RCS: DD-A&T(Q&A)823-439

Small Diameter Bomb Increment II (SDB II)

As of FY 2021 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

Table of Contents

Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance
ACAT - Acquisition Category
ADM - Acquisition Decision Memorandum
APB - Acquisition Program Baseline
APPN - Appropriation
APUC - Average Procurement Unit Cost
$B - Billions of Dollars
BA - Budget Authority/Budget Activity
Blk - Block
BY - Base Year
CAPE - Cost Assessment and Program Evaluation
CARD - Cost Analysis Requirements Description
CDD - Capability Development Document
CLIN - Contract Line Item Number
CPD - Capability Production Document
CY - Calendar Year
DAB - Defense Acquisition Board
DAE - Defense Acquisition Executive
DAMIR - Defense Acquisition Management Information Retrieval
DoD - Department of Defense
DSN - Defense Switched Network
EMD - Engineering and Manufacturing Development
EVM - Earned Value Management
FOC - Full Operational Capability
FMS - Foreign Military Sales
FRP - Full Rate Production
FY - Fiscal Year
FYDP - Future Years Defense Program
ICE - Independent Cost Estimate
IOC - Initial Operational Capability
Inc - Increment
JROC - Joint Requirements Oversight Council
$K - Thousands of Dollars
KPP - Key Performance Parameter
LRIP - Low Rate Initial Production
$M - Millions of Dollars
MDA - Milestone Decision Authority
MDAP - Major Defense Acquisition Program
MILