants are in full-rate production. The foreign military sales variants were deemed sensitive by the participating countries (United Kingdom, Australia, and Canada) and are not included in this SAR.⁷⁶ The Marine Corps variant has been fully procured and future funds are allocated for system upgrades.⁷⁷ A total of \$4.1 billion has been appropriated through FY 2015 for 171 units, \$0.79 billion was requested over the FY16 FYDP for 42 units, and \$81 million is planned for beyond the FYDP to complete production at 234 units.⁷⁸



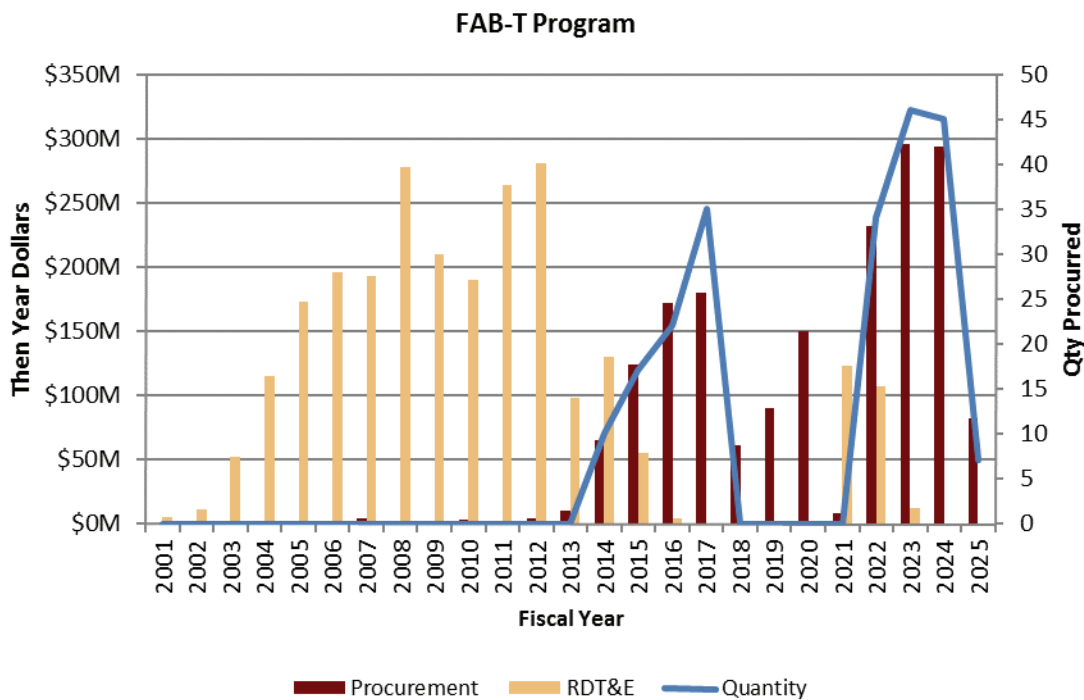
⁷⁶ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/14-F-0402_DOC_15_CECDecember2013SAR.PDF.

⁷⁷ "Composite Tracking Network (CTN)," *Concepts & Programs*, U.S. Marine Corps, May 18, 2015.

⁷⁸ 30 units were procured with RDT&E funding, but are not included in the quantity line.

Family of Beyond Line-of-Sight Terminals (FAB-T)

The Air Force's FAB-T program is developing protected satellite communications terminals for airborne and ground-based users to replace legacy nuclear attack survivable terminals. FAB-T provides voice and data communications for conventional and nuclear forces using the new capabilities, improved data rates, and protection provided by the AEHF constellation of satellites.⁷⁹ Due to cost growth and schedule delays, the Air Force began looking for an alternate contractor to complete the program.⁸⁰ In mid-2014, the Air Force awarded the contract to produce the command post terminals to Raytheon.⁸¹ A total of \$2.46 billion has been appropriated through FY 2015 for the program, \$654.9 million was requested over the FY16 FYDP, and \$1.15 billion is planned for beyond the FYDP for the procurement of a total of 259 terminals over the life of the program.⁸²



⁷⁹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_FAB-T_SAR_Dec_2014.PDF.

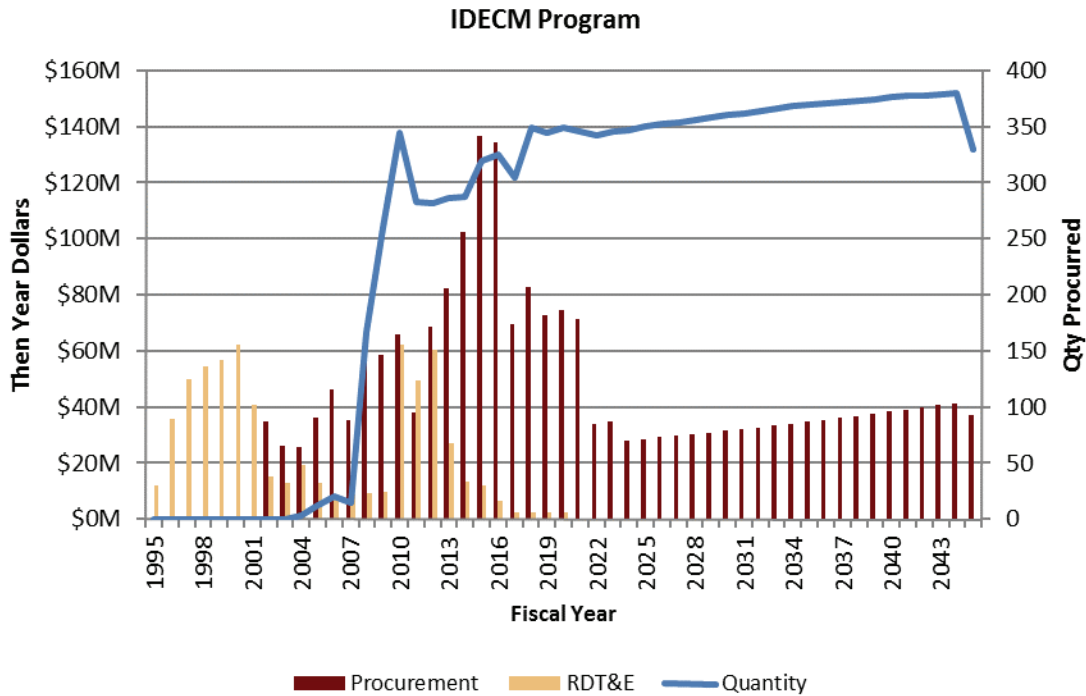
⁸⁰ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 85–86.

⁸¹ Joey Cheng, "Air Force switches contractors with \$298M award for FAB-T satellite terminals," *Defense Systems*, June 4, 2014, <http://defensesystems.com/articles/2014/06/04/air-force-fab-t-contract-raytheon.aspx>.

⁸² 37 units were procured with RDT&E funding, but are not included in the quantity line.

Integrated Defensive Electronic Countermeasures (IDECM)

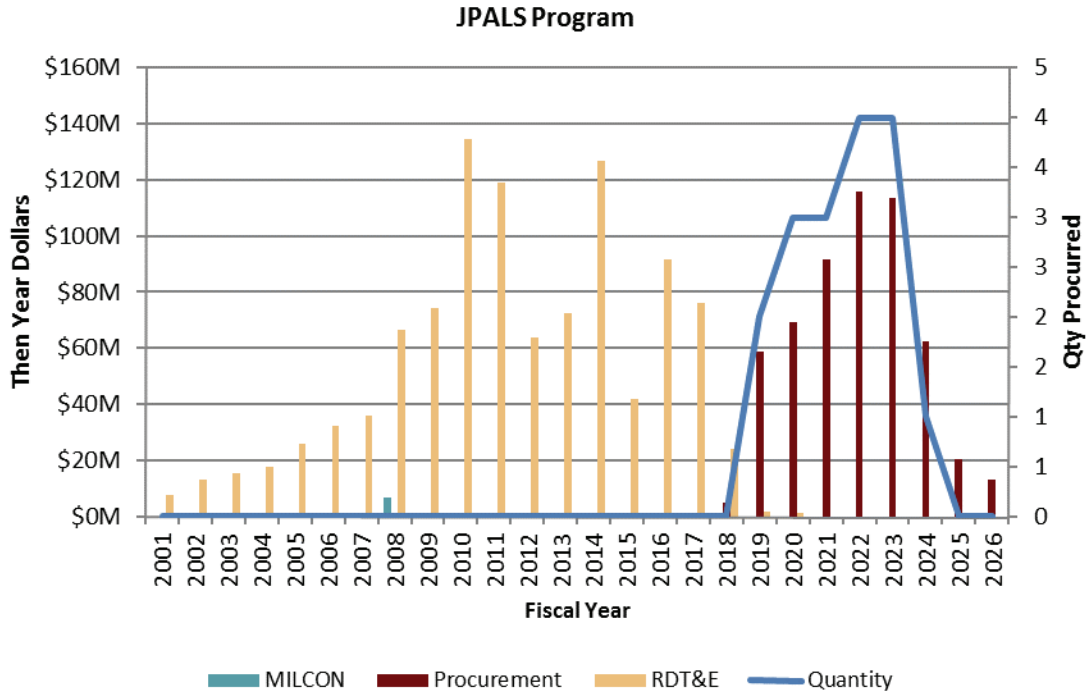
IDECM is a Navy program to design a radio frequency electronic countermeasure suite for the F/A-18 aircraft. The system is designed to receive and process signals from enemy radars and disrupt these signals using on-board and off-board jammers. Four IDECM variants are being developed with slightly different capabilities. The first three are only compatible with F/A-18E/F aircraft and the fourth variant is compatible with F/A-18C-F aircraft.⁸³ A total of \$1.44 billion has been appropriated through FY 2015, \$0.45 billion was requested over the FY16 FYDP, and \$0.9 billion is planned for beyond the FYDP.



⁸³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_IDECM_SAR_Dec_2014.PDF.

Joint Precision Approach and Landing System (JPALS)

JPALS is a Navy program to develop a GPS-based aircraft landing system to replace the current radar-based systems. Increment 1A is the ship-based system and increment 1B will integrate JPALS onto sea-based aircraft.⁸⁴ In 2013, the program reported a critical Nunn-McCurdy breach due in part to the elimination of ten training systems.⁸⁵ The program has been restructured and a Milestone B decision is expected in FY 2016. A total of \$0.85 billion has been appropriated through FY 2015, \$0.33 billion was requested over the FY16 FYDP, and \$0.42 billion is planned for beyond the FYDP.⁸⁶



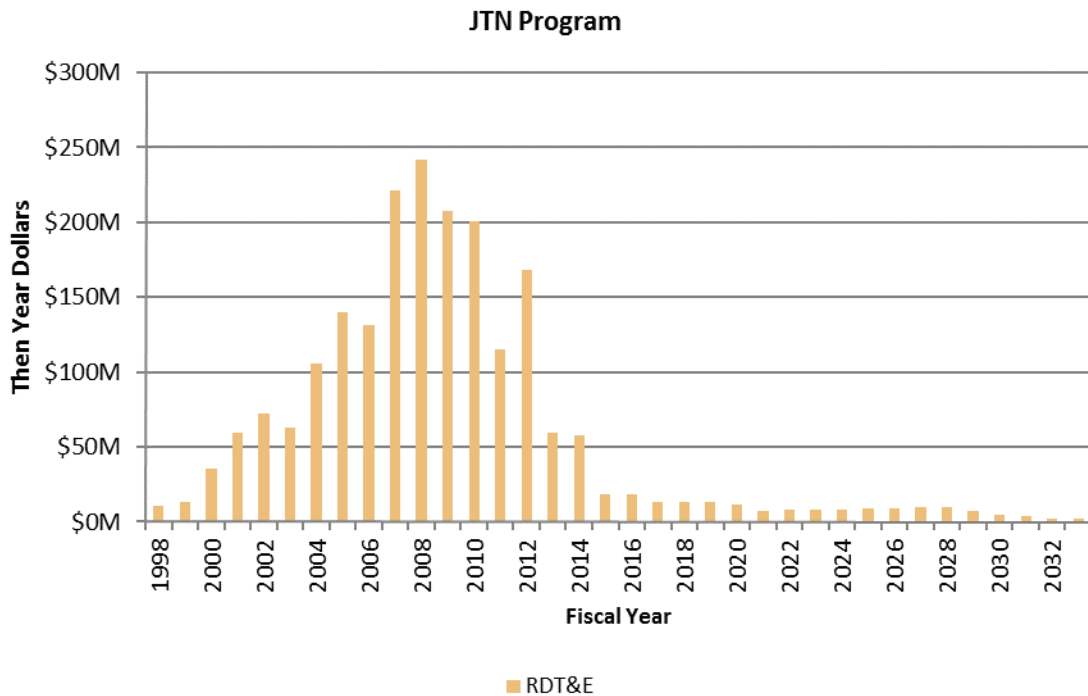
⁸⁴ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 99–100.

⁸⁵ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_JPALS_Inc_1A_SAR_Dec_2014.PDF.

⁸⁶ Ten systems were procured with RDT&E funding, but are not included in the quantity line.

Joint Tactical Networks (JTN)

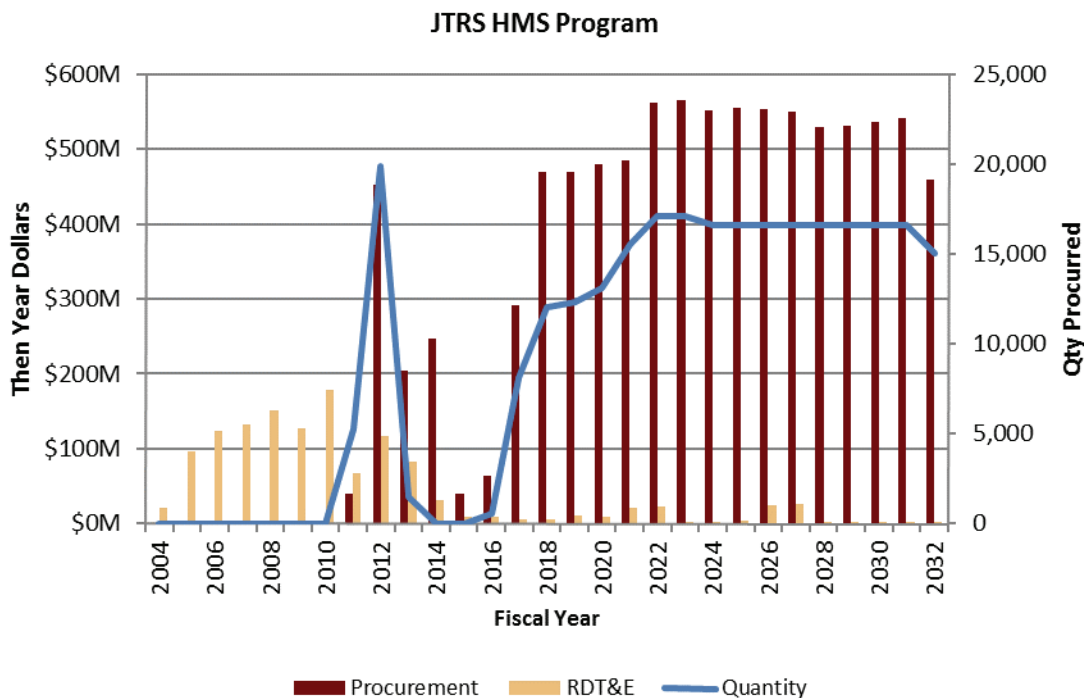
This Army-led program will develop, maintain, and provide network management for software-defined waveforms operating on a variety of radio platforms. This allows DoD to procure radios from different contractors while maintaining interoperability, thus fostering competition between radio manufacturers. The soldier radio waveform, wideband networking waveform, mobile user objective system waveform, Link 16 software defined waveform, and joint enterprise network manager have all completed formal qualification testing under this program.⁸⁷ A total of \$1.92 billion has been appropriated through FY 2015, \$68.1 million was requested over the FY16 FYDP, and \$88.2 million is planned for beyond the FYDP.



⁸⁷ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_JTN_SAR_Dec_2014.PDF.

Joint Tactical Radio System Handheld, Manpack, and Small Form Fit Radios (JTRS HMS)

The JTRS HMS is an Army program to procure a family of software-defined radios that can create secure, self-forming, ad hoc voice and data networks. The program will procure multi-channel Manpack and a single-channel Rifleman radios.⁸⁸ The Army is considering altering the program to also acquire two-channel Rifleman radios, which would require a separate competition, but the Army believes it would not significantly delay the program.⁸⁹ The full rate production decision for both variants was delayed until at least 2017 due to concerns regarding system reliability.⁹⁰ The Pentagon's top weapons tester identified cybersecurity vulnerabilities in both radio variants, although the Army states that it is fixing these vulnerabilities.⁹¹ A total of \$2.13 billion has been appropriated through FY 2015, \$1.82 billion was requested over the FY16 FYDP, and \$6.54 billion is planned for beyond the FYDP for a total procurement of more than 270,000 radios.⁹²



⁸⁸ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_JTRS_HMS_SAR_Dec_2014.PDF.

⁸⁹ Ellen Mitchell, "Army Mulling Over Option of Two-Channel Handheld Rifleman Radio," *Inside Defense*, February 1, 2016.

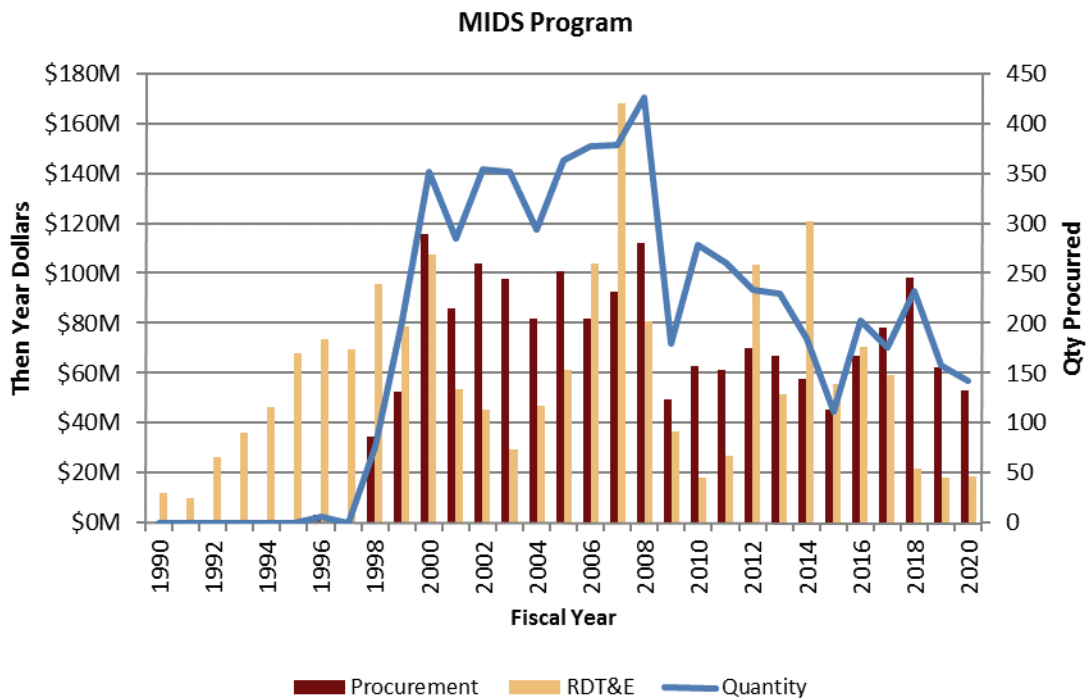
⁹⁰ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 101–102.

⁹¹ Ellen Mitchell, "Pentagon Finds Cyber Vulnerabilities in Army Vehicular, Handheld Radios," *Inside Defense*, February 8, 2016.

⁹² Some 833 radios were procured with RDT&E funding, but are not included in the quantity line.

Multifunctional Information Distribution System (MIDS)

The MIDS program is a multinational (U.S., France, Germany, Italy, and Spain) program to develop lightweight tactical radios for U.S. and allied aircraft, ships, and ground sites. The Navy is leading the U.S. portion of the program. The MIDS Joint Tactical Radio System (MIDS-JTRS) is intended for U.S. military use and provides additional capabilities over the MIDS variant developed by international partners. Both terminals are in production, and the MIDS-JTRS has been approved for sale to many foreign countries, including Belgium, Canada, Poland, South Korea, and Japan.⁹³ A total of \$3.55 billion has been appropriated through FY 2015 and \$0.55 billion was requested over the FY16 FYDP for a total procurement of 5,851 radios.⁹⁴

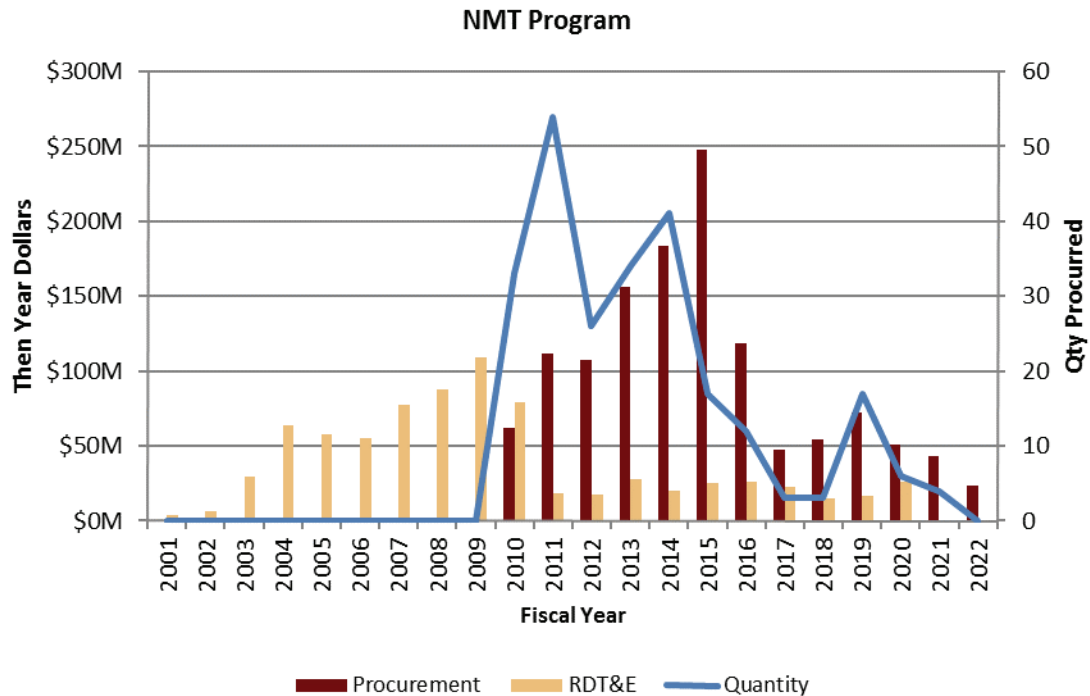


⁹³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MIDS_SAR_Dec_2014.PDF.

⁹⁴ 548 MIDS radios were procured with RDT&E funding, but are not included in the quantity line.

Navy Multiband Terminal (NMT)

The NMT is a multiband SATCOM terminal for naval forces. The NMT will be capable of communicating using the DSCS, WGS, MILSTAR, and AEHF satellite constellations. The program is in full-rate production and is preparing for a follow-on operational test late in FY 2016.⁹⁵ A total of \$1.55 billion has been appropriated through FY 2015, \$0.45 billion was requested over the FY16 FYDP, and \$66 million is planned for beyond the FYDP.⁹⁶

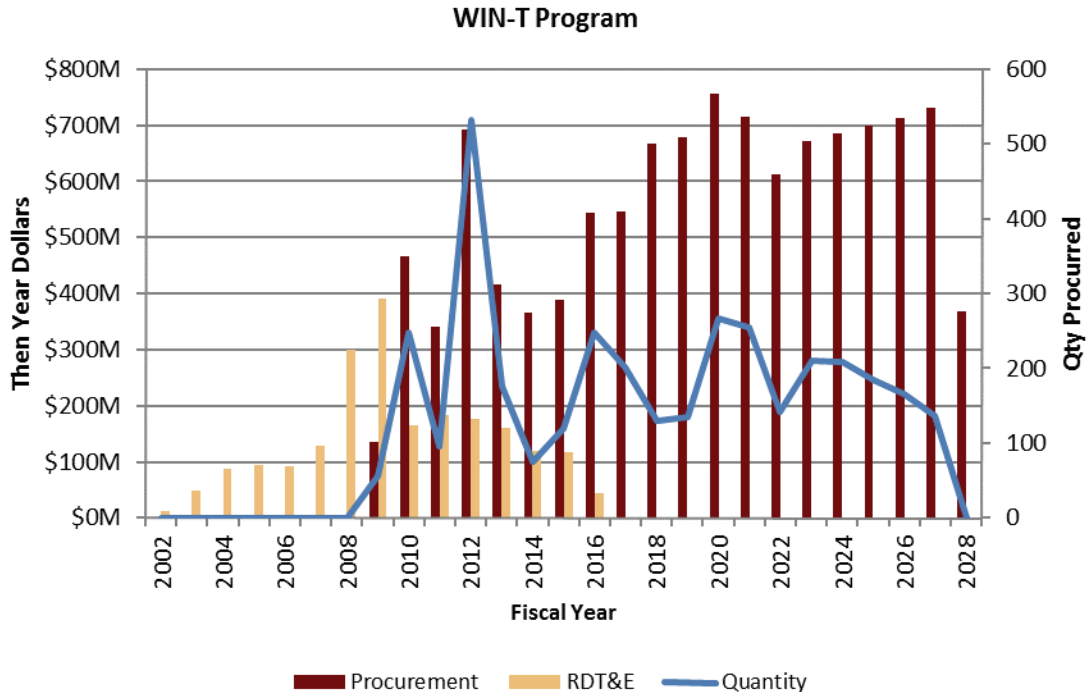


⁹⁵ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_NMT_SAR_Dec_2014.PDF.

⁹⁶ 28 NMT terminals were procured with RDT&E funding, but are not reflected in the quantity line.

Warfighter Information Network-Tactical (WIN-T)

WIN-T is a multi-increment program that provides mobile, self-forming, high-speed and high-capacity networking to units at the company level. Increment 2 was approved for full-rate production in June 2015.⁹⁷ In part due to space and power constraints, the Army is struggling to integrate the WIN-T system onto its tracked vehicles.⁹⁸ The Increment 3 sub-program was restructured in 2014, turning the program into a software development program only. The restructured Increment 3 sub-program will focus on developing network operations software and two new waveforms. Increment 2 quantities and capabilities have been adjusted to cover the fielding requirements of the Increment 3 sub-program.⁹⁹ The reduction of the Increment 3 sub-program and the associated expansion of the Increment 2 sub-program caused the Increment 2 sub-program to report a significant Nunn-McCurdy breach in 2014.¹⁰⁰ A total of \$4.88 billion has been appropriated through FY 2015, \$3.23 billion was requested for the FY 2016 FYDP, and \$5.2 billion is planned for beyond the FYDP.¹⁰¹



⁹⁷ "General Dynamics' WIN-T Increment 2 Cleared for \$8.3B Production Run," *Inside Defense*, June 8, 2015.

⁹⁸ Ellen Mitchell, "Pentagon's Chief Weapons Tester Worried Over Win-T Aboard Army Vehicles," *Inside Defense*, February 1, 2016.

⁹⁹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_WIN-T_Inc_3_SAR_Dec_2014.PDF.

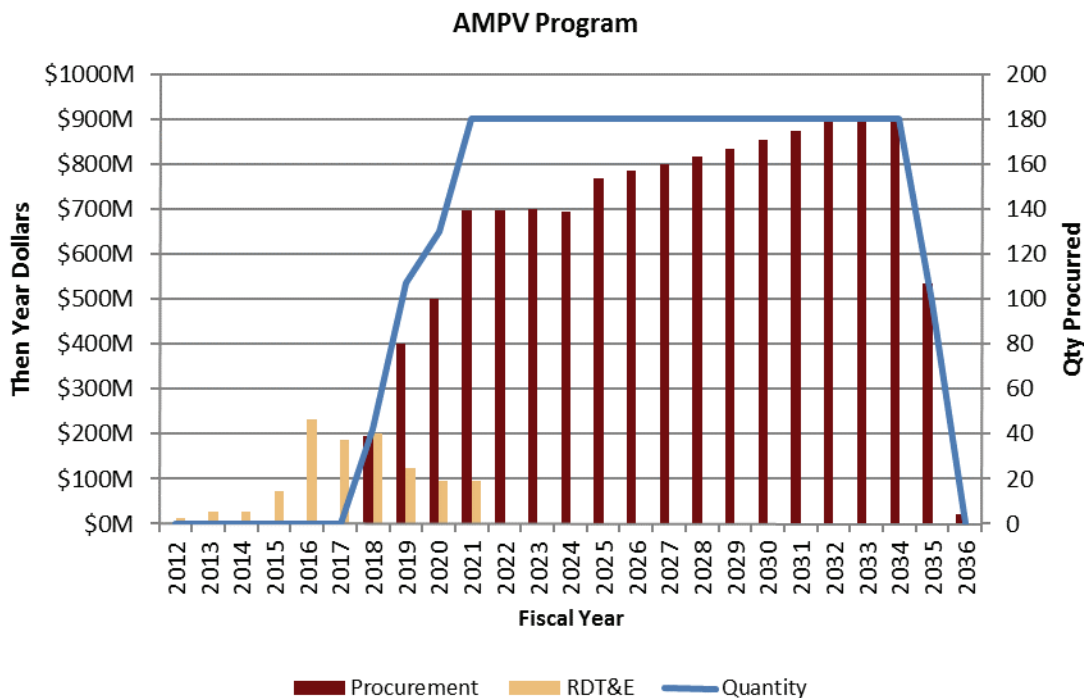
¹⁰⁰ DoD, "Department of Defense Selected Acquisition Reports (SARs) (as of December 31, 2014)," Press Operations Release NR-090-15, March 19, 2015.

¹⁰¹ 56 WIN-T Increment 2 units were procured with RDT&E funding, but are not included in the quantity line.

Ground Systems

Armored Multi-Purpose Vehicle (AMPV)

The AMPV program will replace the M113 family of vehicles and fulfill medical treatment/evacuation, mission command, general purpose, and mortar carrier roles with 2,936 new vehicles at the armored brigade combat team level and below. In December 2014, BAE was awarded a cost plus incentive fee engineering and manufacturing development contract. The program is on track for a critical design review in June 2016.¹⁰² The program acquisition strategy is based on utilizing derivatives of existing military vehicles and not requiring the development of new technology in order to manage overall program risk.¹⁰³ A total of \$138.1 million has been appropriated through FY 2015, \$1.94 billion was requested over the FY 2016 FYDP, and \$11.87 billion is planned for beyond the FYDP.¹⁰⁴



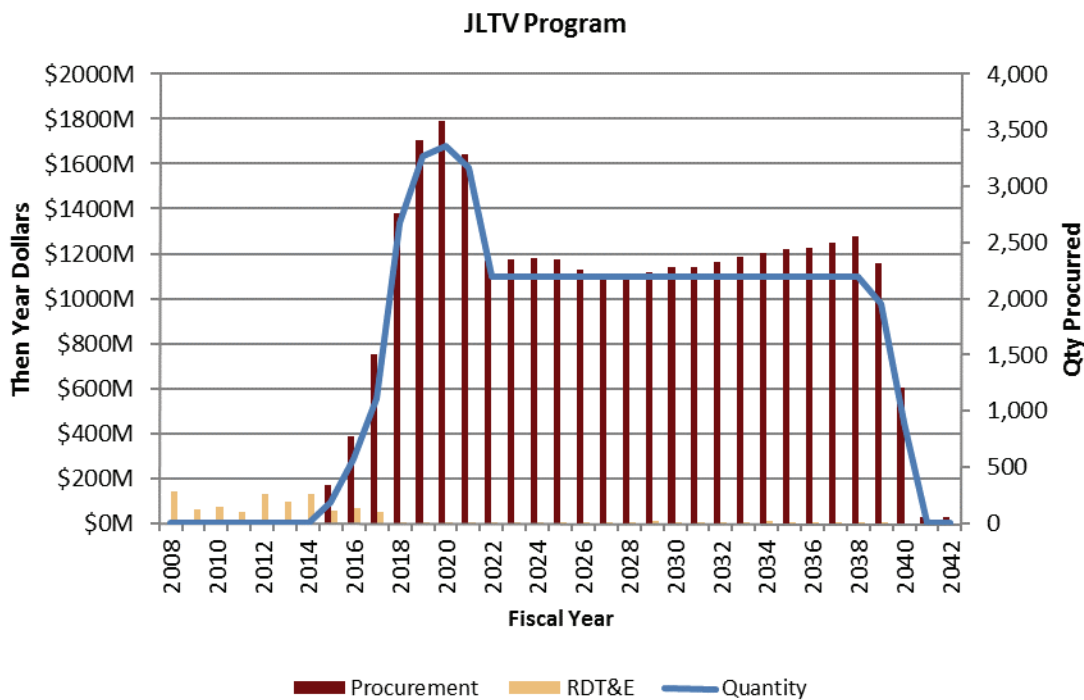
¹⁰² DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AMPV_SAR_Dec_2014.PDF.

¹⁰³ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 67–68.

¹⁰⁴ 39 AMPV vehicles will be procured with RDT&E funding, but are not included in the quantity line.

Joint Light Tactical Vehicle (JLTV)

This Army led program is intended to replace part of the fleet of High Mobility Multipurpose Wheeled Vehicles (HMMWVs) used by the Army and Marine Corps. The JLTV will provide better protection for passengers and has greater payload capacity than the up-armored HMMWV. It will be produced in a two-seat and four-seat variant with the two-seat variant supporting a higher payload capacity of 5,100 pounds versus 3,500 pounds for the four-seat variant.¹⁰⁵ In August 2015, Oshkosh Corporation was awarded a firm fixed price production contract. Low rate initial production is scheduled to begin early in 2016 with both the Army and Marine Corps expecting the JLTV to achieve initial operational capability in 2018.¹⁰⁶ A total of \$914 million has been appropriated through FY 2015, \$6.15 billion was requested over the FY16 FYDP, and \$23.51 billion is planned for beyond the FYDP for a total projected buy of 54,720 vehicles through FY 2040.¹⁰⁷



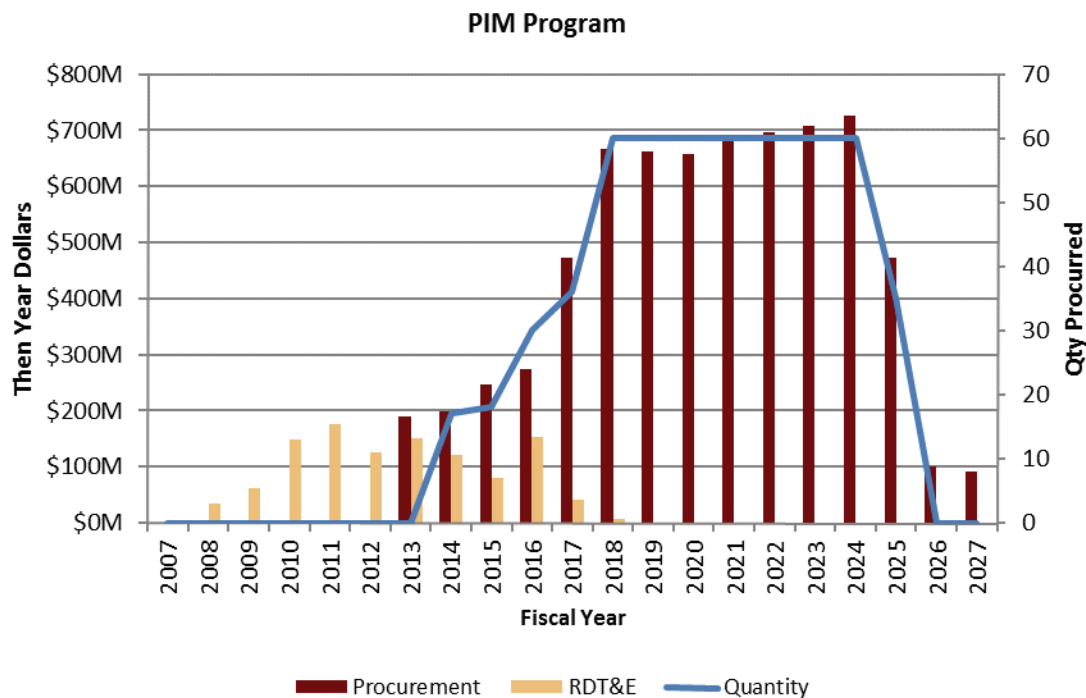
¹⁰⁵ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_JLTV_SAR_Dec_2014.PDF.

¹⁰⁶ U.S. Army, "JLTV Enters Low Rate Production," August 25, 2016, http://www.army.mil/article/154425/JLTV_enters_low_rate_production/.

¹⁰⁷ 131 vehicles were procured with RDT&E funding, but are not included in the quantity line.

Paladin Integrated Management (PIM)

The Army's PIM program is producing two new ground vehicles: a self-propelled 155mm howitzer and a tracked ammunition carrier to replace the current M109A6 Paladin and M992A2 ammunition carrier. The previous upgrade to the M109A6 variant rebuilt the turret. This program will rebuild the hull, effectively resulting in procuring a new howitzer in two phases. The upgraded vehicles will provide improved protection and sustainability over the current variant due to a new hull, a modernized electrical system, and incorporating modified versions of the power train, suspension, and tracks from the Bradley Infantry Fighting Vehicle. The systems developed for the PIM program will support future upgrades to the Bradley and the AMPV program, resulting in significant commonality amongst Army vehicle programs. The first production vehicles were delivered in 2015 with operational testing scheduled for 2016.¹⁰⁸ The first units should be equipped with the upgraded howitzers in 2017.¹⁰⁹ A total of \$1.53 billion has been appropriated through FY 2015. An additional \$2.94 billion was requested over the FY16 FYDP and \$3.48 billion is planned for beyond the FYDP.¹¹⁰



¹⁰⁸ Sydney Freedberg, "Paladin PIM: The Little Cannon That Could & The Future Of The Armored Brigade," *Breaking Defense*, April 6, 2015.

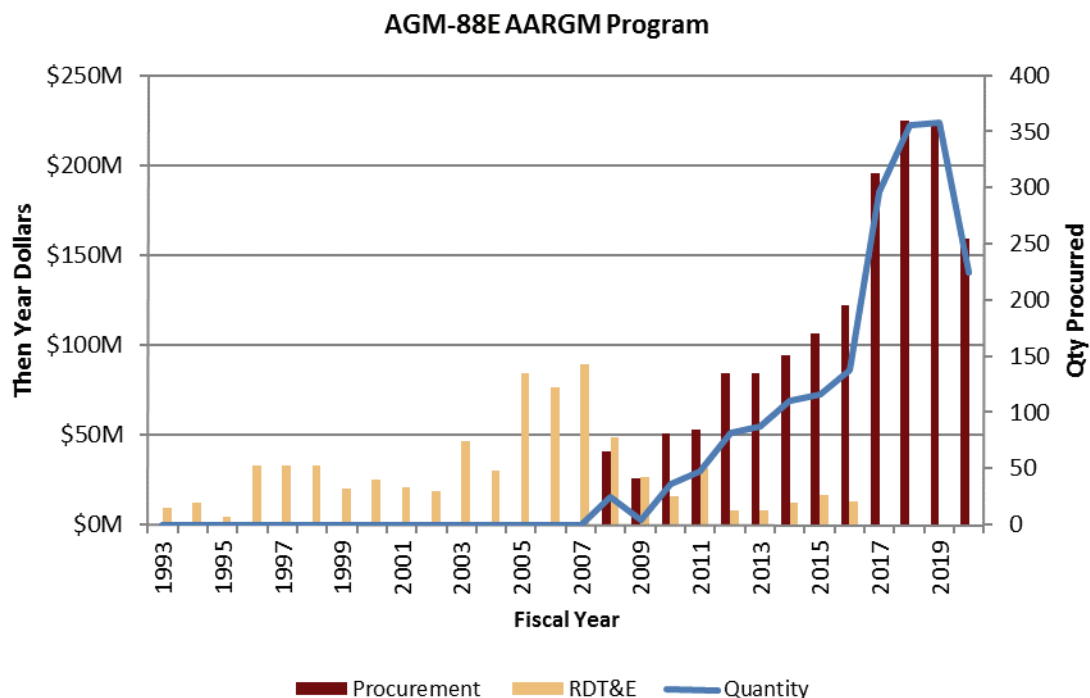
¹⁰⁹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_PIM_Draft_SAR_Dec_2014.PDF.

¹¹⁰ Two PIM systems were procured with RDT&E funding, but are not included in the quantity line.

Missiles and Munitions

AGM-88E Advanced Anti-Radiation Guided Missile (AARGM)

The AGM-88E is an air-to-surface missile for targeting enemy air defenses. The AARGM program upgrades the guidance and control mechanisms of the existing AGM-88 High Speed Anti-Radiation Missile (HARM) propulsion and warhead sections. The AARGM can also transmit weapon impact assessment data via satellite. The AARGM will be compatible with the F/A-18C/D/E/F, EA-6B, EA-18G, F-16C/J, and F-35 (external carriage).¹¹¹ The Navy plans to procure 1,879 missiles through FY 2020. A total of \$1.24 billion has been appropriated through FY 2015 and \$0.94 billion was requested over the FY16 FYDP. The FY16 budget also includes a request for funding for development and procurement of the AARGM Extended Range (AARGM-ER) program; that funding is not included in the chart below as the program will be run separately.¹¹²

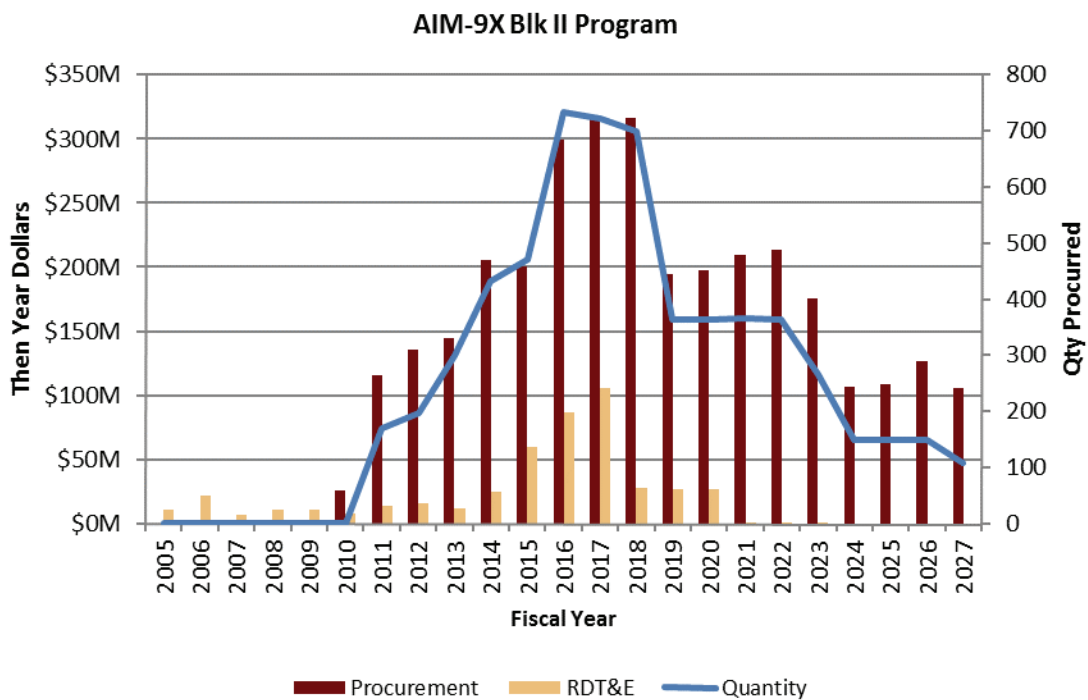


¹¹¹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AGM-88E_AARGM_SAR_Dec_2014.PDF.

¹¹² 40 AGM-88E AARGM missiles were procured with RDT&E funding, but are not included in the quantity line.

AIM-9X Block II Air-to-Air Missile

The AIM-9X Block II is a Navy-led program to acquire short-range air-to-air missiles for the F-15, F-16, F-18, F-22A, and F-35 aircraft. Block II includes hardware and software upgrades to improve the range from which the missile can engage and discriminate among targets. The most significant upgrade allows the Block II missiles to engage targets its seeker can't see at launch using targeting data from the launching fighter. Additionally, the range upgrades to the Block II provide some beyond-visual-range capabilities. The program entered full-rate production in September 2015.¹¹³ A total of \$1 billion has been appropriated through FY 2015, \$1.6 billion was requested over the FY16 FYDP, and \$1 billion is planned for beyond the FYDP for a total procurement quantity of 6,000 missiles.¹¹⁴

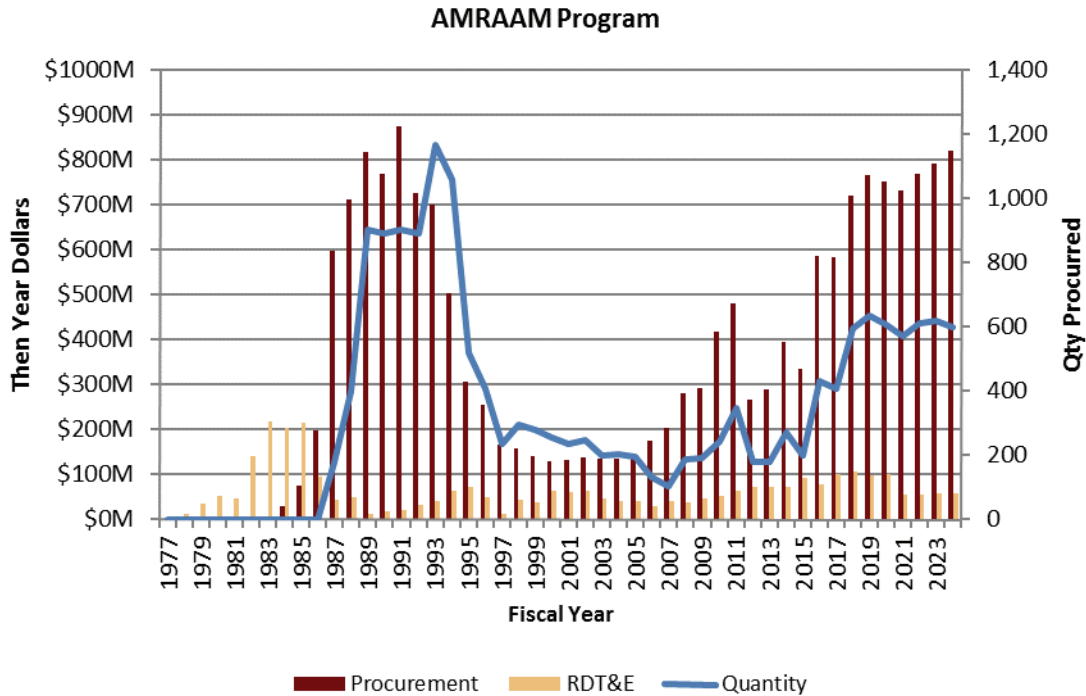


¹¹³ Richard Scott, "First Full-Rate Production Contract for AIM-9X Sidewinder Block II," *Jane's Missiles & Rockets*, September 28, 2015.

¹¹⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AMRAAM_SAR_Dec_2014.PDF.

AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM)

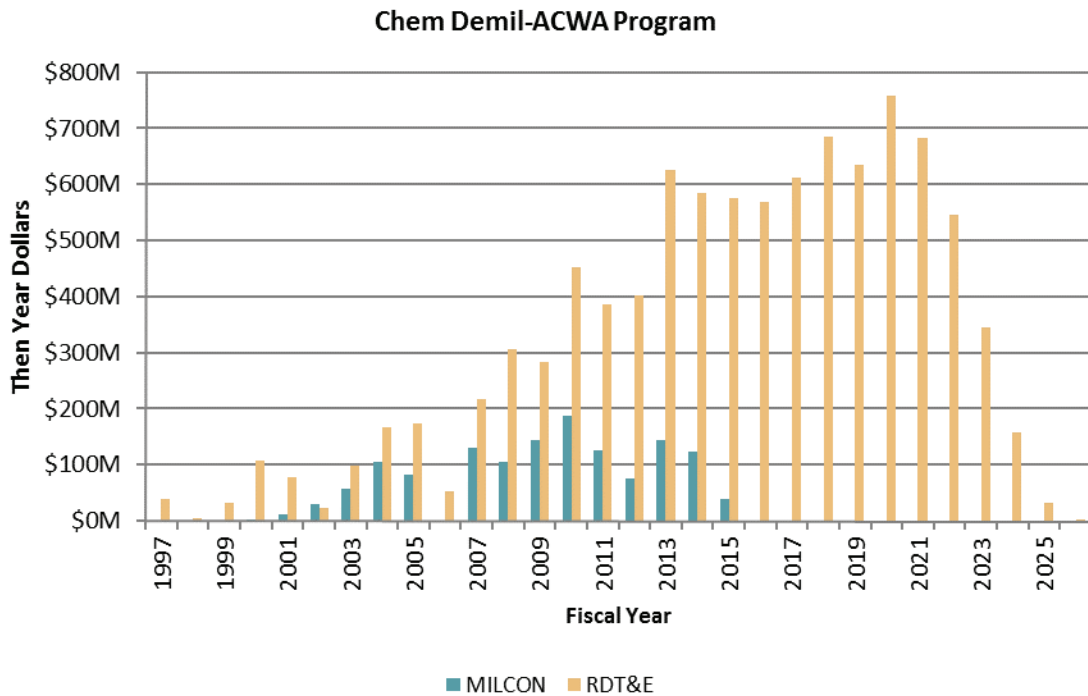
The AMRAAM is an Air Force-led program to acquire an advanced medium-range air-to-air missile. The AIM-120, designed to replace the AIM-7 Sparrow, is an active radar-guided missile with electronic protection capabilities. The AIM-120D will have improved accuracy, network compatibility, and electronic protection and, as of January 2015, is in use by both the Navy and Air Force.¹¹⁵ A total of \$13.37 billion has been appropriated through FY 2015, \$3.89 billion was requested over the FY16 FYDP, and \$3.34 billion is planned for beyond the FYDP.



¹¹⁵ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AMRAAM_SAR_Dec_2014.PDF.

Chemical Demilitarization-Assembled Chemical Weapons Alternatives (Chem Demil-ACWA)

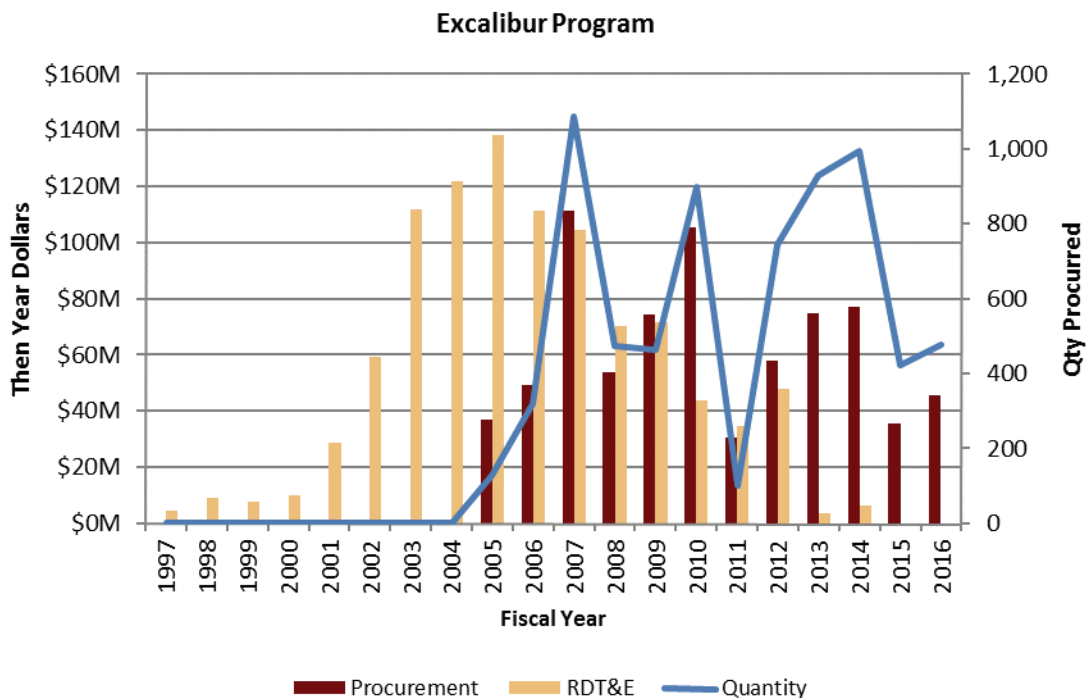
This DoD-wide program is employing two different technologies to eliminate stockpiles of chemical weapons. It is in the process of building fixed-base, single-use systems at the Pueblo Chemical Depot in Colorado and the Blue Grass Army Depot in Kentucky. The Colorado facility should complete its operations in late 2022 and the Kentucky facility should complete its operations in early 2025. A total of \$5.97 billion has been appropriated through FY 2015, \$3.26 billion was requested over the FY16 FYDP, and \$1.76 billion is planned for beyond the FYDP.¹¹⁶



¹¹⁶ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_Chem_Demil-ACWA_SAR_Dec_2014.PDF.

Excalibur Precision 155mm Projectiles (Excalibur)

The Army's Excalibur projectile is a GPS-based fire-and-forget 155mm artillery munition intended to provide improved range and accuracy – out to 40.5 kilometers and accurate within three meters. The Excalibur projectile can be fired by the M77A2, M109A6, M109A7, and Swedish Archer howitzers. The near vertical angle of the round's descent is supposed to minimize collateral damage and improve effectiveness in urban environments. Increment Ia-1 Ia-2 are in use. Increment Ib is designed to increase reliability and reduce costs further.¹¹⁷ After exceeding the Army's reliability, lethality, and range requirements, the Increment Ib projectile entered full-rate production in July 2014.¹¹⁸ A total of \$1.69 billion has been appropriated through FY 2015 and \$45.5 million was requested in the FY 2016 FYDP through the projected end of the program that year.¹¹⁹



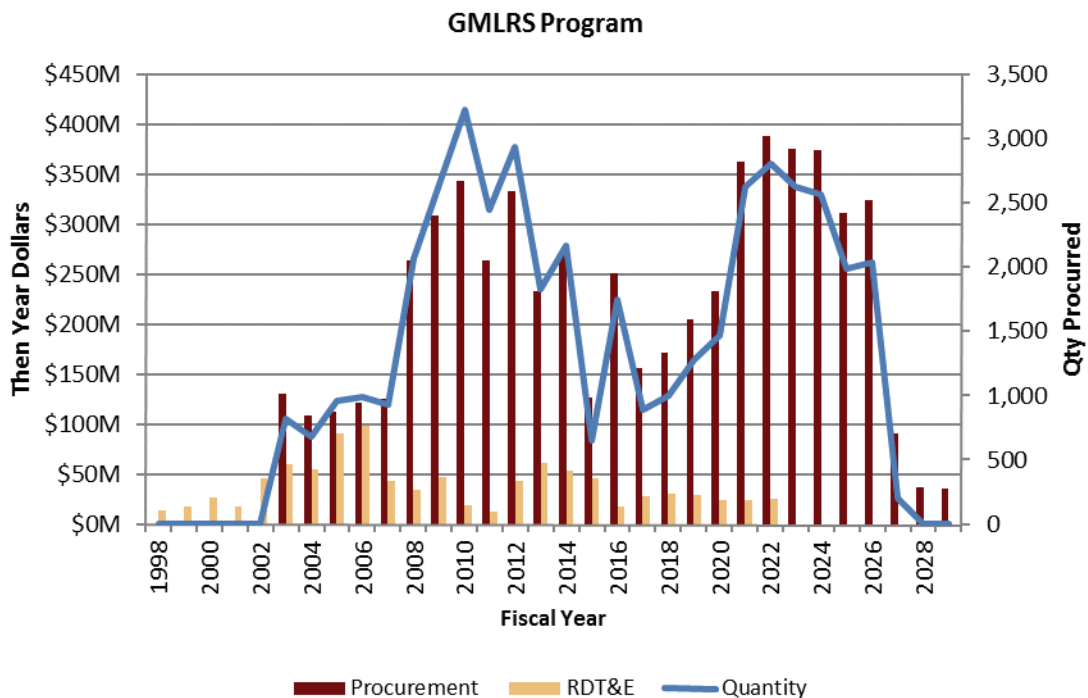
¹¹⁷ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_Excalibur_SAR_Dec_2014.PDF.

¹¹⁸ Raytheon, "Excalibur IB Enters Full Rate Production and Receives \$52 Million Award," press release, July 31, 2014.

¹¹⁹ 544 projectiles were procured with RDT&E funding, but are not included in the quantity line. The \$69 million contributed by the Kingdom of Sweden for system development is included in the figures and chart above.

Guided Multiple Launch Rocket System/Guided Multiple Launch Rocket System Alternative Warhead (GMLRS/GMLRS AW)

This Army-led program is developing and procuring rockets designed to attack targets using indirect and precision fires out to roughly 70 kilometers. GMLRS uses a solid propellant rocket and an inertial measurement unit with GPS assistance for guidance. It can be fired either from the M270A1 tracked vehicle or the High Mobility Artillery Rocket System (HIMARS) mobile launch vehicle. It currently is fired either with cluster munitions for personnel and thinly-armored vehicles or a 200-pound unitary warhead designed to limit collateral damage. The alternative warhead will replace the cluster munition warhead due to the impending entry into force of the Cluster Munitions Ban.¹²⁰ Lockheed Martin was awarded a fixed-price-incentive full rate production contract for the alternative warhead in June 2015.¹²¹ A total of \$3.53 billion has been appropriated through FY 2015, \$1.14 billion was requested over the FY16 FYDP, and \$2.35 billion is planned for beyond the FYDP.¹²²



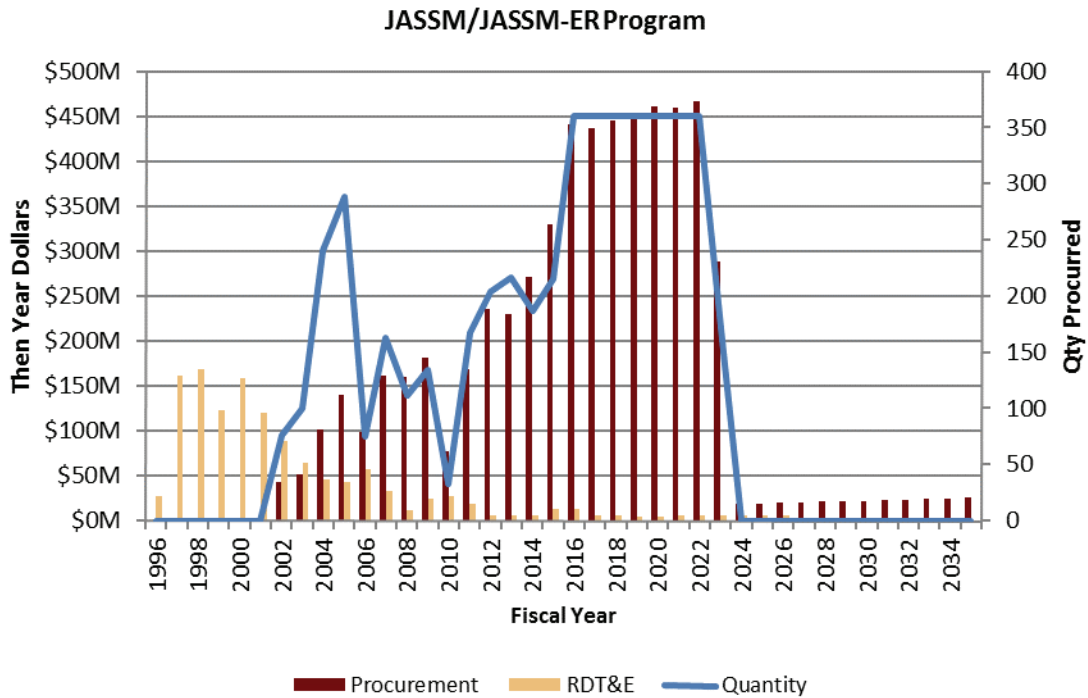
¹²⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_GMLRS_GMLRS_AW_SAR_Dec_2014.PDF.

¹²¹ DoD, "Contracts," June 3, 2015, <http://www.defense.gov/News/Contracts/Contract-View/Article/606862>.

¹²² 376 GMLRS rockets were procured with RDT&E funding, but are not included in the quantity line.

Joint Air-to-Surface Standoff Missile/JASSM-Extended Range (JASSM/JASSM-ER)

The Air Force-run JASSM/JASSM-ER program is developing the next generation low-observable, subsonic cruise missile. It is designed to carry a 1000-pound warhead with ranges greater than 200 nautical miles (JASSM) or 500 nautical miles (JASSM-ER). JASSM is accurate within three meters when using the imaging infrared seeker and within 13 meters when only using the GPS navigation system.¹²³ JASSM and JASSM-ER give fighters and bombers the ability to strike heavily defended targets from greater distances than current munitions allow. The two missiles share 70 percent of the same hardware and 95 percent of the same software. The JASSM-ER entered full rate production in December 2015.¹²⁴ A total of \$3.45 billion has been appropriated through FY 2015, \$2.27 billion was requested over the FY16 FYDP, and \$1.51 billion is planned for beyond the FYDP.¹²⁵



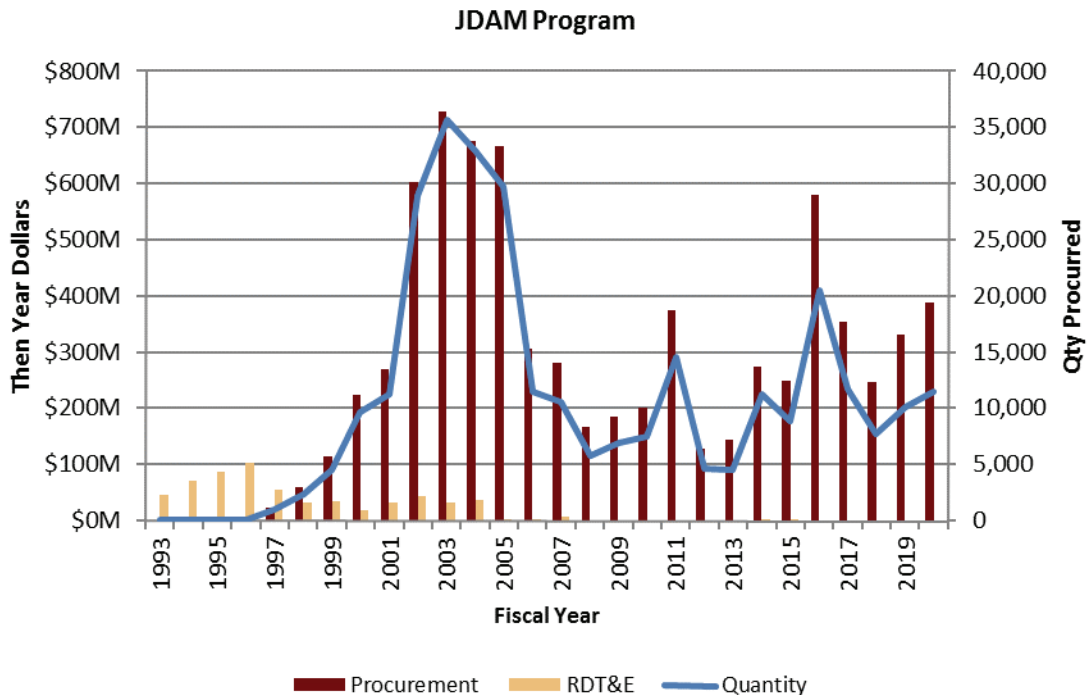
¹²³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_JASSM_SAR_Dec_2014.PDF.

¹²⁴ "JASSM Moves to Full-Rate Production," *Inside Defense*, December 14, 2015.

¹²⁵ 87 JASSM missiles and 31 JASSM-ER missiles were procured with RDT&E funding, but are not included in the quantity line.

Joint Direct Attack Munition (JDAM)

JDAM is a joint Air Force/Navy program to upgrade the existing inventory of general-purpose bombs with GPS and inertial navigation tailkits to improve accuracy under all weather conditions. JDAM bombs can be employed on a variety of aircraft, including the B-52H, B-2A, B-1B, F-16C/D, F/A-18A/C/D/E/F, F-15E, A-10C, AV-8B, and the F-22A.¹²⁶ Laser sensors are also being incorporated onto some JDAMs to improve the bomb's ability to attack mobile targets while minimizing collateral damage.¹²⁷ A total of \$6.27 billion has been appropriated through FY 2015 and \$1.9 billion was requested over the FY16 FYDP. No additional funding is projected beyond the FYDP.¹²⁸



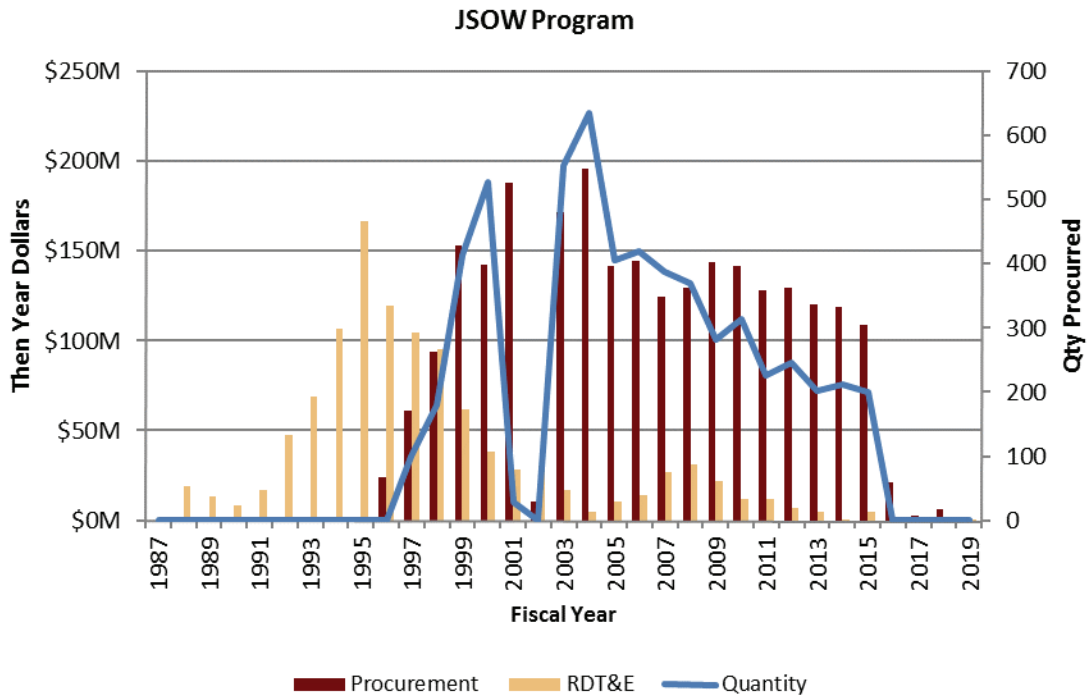
¹²⁶ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_JDAM_SAR_Dec_2014.PDF.

¹²⁷ Boeing, "Boeing Receives Additional Laser JDAM Contract from US Navy," April 17, 2012, <http://boeing.mediaroom.com/index.php?s=20295&item=2223>.

¹²⁸ 804 JDAMs were procured with RDT&E funding, but are not included in the quantity line.

Joint Standoff Weapon (JSOW)

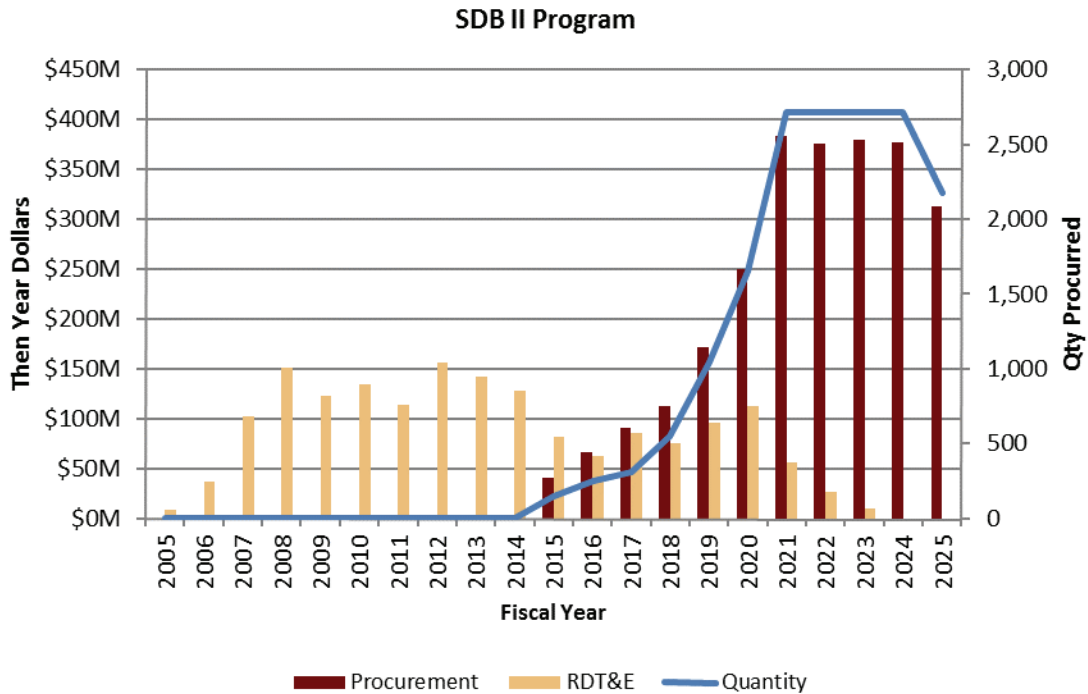
JSOW is a long-range air-to-ground weapon used to attack a variety of targets under all conditions. The JSOW can be launched beyond the range of most surface-to-air systems and has a launch-and-leave capability allowing several target kills per sortie. JSOW procurement was terminated in the FY 2015 budget and all procurement quantities after 2015 were zeroed, resulting in a significant increase in unit cost and Nunn-McCurdy cost breaches. A total of \$3.56 billion has been appropriated through FY 2015, \$33 million was requested over the FY16 FYDP, and \$4 million is planned for beyond the FYDP.¹²⁹



¹²⁹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_JSOW_SAR_Dec_2014.PDF.

Small Diameter Bomb Increment II (SDB II)

The Air Force's SDB II is an all-weather air-to-ground glide bomb for use against mobile targets. It uses radar, infrared, and laser sensors to track targets. As funding becomes available, it will be integrated with the F-15E, F-35, F/A-18E/F, F-16, F-22A, B-1B, B-2, B-52, A-10, and MQ-9.¹³⁰ The SDB II program was approved for low-rate initial production in May 2015.¹³¹ A total of \$1.22 billion has been appropriated through FY 2015, \$1.12 billion is requested for the FYDP, and \$1.92 billion is planned for beyond the FYDP.¹³²



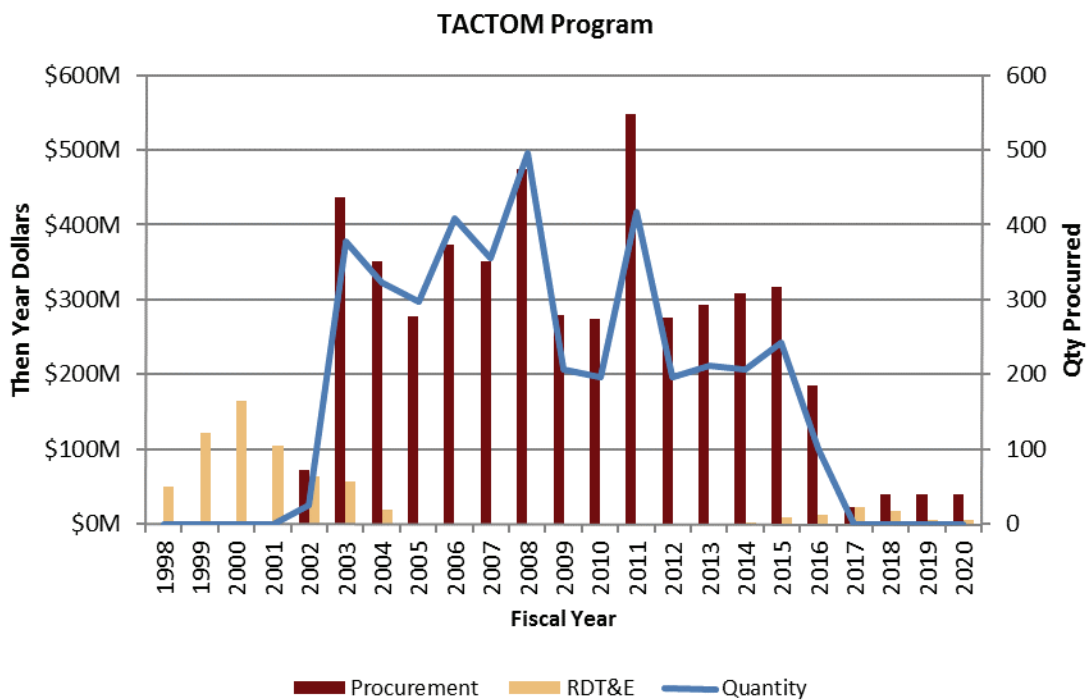
¹³⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_SDB_II_SAR_Dec_2014.PDF.

¹³¹ "SDB II Cleared for Low-Rate Production," *Jane's 360*, May 18, 2015.

¹³² 163 SDB II bombs were procured with RDT&E funding, but are not included in the quantity line.

Tactical Tomahawk (TACTOM)

Tactical Tomahawk (TACTOM) is a Navy cruise missile designed to destroy fixed and mobile targets at a range of up to 1,000 miles. The Block IV design includes improved navigation and anti-jam GPS, the ability to re-target in-flight, a loitering capability, and the ability to send a single-frame battle-damage assessment image of overflown areas.¹³³ The FY 2016 budget request included funding to replace Tomahawks that have been expended during combat operations. Continued procurement funding sustains the industrial base to support unplanned maintenance requirements and additional funds may be allocated to replace expended weapons. A total of \$5.23 billion has been appropriated through FY 2015 and \$0.39 billion was requested over the FY 2016 FYDP.¹³⁴



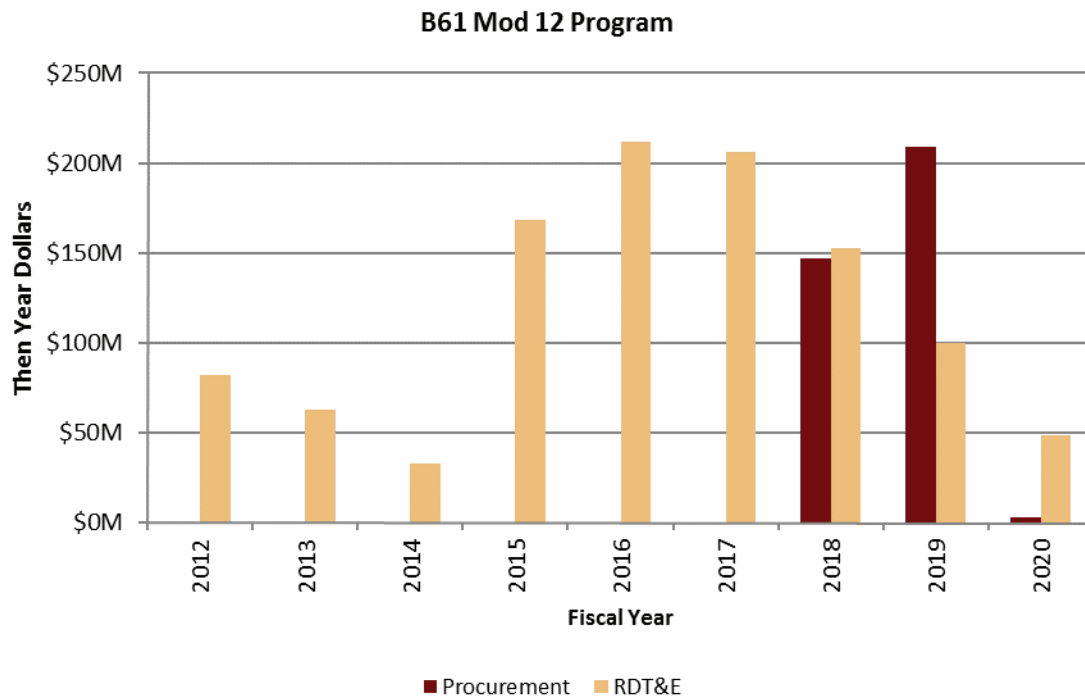
¹³³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_TACTOM_SAR_Dec_2014.PDF.

¹³⁴ Ten TACTOM missiles were procured with RDT&E funding, but are not included in the quantity line.

Nuclear Forces

B61 Mod 12 Life Extension Program Tailkit Assembly

The B61 modernization program will consolidate four variants of the existing B61 air-delivered nuclear gravity bomb – the Mod 3, Mod 4, Mod 7, and Mod 10 – into one Mod 12 version with a variable yield estimated from 0.3 to 350 kilotons and extend the service life of the weapon.¹³⁵ It is a joint DoD/Department of Energy (DoE) program. The Air Force-led DoD portion of the modernization effort adds a tailkit to the bomb to improve its accuracy, reducing the yield required to destroy a target.¹³⁶ For DoD's share of the program, a total of \$345.4 million has been appropriated through FY 2015 and \$1.08 billion was requested in the FY 2016 FYDP through program completion in 2020. These figures do not include DoE's share of the program's funding.

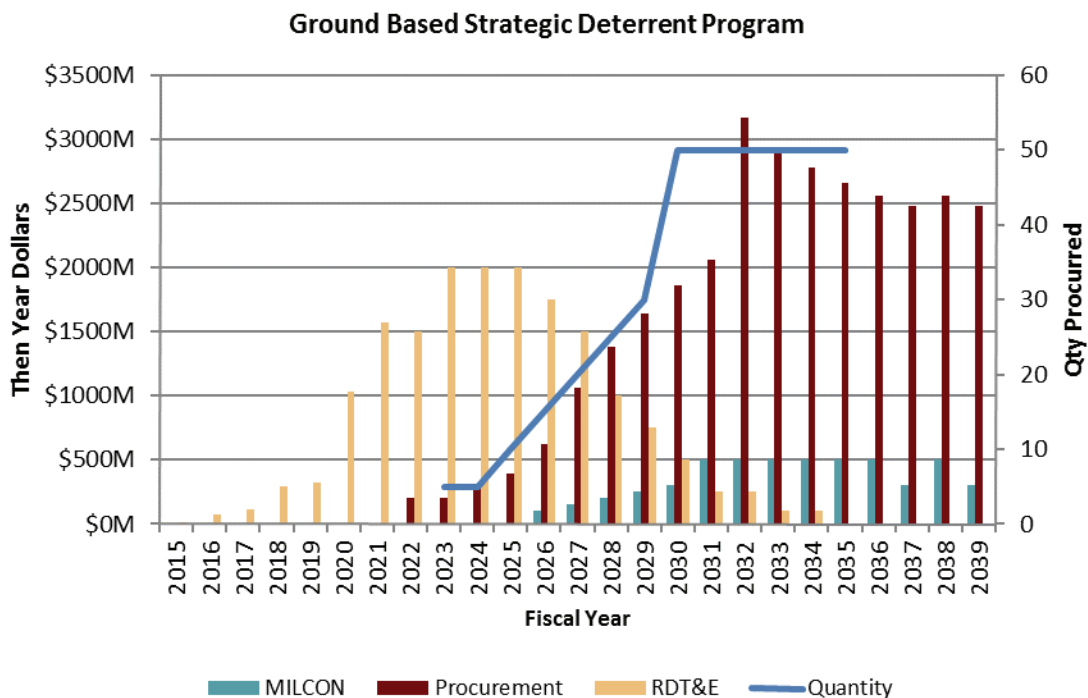


¹³⁵ Jeffrey Lewis, "B61 Mod 12 LEP," *Arms Control Wonk*, blog, October 13, 2008; and "B61 nuclear bomb," *Jane's Strategic Weapons Systems*, IHS Jane's, June 18, 2014.

¹³⁶ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_B61_Mod_12_LEP_TKA_SAR_Dec_2014.PDF; and National Nuclear Security Administration, "Statement on B61 Extension Program and Future Stockpile Strategy before the House Armed Services Subcommittee on Strategic Forces," Testimony, October 30, 2013, <http://nnsa.energy.gov/mediaroom/congressionaltestimony/lep>.

Ground Based Strategic Deterrent (GBSD)

The GBSD is designed to replace the Minuteman III ICBM. The Air Force is currently funding a development program, which is in the technology maturation and risk reduction phase. The program is structured to deliver a fully integrated system in the late 2020s.¹³⁷ The GBSD, however, does not yet have a SAR. Using the RDT&E funding identified in the FY16 budget request and assuming that roughly \$15.27 billion in additional development funding will be needed in FY 2021 and beyond, the total RDT&E cost of the program will likely total \$17.12 billion in then-year dollars.¹³⁸ Assuming an average procurement unit cost of \$54.72 million in FY 16 dollars for roughly 410 missiles, the total procurement cost would be roughly \$31.37 billion in then-year dollars. The total program cost will likely be roughly \$53.59 billion in then-year dollars.¹³⁹



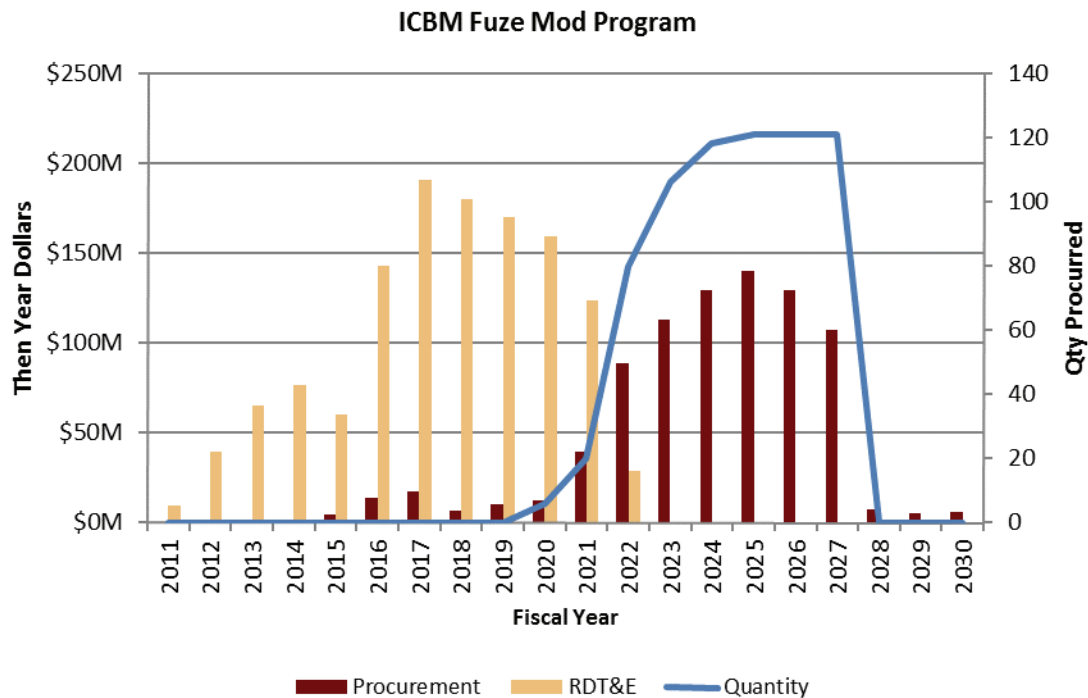
¹³⁷ DoD, *Department of Defense Fiscal Year (FY) 2016 President's Budget Submission*, Air Force Justification Book Volume 2, *Research, Development, Test & Evaluation*, Vol-II (Washington, DC: DoD, February 2015).

¹³⁸ RDT&E requirements were assumed to be in line with the 2006 LBSD analysis of alternatives. *The Future of the U.S. Intercontinental Ballistic Missile Force* (Santa Monica, CA: RAND, 2014).

¹³⁹ This estimate is derived from Harrison and Montgomery, *The Cost of U.S. Nuclear Forces*.

Intercontinental Ballistic Missile Fuze Modernization (ICBM Fuze Mod)

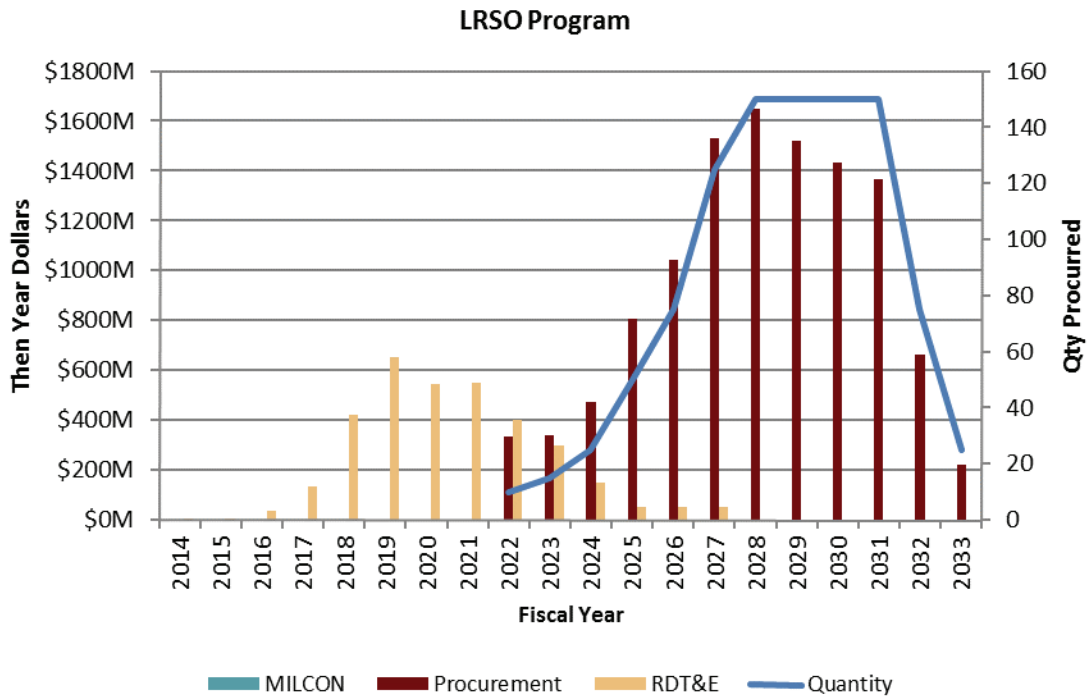
This ICBM fuze modernization program will develop and procure a replacement for the legacy Mk21 arming and fuzing assembly in the W87 warhead on the Minuteman III ICBMs. Current fuzes are three times past the designed service life. The new fuze, with a thirty-year service life, will meet the requirements of the current generation Minuteman III missiles as well as the planned replacement missile – the Ground Based Strategic Deterrent. A total of \$255.9 million has been appropriated through FY 2015, \$902.4 million is requested through the FYDP, and an additional \$917.7 million is planned for beyond the FYDP.¹⁴⁰



¹⁴⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_ICBM_Fuze_Mod_SAR_Dec_2014.PDF.

Long Range Standoff Weapon (LRSO)

The LRSO is designed to replace the AGM-86B nuclear-capable air-launched cruise missile. The Air Force is currently funding a development program, which is in the engineering and manufacturing development phase to meet validated requirements prior to a full rate production decision.¹⁴¹ The LRSO, however, does not yet have a SAR and the Air Force has not released a formal cost estimate. Using the RDT&E funding identified in the FY16 budget request and assuming that roughly \$1.55 billion in additional development funding will be needed in FY 2021 and beyond, the total RDT&E cost of the program will likely total \$3.34 billion in then-year dollars. Assuming an average procurement unit cost of \$9 million in FY 16 dollars for roughly 1,000 missiles the total procurement costs,¹⁴² the total procurement cost would be roughly \$11.38 billion in then-year dollars. The total program cost will likely be \$14.72 billion in then-year dollars.¹⁴³



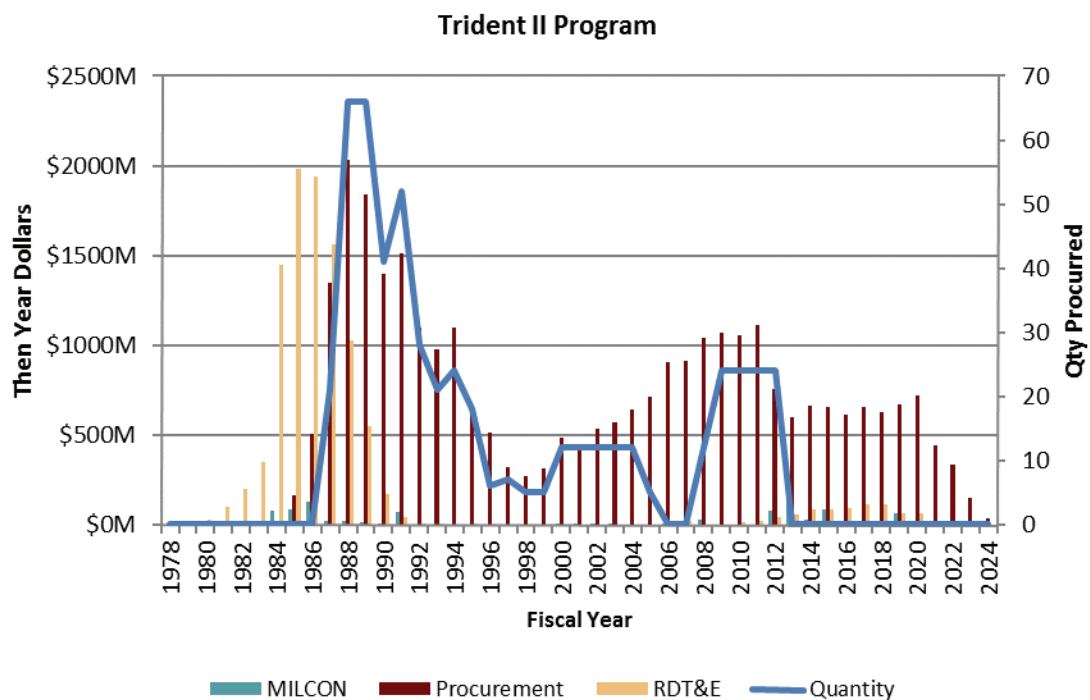
¹⁴¹ DoD, *FY 2016 PB Submission*, Air Force Justification Book Volume 2, *Research, Development, Test & Evaluation*, Vol-II.

¹⁴² Kingston Reif, "Air Force Wants 1,000 New Cruise Missiles," *Arms Control Association*, May 7, 2015.

¹⁴³ This estimate is derived from Harrison and Montgomery, *The Cost of U.S. Nuclear Forces*.

Trident II (D-5) Sea-Launched Ballistic Missile UGM 133 A (Trident II)

The Trident II is a submarine-launched nuclear ballistic missile fielded on the Ohio-class SSBN. The current program modernizes and extends the service life of existing Trident II missiles. Due to the high rate of Trident II production early in the program, a significant portion of the inventory will be due for modernization in the coming years. Overall program costs for the Trident II modernization could increase if NASA chooses a liquid fuel rocket motor for its next generation launch vehicle in 2016, as the industrial base for solid fuel rocket motors would be diminished.¹⁴⁴ A total of \$36.87 billion has been appropriated through FY 2015, \$3.81 billion was requested over the FY 2016 FYDP, and \$0.98 billion is planned for beyond the FYDP.¹⁴⁵



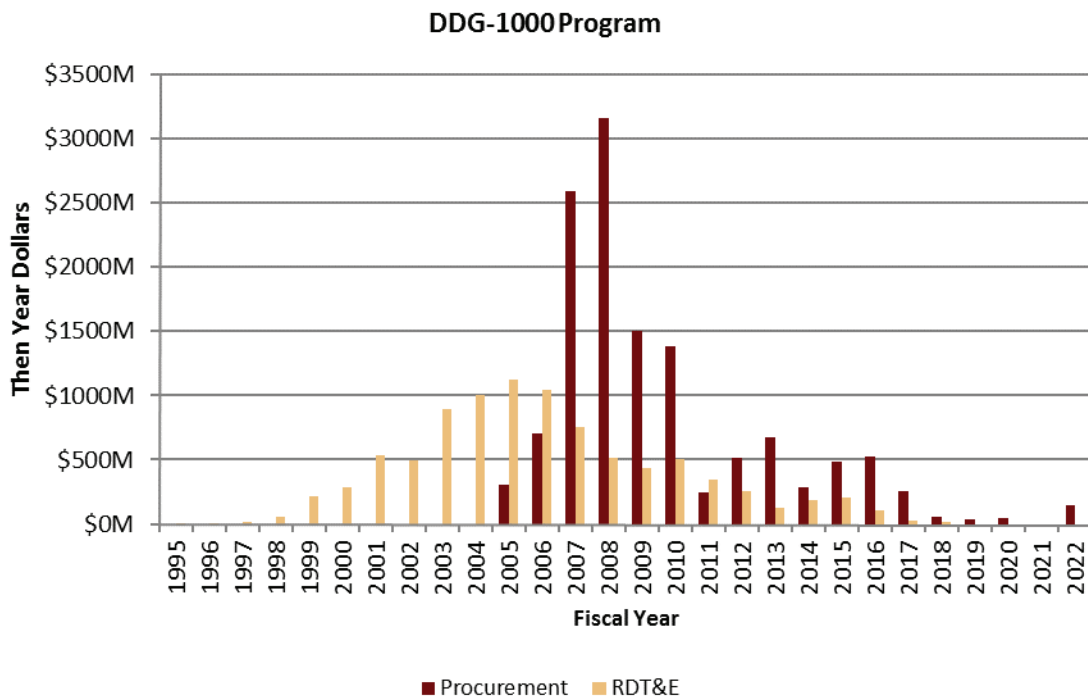
¹⁴⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_Trident_II_Missile_SAR_Dec_2014.PDF.

¹⁴⁵ 28 Trident II missiles were procured with RDT&E funding, but are not included in the quantity line.

Shipbuilding

DDG-1000 Zumwalt Class Destroyer

The Navy's DDG-1000 is a destroyer designed for littoral and land-attack operations. The DDG-1000 incorporates several features to reduce its radar signature, and it includes an advanced gun system and greater power generation capabilities for future weapons systems. The lead ship is scheduled for delivery in April 2016 and fabrication is in process on the remaining two ships in the class.¹⁴⁶ The program was originally intended to produce ten ships but was scaled back to three ships due to the growing cost of the program. As a result, production of the Arleigh Burke-class DDG-51 destroyer was restarted.¹⁴⁷ A total of \$20.82 billion has been appropriated through FY 2015, \$1.05 billion was requested over the FY16 FYDP, and \$143 million is planned for beyond the FYDP.¹⁴⁸



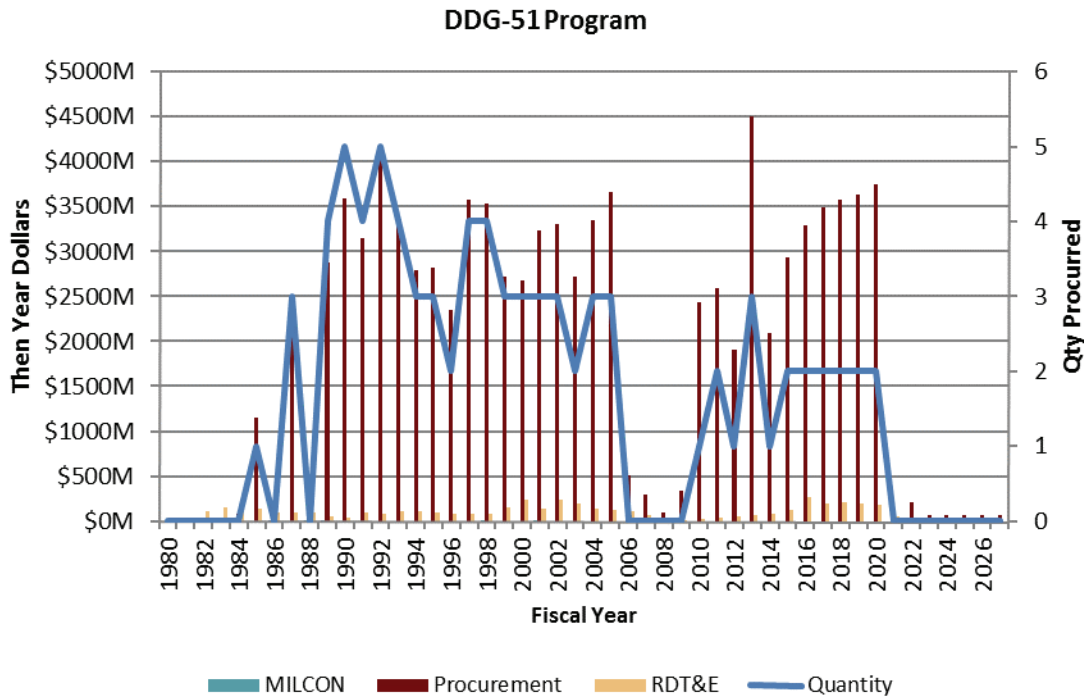
¹⁴⁶ Valerie Insinna, "DDG 1000 On Track For Delivery In April," *Defense Daily*, January 14, 2016.

¹⁴⁷ "Gates Lays out Key FY 2010 Budget Recommendations," *Defense Industry Daily*, April 6, 2009.

¹⁴⁸ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_DDG_1000_SAR_Dec_2014.PDF.

DDG-51 Arleigh Burke Class Guided Missile Destroyer

The DDG-51 destroyer is designed to operate against air, surface, and subsurface threats. The destroyer has been in procurement since the 1980s, making it one of the oldest programs in DoD's current portfolio. The Navy restarted the program in 2008 after a four-year break in production.¹⁴⁹ Program costs increased by 5 percent between the December 2013 and the December 2014 SARs due to the procurement of an additional 2 ships, bringing the total program quantity up to 82. The latest version of this ship, the Flight III, will likely have an increased focus on missile defense and will include the new Air and Missile Defense Radar (AMDR). The entirety of the Navy's planned Flight III purchase is not included in the December 2014 SAR, so the total spending on the DDG-51 will likely exceed that reported for the FY 2016 budget.¹⁵⁰ A total of \$78.79 billion has been appropriated through FY 2015, \$18.78 billion was requested over the FY16 FYDP, and \$0.76 billion is planned for beyond the FYDP.¹⁵¹



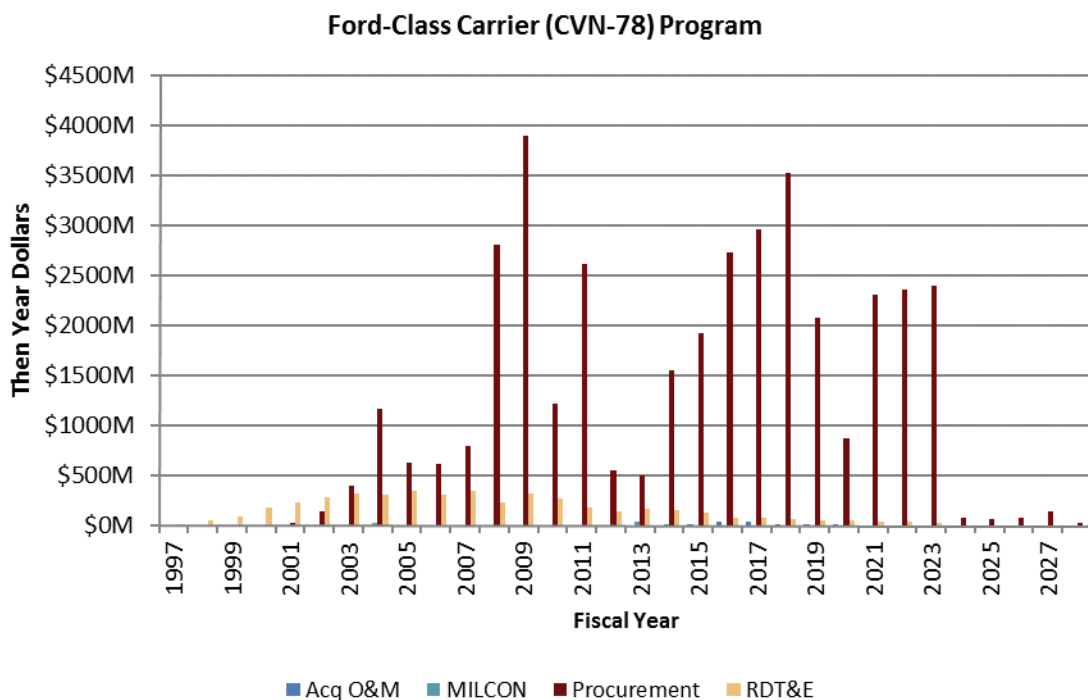
¹⁴⁹ Megan Eckstein, "Ingalls Shipbuilding Launches First Ship Since Destroyer Program Restart," *USNI News*, March 30, 2015

¹⁵⁰ Office of the Chief of Naval Operations (CNO), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2016* (Washington, DC: DoD, 2015).

¹⁵¹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_DDG_51_SAR_Dec_2014.PDF.

Gerald R. Ford Class Nuclear Aircraft Carrier (CVN 78)

The Ford-class carrier is the Navy's latest generation of super-carrier, designed for higher sortie rates and reduced manpower through the use of new technologies, such as an electromagnetic catapult to replace the traditional steam catapult. The lead ship's procurement costs have increased by 23 percent and construction has been delayed by critical technology development delays, material shortages, and engineering problems. The lead ship is expected to be delivered to the Navy in March 2016.¹⁵² A total of \$22.87 billion has been appropriated through FY 2015, \$12.58 billion was requested over the FY16 FYDP, and \$7.51 billion is planned for beyond the FYDP.¹⁵³ The program SAR only includes funding for the first three carriers in the class. It does not include estimates for the procurement of additional aircraft carriers at five-year intervals from FY 2023 forward as projected in the Navy's most recent 30-year shipbuilding plan.¹⁵⁴



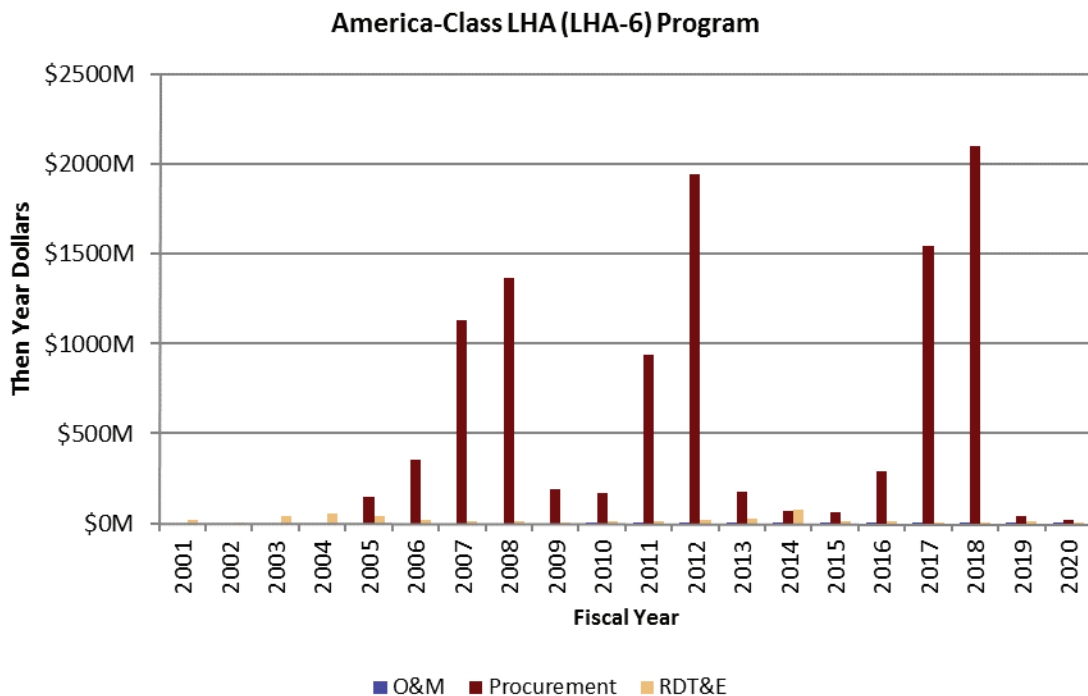
¹⁵² Ronald O'Rourke, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress* (Washington, DC: Congressional Research Service, December 17, 2015), pp. 4–6.

¹⁵³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_CVN_78_SAR_Dec_2014.PDF.

¹⁵⁴ CNO, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2016*.

LHA 6 America-Class Amphibious Assault Ship

The LHA 6 America-class amphibious assault ship is a small deck aircraft carrier capable of supporting helicopters and short takeoff/vertical landing fixed-wing aircraft, such as the F-35B. The lead ship in the class was delivered in April 2014,¹⁵⁵ 20 months behind schedule, the second ship is under construction, and the contract for the third should be awarded in FY 2017. LHA 6 and 7 do not have a well deck to move people and equipment rapidly from ship to shore, but LHA 8 will be redesigned to include a well deck. The flight deck of LHA 6 also has to be reconfigured to withstand the exhaust and downwash from the F-35B.¹⁵⁶ The LHA 6 class can transport up to 1,800 troops and their equipment as well as 9 F-35B fighters, 4 AH-1Z attack helicopters, 4 CH-53E helicopters, 12 MV-22 Osprey's, and 2 MH-60S search and rescue helicopters.¹⁵⁷ A total of \$6.9 billion has been appropriated through FY 2015 and \$4.03 billion was requested over the FY16 FYDP to complete the procurement of three LHAs.¹⁵⁸ No additional funding or procurements are projected beyond the FYDP.



¹⁵⁵ U.S. Navy, "Navy Accepts Delivery of the Future USS America (LHA 6)," April 28, 2014, http://www.navy.mil/submit/display.asp?story_id=80279.

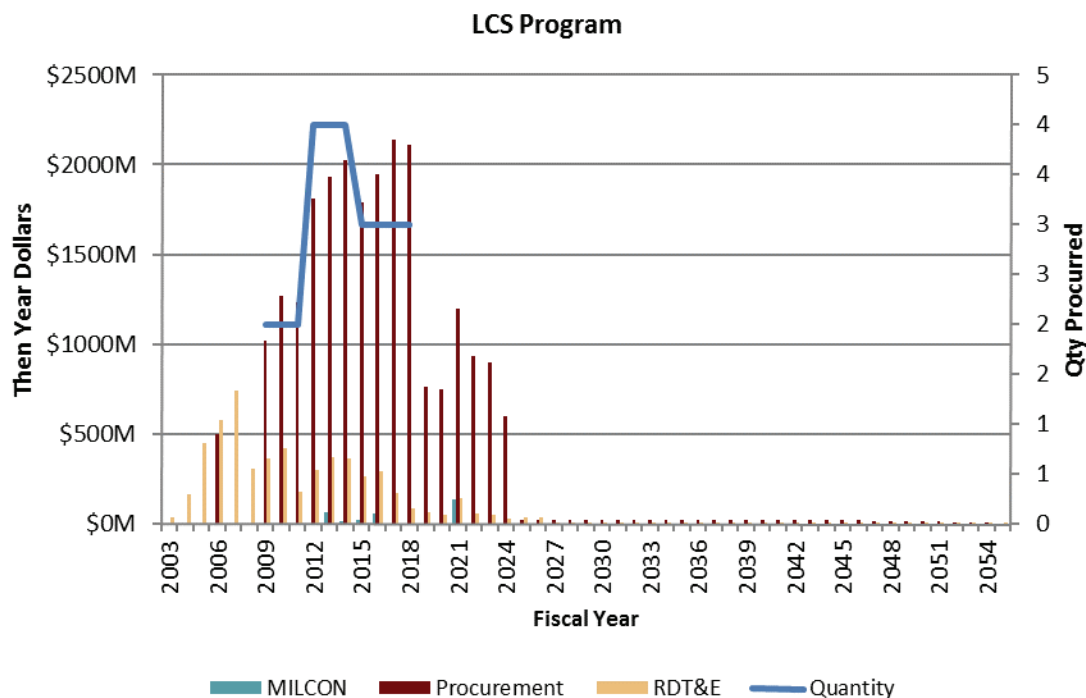
¹⁵⁶ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 105–106.

¹⁵⁷ Ingalls Huntington, "The LHA 6 America-class of Amphibious Assault Ships," <http://ingalls.huntingtoningalls.com/products/lha/class>.

¹⁵⁸ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_LHA%206_SAR_Dec_2014.PDF.

Littoral Combat Ship (LCS)

The LCS consists of the ship and separate mission modules (mine countermeasures, anti-submarine warfare, and surface warfare). There are two versions of the LCS—the steel monohull (*Freedom* variant) and the aluminum trimaran hull (*Independence* variant). The Navy had planned to downselect to a single design after the first four ships, but instead opted to split the award between the two contractors. The mine countermeasures module has experienced performance problems, the surface warfare module is still under development, and development on the anti-submarine warfare module was restarted with new requirements.¹⁵⁹ The December 2014 SAR reflects a procurement quantity of 32 ships, which excludes the procurement of a new frigate variant (FF). The program, however, will likely stop at 40 ships (29 LCSs and 11 frigates), with a downselect to one variant in FY2019.¹⁶⁰ It is unclear whether the FF program will have a new SAR or if it will be covered by the LCS SAR. A total of \$16.19 billion has been appropriated through FY 2015 for development and procurement of 21 ships and 11 mission modules.¹⁶¹ An additional \$8.42 billion was requested over the FY16 FYDP and \$4.71 billion is planned for beyond the FYDP.¹⁶²



¹⁵⁹ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 107–110.

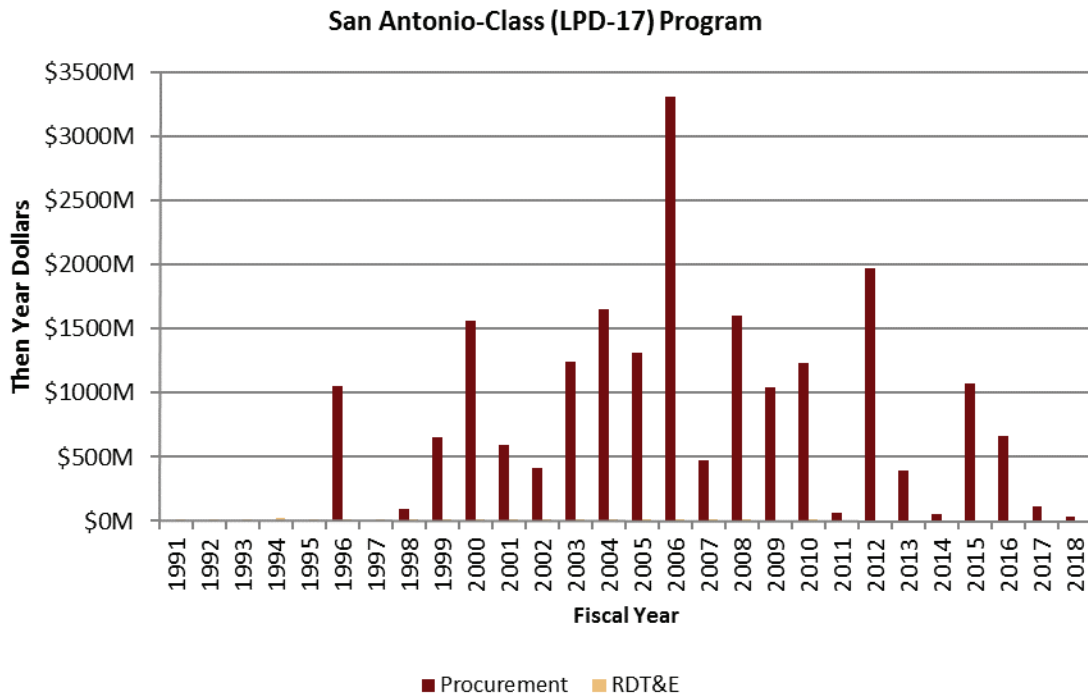
¹⁶⁰ Justin Doubleday, “Navy Pushes Back on LCS Cut, Gets One More Ship in FY-17 Request,” *Inside Defense*, February 16, 2016.

¹⁶¹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_LCS_SAR_Dec_2014.PDF.

¹⁶² Two of the planned LCS seaframes were procured with RDT&E funds, but are not included in the quantity line. Additionally, five mission modules were procured with RDT&E funds. The quantity line only includes seaframes.

LPD 17 San Antonio Class Amphibious Transport Dock

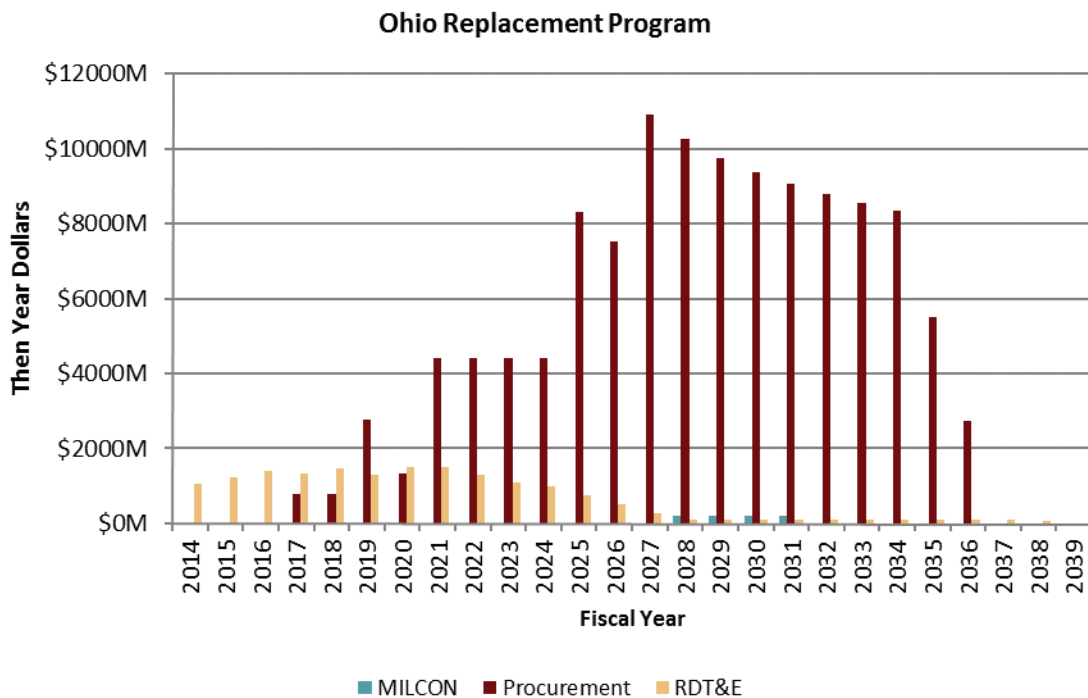
The San Antonio-class landing platform dock (LPD) is designed to transport and land elements of a Marine landing force by helicopter, landing craft, and amphibious vehicles. An LPD 17 can carry up to 800 personnel (surge) and two MV-22 tilt rotors. A total of \$20.72 billion has been appropriated through FY 2015 for development and procurement of 12 ships, and \$0.81 billion is requested to complete the program over the FYDP.¹⁶³



¹⁶³ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_LPD%2017_SAR_Dec_2014.PDF.

Ohio-Class Replacement SSBN

The Navy's current fleet of 14 Ohio-class ballistic missile submarines is widely seen as the most survivable leg of the nuclear triad. The Navy has already extended the life of the Ohio-class boats beyond their original design life and plans to begin retiring them in the late 2020s. The Navy has begun a program to design and build a fleet of 12 replacement boats for the Ohio-class, but this program does not have a published SAR. While the Navy has not yet released a formal cost estimate, some cost information can be derived from RDT&E funding included in the budget request and the Navy's 30-year shipbuilding plan. Using the RDT&E funding identified for the program in the FY 2016 budget request and assuming that roughly \$7.45 billion in additional development funding will be needed in FY 2021 and beyond, the total RDT&E cost of the program is likely to total some \$16.68 billion in then-year dollars. Navy plans indicate that procurement of the first sub will begin in FY 2021, followed by the second in FY 2024, and one sub per year from FY 2026 to FY 2035.¹⁶⁴ Assuming an average procurement unit cost of \$8 billion (in FY 2016 dollars), the total procurement costs would be roughly \$122 billion (in then-year dollars).¹⁶⁵ The total program cost would be \$143 billion in then-year, or \$114.5 billion in FY 2016 dollars, making it second to only the F-35 program in terms of future funding requirements.

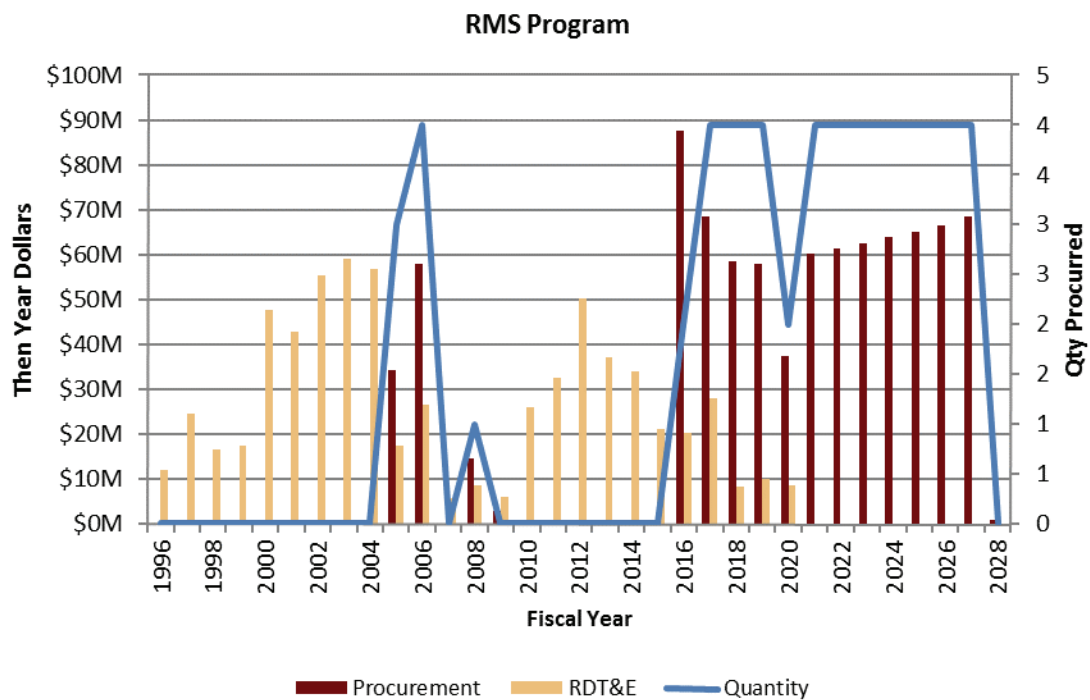


¹⁶⁴ CNO, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2016*.

¹⁶⁵ This estimate is derived from Harrison and Montgomery, *The Cost of U.S. Nuclear Forces*.

Remote Minehunting System (RMS)

This Navy program is developing and procuring a semi-autonomous system to detect, classify, and localize bottom and moored mines in shallow and deep water. It will deploy from an LCS as part of the mine countermeasure mission package and will allow the Navy to conduct mine countermeasure operations while keeping sailors and ships safely away from minefields.¹⁶⁶ The Navy released a request for proposals on August 26, 2014 launching a new competition for the RMS mission vehicle.¹⁶⁷ The future of the RMS is uncertain and the contract award decision has been delayed due to a lack of funding in FY 2015 and pending a Navy review of the program. A total of \$0.71 billion has been appropriated through FY 2015, \$0.38 billion is requested for the FYDP, and \$0.45 billion is planned for beyond the FYDP.¹⁶⁸



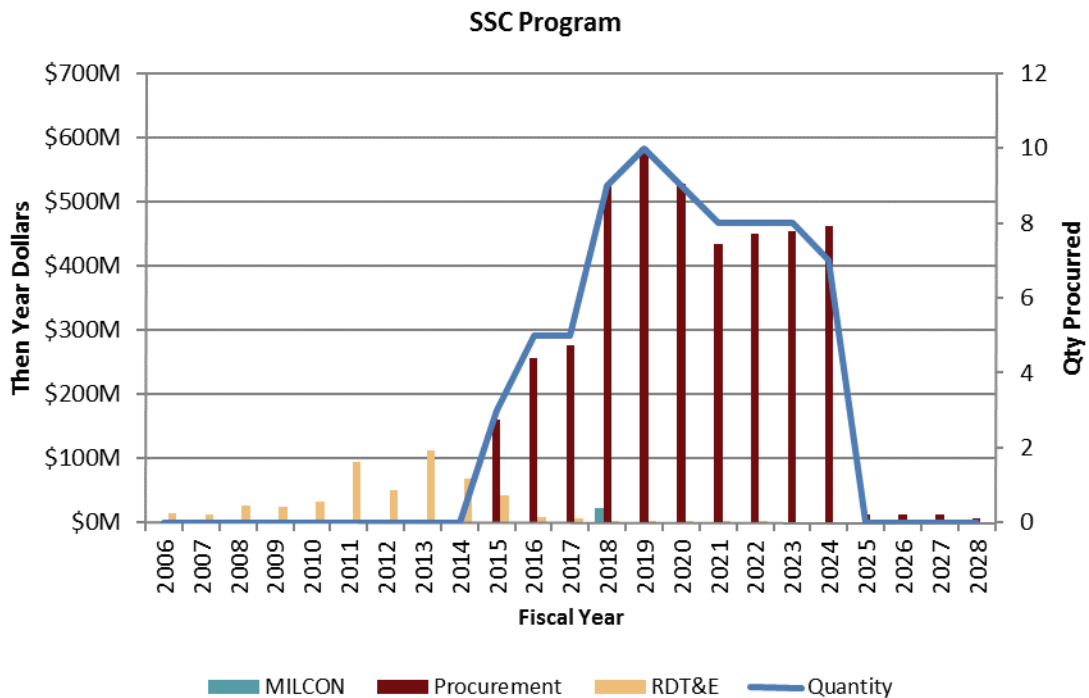
¹⁶⁶ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_RMS_SAR_Dec_2014.PDF.

¹⁶⁷ "RMS Solicitation," *Inside Defense*, August 27, 2014.

¹⁶⁸ Two RMS units were procured with RDT&E funding, but are not include in the quantity line.

Ship to Shore Connector Amphibious Craft (SSC)

The Navy’s SSC is an air cushioned landing craft designed to transport personnel, equipment, and supplies from amphibious vessels to shore. It will be lighter and more environmentally friendly than the system it replaces, the Landing Craft, Air Cushion (LCAC). The SSC will deploy from the well deck of amphibious ships, such as the LPD-17.¹⁶⁹ The FY 2015 request accelerated the program with procurement beginning in FY 2015 and continuing through FY 2024.¹⁷⁰ The Navy plans to procure 73 landing craft. A total of \$0.64 billion has been appropriated through FY 2015, \$2.21 billion was requested over the FY 2016 FYDP, and \$1.85 billion is planned for beyond the FYDP.¹⁷¹



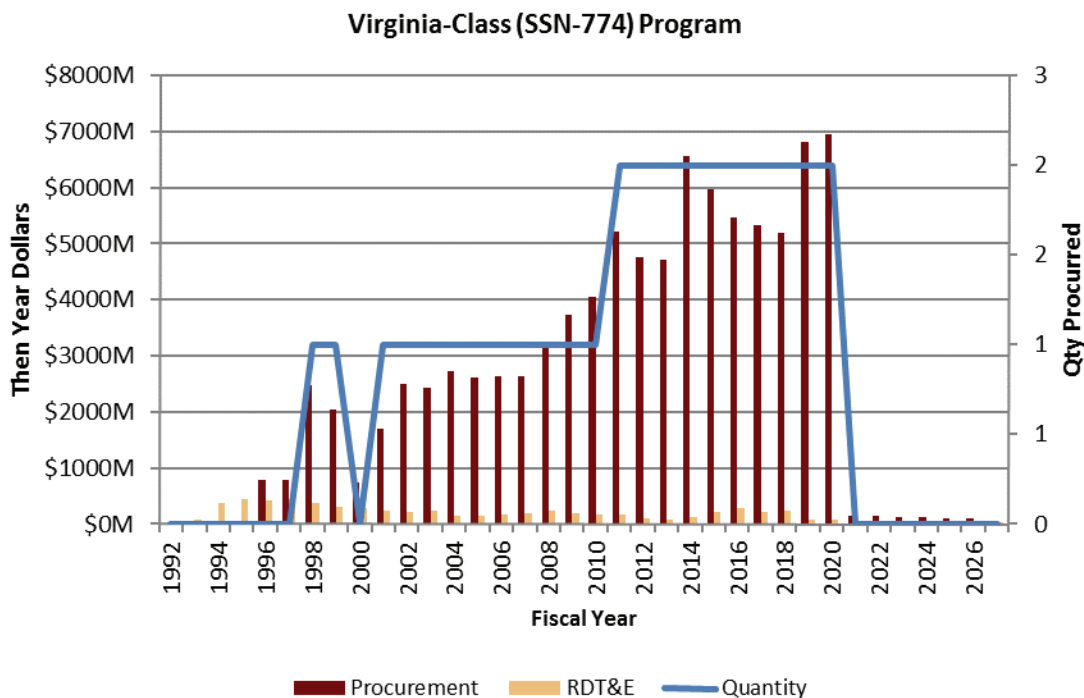
¹⁶⁹ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 121–122.

¹⁷⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_SSC_SAR_Dec_2014.PDF.

¹⁷¹ One landing craft was procured with RDT&E funding but is not reflected in the quantity line.

SSN 774 Virginia Class Submarine

The Virginia class SSN is the replacement for the Los Angeles class attack submarine. In addition to performing traditional submarine missions, the Virginia class also supports special operations forces and maintains a cruise missile vertical launch capability.¹⁷² The current SAR only includes procurements of two Virginia class submarines per year through FY 2020 and does not reflect the Navy's current shipbuilding plan.¹⁷³ The Navy is also continuing to plan for the Virginia Payload Module (VPM), which will add additional vertical launch tubes to the hull design for future ships – adding four large payload tubes, which can carry seven cruise missiles each. The VPM addition will help mitigate the loss of strike capacity as existing SSGNs are decommissioned.¹⁷⁴ The FY 2016 budget requests funding for an additional two submarines, bringing the total purchase reflected in the December 2014 SAR to 32. A total of \$67.61 billion has been appropriated through FY 2015 for the development and procurement of the initial 22 SSNs, \$30.64 billion was requested over the FY16 FYDP for the 10 remaining SSNs. The SAR projects an additional \$1.07 billion beyond the FYDP.



¹⁷² DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_SSN_774_SAR_Dec_2014.PDF.

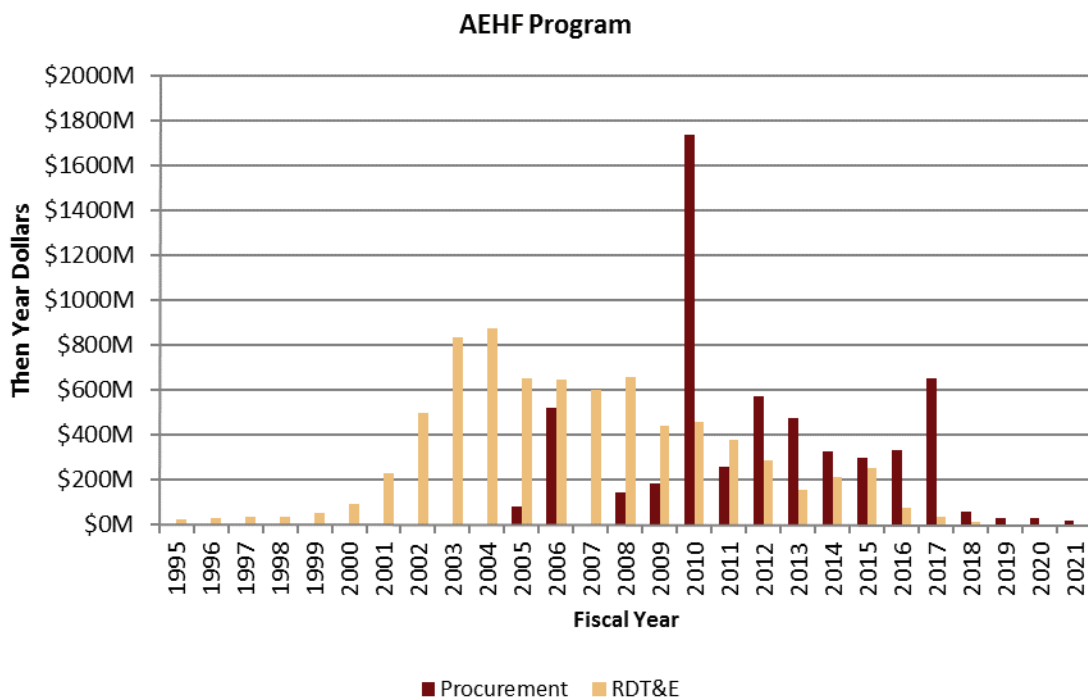
¹⁷³ CNO, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2016*.

¹⁷⁴ Four Ohio class ballistic missile submarines were converted to guided missile submarines (SSGN) to provide the Navy with increased strike and special operations capabilities from a clandestine platform. See U.S. Navy, "Guided Missile Submarines: SSGN," 2013, http://www.navy.mil/navydata/fact_display.asp?cid=4100&tid=300&ct=4

Space Systems

Advanced Extremely High Frequency Satellite (AEHF)

AEHF is constellation of satellites that provide global, survivable, secure, and jam-resistant communications for tactical and strategic users. The program currently plans to field six satellites in geosynchronous orbit. The program was funded in part by Canada, the Netherlands, and the United Kingdom, which in exchange will be able to use a portion of the constellation's capacity.¹⁷⁵ Three AEHF satellites are currently on orbit, and the fourth is scheduled for launch in 2017. The fifth and sixth satellites are scheduled for launch in 2018 and 2019, respectively. Once the fourth satellite is operational, the system will have achieved full operational capability.¹⁷⁶ A total of \$12.02 billion has been appropriated through FY 2015, \$1.23 billion was requested over the FY16 FYDP, and \$16 million is planned for beyond the FYDP.

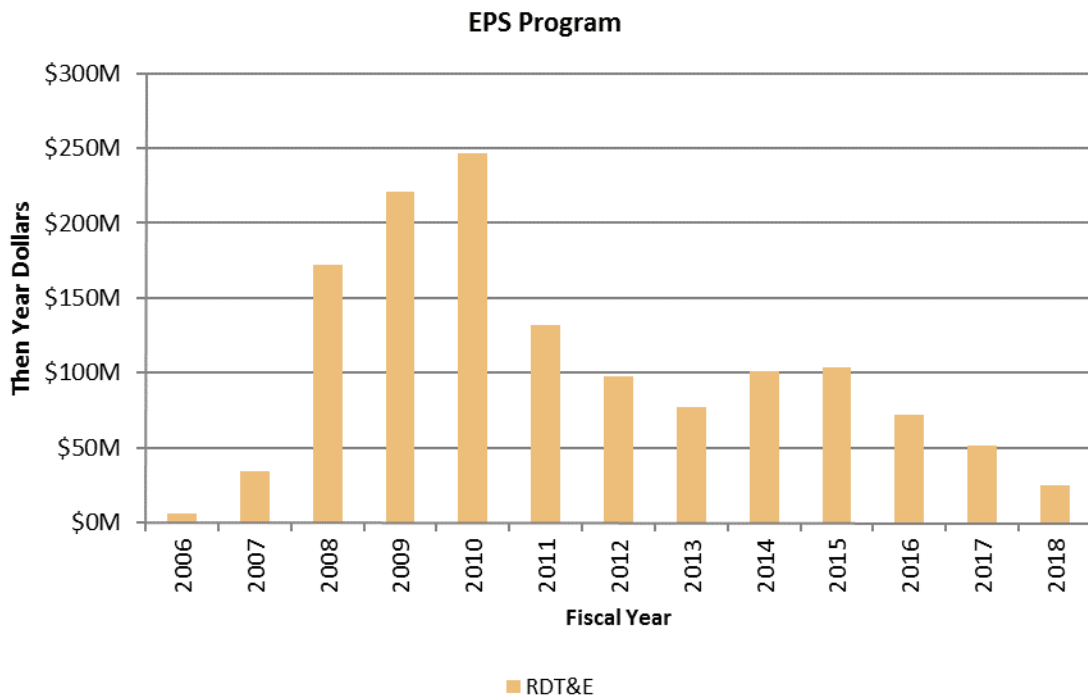


¹⁷⁵ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_AEHF_SAR_Dec_2014.PDF.

¹⁷⁶ Lockheed Martin, "Fourth AEHF Protected Communications Satellite Begins Integration Months Ahead of Schedule," April 2014, <http://www.lockheedmartin.com/us/news/press-releases/2014/april/0408-ss-ahf4.html>.

Enhanced Polar System (EPS)

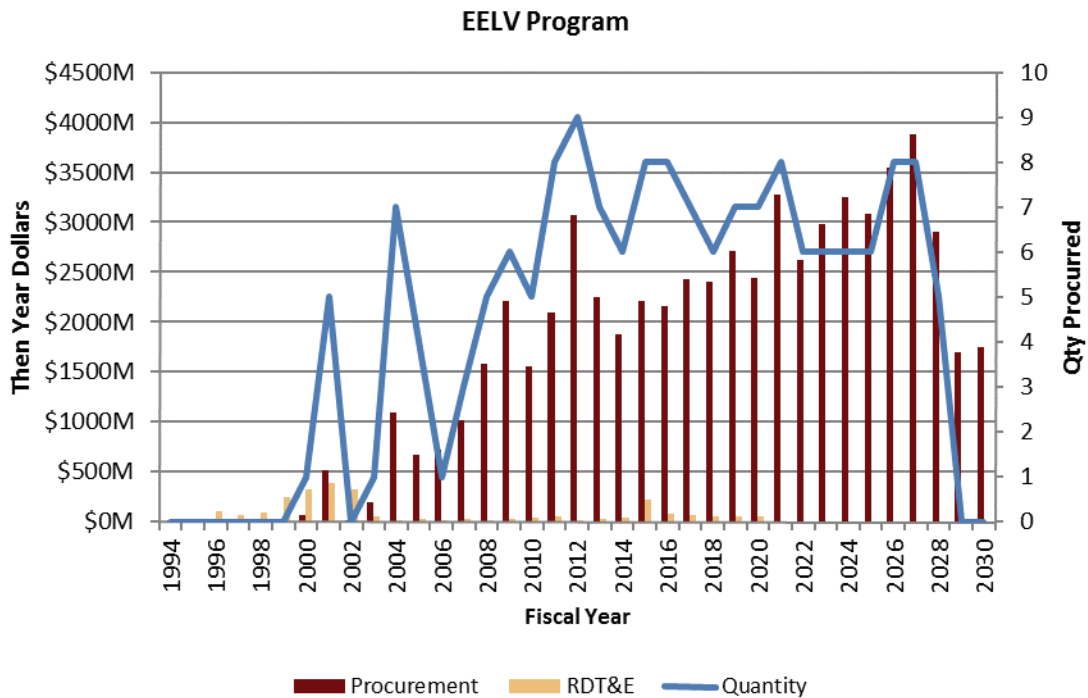
The Enhanced Polar System provides low probability of interception and detection extremely high frequency (EHF) communications over the north polar region via two hosted payloads in Molniya orbits. The program has four segments: two hosted payloads; user terminals; a fixed gateway connecting users in the north polar region to users in middle latitudes; and a fixed command and control center. The two payloads are complete with one ready for launch and the second being integrated into the host satellite. The entire system should be operationally available in mid-2018. A total of \$1.19 billion has been appropriated through FY 2015 and \$148 million was requested over the FY16 FYDP for the completion of the program.¹⁷⁷



¹⁷⁷ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_EPS_SAR_Dec_2014.PDF.

Evolved Expendable Launch Vehicle (EELV)

The Air Force's EELV provides launch services to support the Department of Defense and other government missions. The United Launch Alliance is currently the sole provider of launch vehicles for the U.S. military and intelligence community, providing multiple configurations of the Atlas V and Delta IV launch vehicles. The Atlas V uses the Russian made RD-180 rocket motor, however, and efforts are underway to develop a domestically produced alternative. The Air Force certified SpaceX as a launch provider in May of 2015.¹⁷⁸ Other new entrants are working through the certification process and expect to be certified by the end of 2016. Future EELV awards will be done on a competitive basis.¹⁷⁹ A total of \$23.34 billion has been appropriated through FY 2015, and \$12.44 billion was requested over the FY16 FYDP for 35 launch vehicles.¹⁸⁰ An additional \$35.0 billion is planned for beyond the FYDP for an additional 53 launch vehicles through FY 2028.¹⁸¹



¹⁷⁸ Stephen Clark, "Air Force Stays the Course with SpaceX Rocket Certification," *Spaceflight Now*, July 2, 2015.

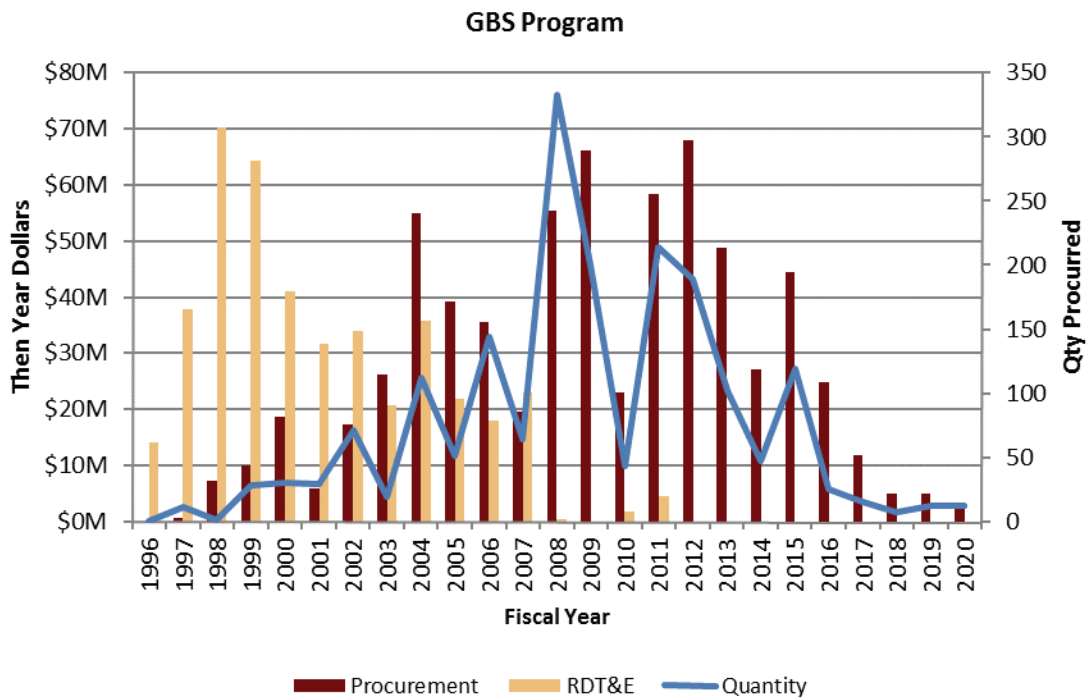
¹⁷⁹ GAO, *Defense Acquisitions of Selected Weapon Programs*, pp. 77–78.

¹⁸⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_EELV_SAR_Dec_2014.PDF.

¹⁸¹ One EELV was procured with RDT&E funding, but is not included in the quantity line.

Global Broadcast Service (GBS)

This Air Force program provides global, high-capacity, one-way transmission of video, imagery, and geospatial intelligence products supporting command centers and joint-combat forces. It utilizes available commercial technologies and can broadcast over GBS-payloads hosted on two Ultra-High Frequency Follow-On satellites, commercially leased transponders, and the Wideband Global SATCOM constellation to connect data sources (e.g., UAVs) to commanders via 2,014 receiver suites procured and maintained by the GBS program.¹⁸² A total of \$1.05 billion has been appropriated through FY 2015 and \$50 million was requested over the FY16 FYDP for completion of the program.¹⁸³

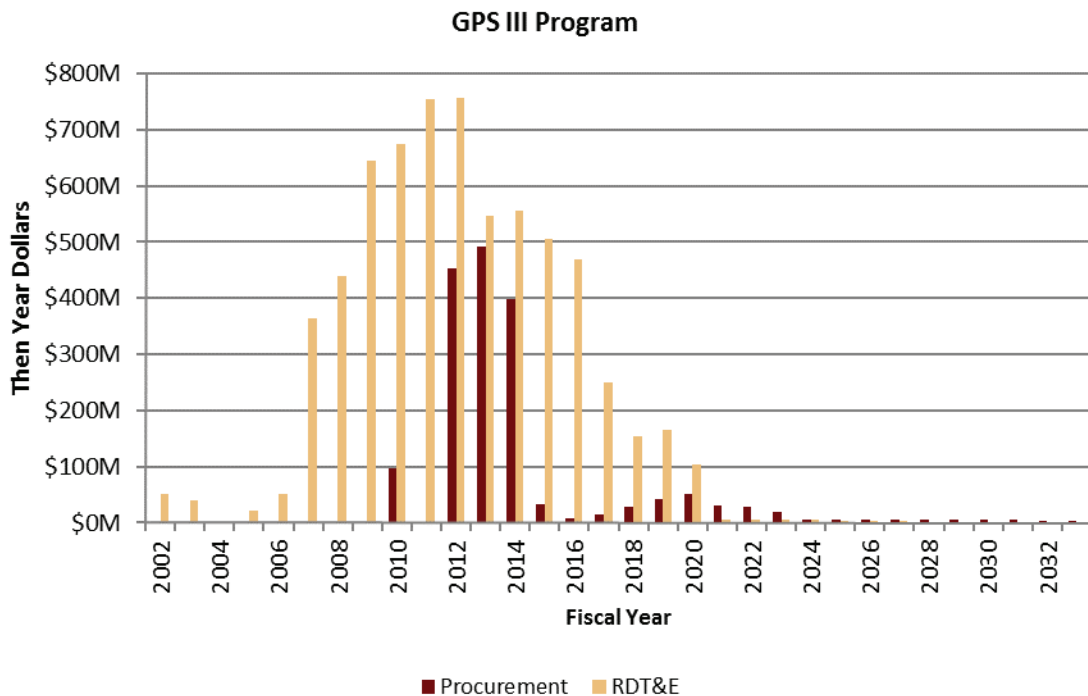


¹⁸² DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_GBS_SAR_Dec_2014.PDF.

¹⁸³ 136 receivers were procured with RDT&E funding. That funding is captured in the graph, but the quantity is not.

Global Positioning System III (GPS III) and Next Generation Operational Control System (GPS OCX)

The GPS III program will replace the existing GPS constellation. GPS III provides a high-gain antenna for the military signal that increases the signal strength and makes it more resistant to jamming. It also provides a new civilian signal for improved accuracy. The OCX sub-program is developing a new command and control ground system to support the constellation and enable many new features.¹⁸⁴ Initial operations of the OCX program have been delayed until July 2021, which will push the availability of its Block 0 capability to September 2017 (necessary for launch and checkout of the GPS III satellites).¹⁸⁵ The first GPS III satellite should be available before Block 0 is online so existing ground stations will be modified to operate the new satellites.¹⁸⁶ The costs reported in the SAR only cover the first eight satellites and the OCX ground segment.¹⁸⁷ A total of \$6.87 billion has been appropriated through FY 2015, \$1.28 billion was requested over the FY16 FYDP, and \$156.6 million is planned for beyond the FYDP.¹⁸⁸



¹⁸⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_GPS_III_SAR_Dec_2014.PDF and http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_OCX_SAR_Dec_2014.PDF.

¹⁸⁵ Courtney Albon, "Air Force to Measure Impact of OCX Delay on Early GPS III Launch Plans," *Inside Defense*, January 29, 2016.

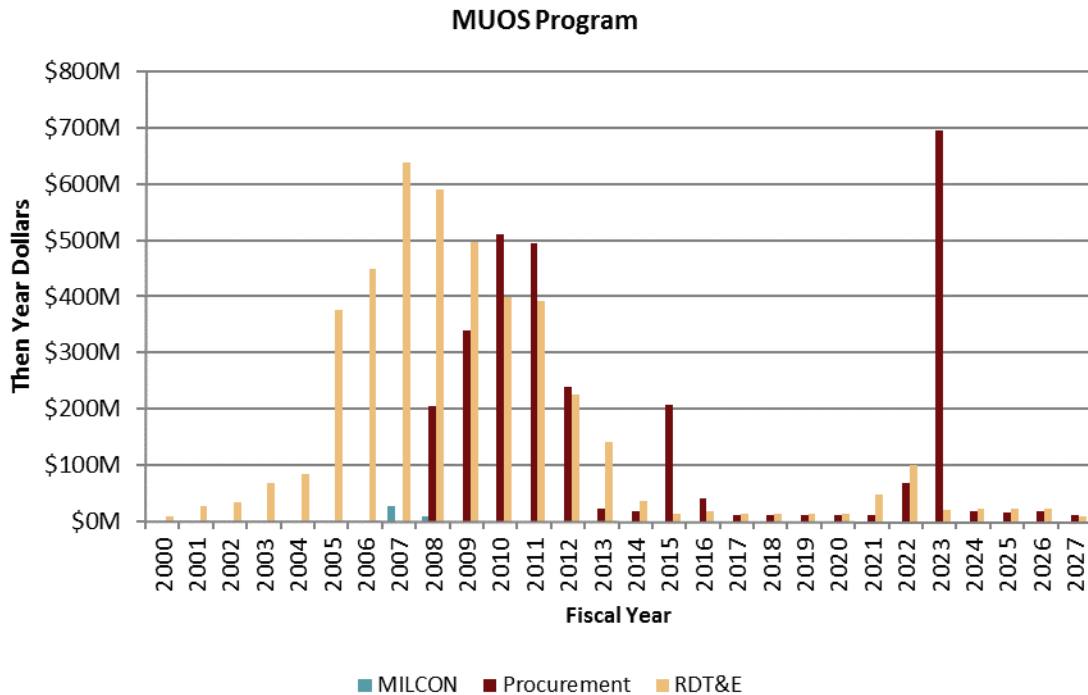
¹⁸⁶ Courtney Albon, "Lockheed Awarded GPS Upgrade Contract," *Inside Defense*, February 5, 2016.

¹⁸⁷ The U.S. has committed to maintaining at least 24 operational GPS satellites with 95 percent availability, so the program will likely expand as additional legacy satellites have to be replaced. See GPS.gov, "Space Segment," August 2, 2014, <http://www.gps.gov/systems/gps/space/>.

¹⁸⁸ The OCX program expects to receive \$23 million from the Department of Transportation to support this program. These funds are not included in the graph.

Mobile User Objective System (MUOS)

The Navy's MUOS satellite constellation is designed to provide increased narrowband SATCOM capacity for mobile and fixed-site users. It will replace the Ultra High Frequency Follow-On (UFO) satellite system currently in use. The MUOS program includes funding for both the space and ground control segments. Advanced MUOS capabilities are currently not available to users due to delays in developing the MUOS-compatible radios through the JTRS program. Moreover, the system is suffering from frequent problems with call reliability. Lockheed Martin is currently investigating the root cause of this problem. The first two MUOS satellites are on orbit and functional. MUOS 3 was launched in January 2015 and MUOS 4 was launched in September 2015.¹⁸⁹ The entire system is scheduled to reach full operational capability in 2017. A total of \$6.04 billion has been appropriated through FY 2015, \$0.15 billion was requested over the FY16 FYDP, and \$1.07 billion is planned for beyond the FYDP.¹⁹⁰

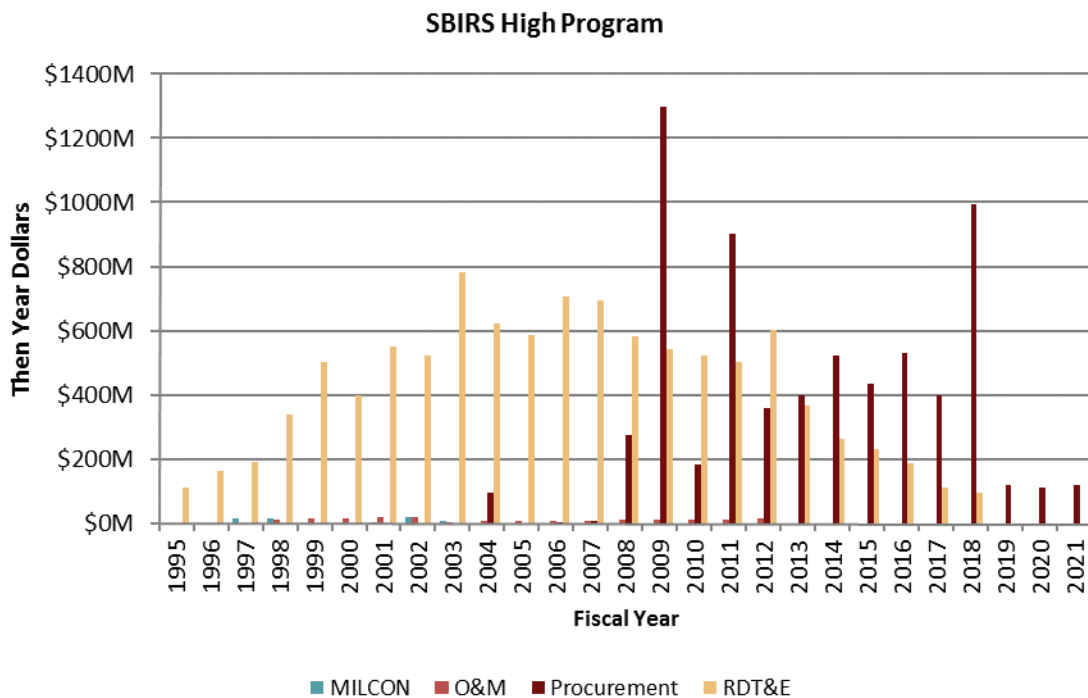


¹⁸⁹ "United Launch Alliance Successfully Launches the U.S. Navy's Mobile User Objective System-4," *ULA*, September 2, 2015.

¹⁹⁰ DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_MUOS_SAR_Dec_2014.PDF.

Space Based Infrared System High (SBIRS High)

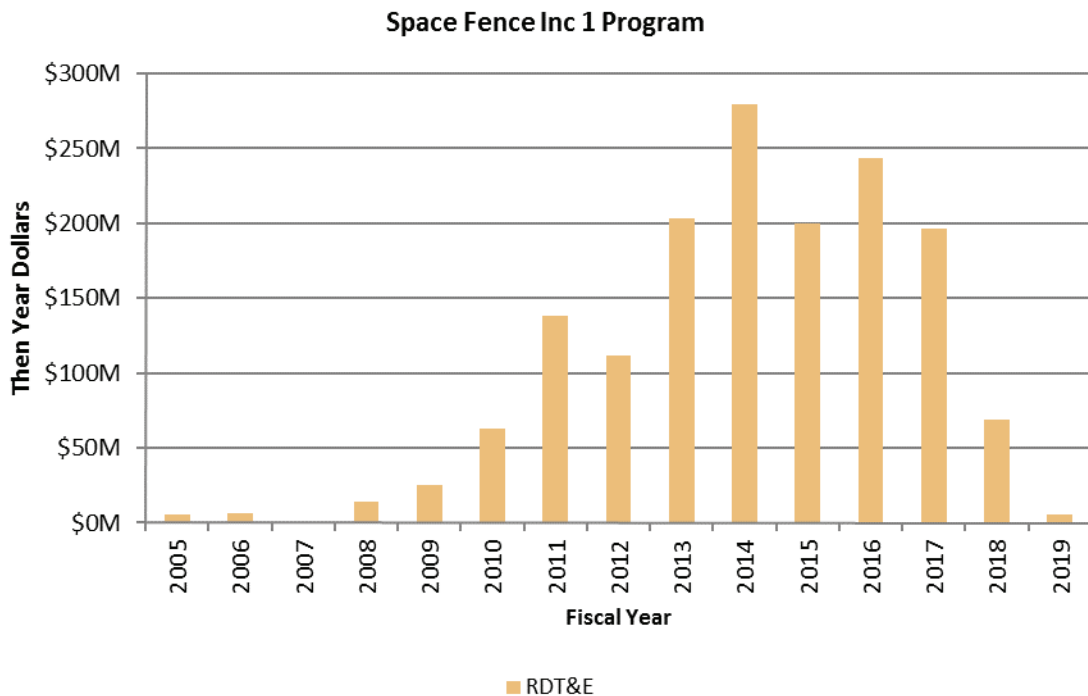
SBIRS is designed to replace the Defense Support Program to provide missile warning, technical intelligence, and battlespace awareness. The program includes four geostationary SBIRS satellites, two SBIRS hosted payloads on satellites in a highly elliptical orbit, two replenishment satellites and sensors, and fixed and mobile ground stations. The program is on track to have both hosted HEO payloads and four GEO satellites on orbit by 2017. The two GEO spares should be available by 2021. A total of \$14.49 billion has been appropriated through FY 2015 for the program, \$2.55 billion is requested for the FYDP, and \$118.3 million is planned for beyond the FYDP.¹⁹¹



¹⁹¹ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_SBIRS_High_SAR_Dec_2014.PDF.

Space Fence Ground-Based Radar System Increment 1

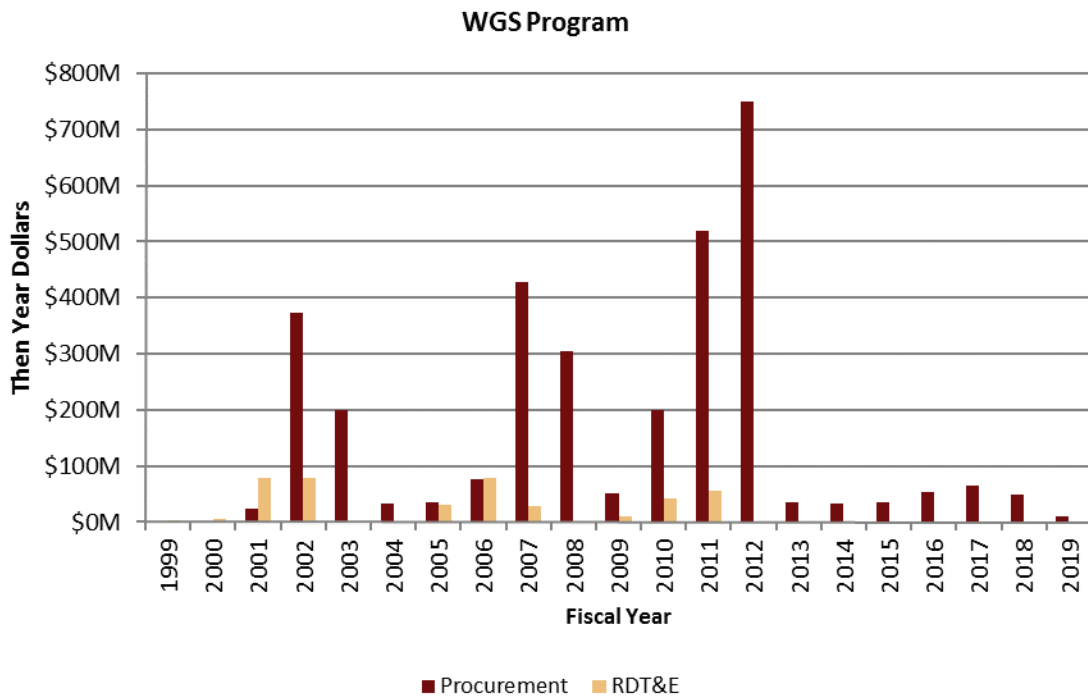
The Space Fence Ground-Based Radar system is designed to detect orbiting objects in Low-Earth/Medium-Earth Orbit (LEO/MEO), replacing the Air Force Space Surveillance System Very High Frequency radar. When complete, the system will include one ground station and two S-band radar stations. Increment 1 funds one radar site at Kwajalein Atoll and the ground station in Huntsville, Alabama. The system is projected to be operationally available in October 2018. A total of \$1.05 billion has been appropriated through FY 2015 for the program and \$513.7 million is requested for the FYDP.¹⁹²



¹⁹² DoD, *FOIA Requester Service Center: Selected Acquisition Reports, 2014*, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_Space_Fence_Inc_1_SAR_Dec_2014.PDF.

Wideband Global SATCOM (WGS)

This Air Force-led program, previously known as the Wideband Gapfiller System, provides DoD with its highest capacity communications satellites. Six WGS satellites are on orbit with four additional satellites in production. The system reached full operational capability in May 2014 once the sixth satellite arrived on station. The satellites are based on Boeing's commercial 702 satellite design.¹⁹³ Australia, Canada, Denmark, Luxembourg, the Netherlands, and New Zealand are providing funding to the U.S. in exchange for the right to use some of the WGS constellation's global capacity, which has enabled the Air Force to expand the constellation. A total of \$3.51 billion has been appropriated through FY 2015 and \$178.4 million was requested over the FY16 FYDP.¹⁹⁴



¹⁹³ Boeing, "Transformational Wideband Communication Capabilities for the Warfighter," 2014, http://www.boeing.com/boeing/defense-space/space/bss/factsheets/702/wgs/wgs_factsheet.page.

¹⁹⁴ DoD, *FOIA Requester Service Center: Selected Acquisition Reports*, 2014, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/15-F-0540_WGS_SAR_Dec_2014.PDF.

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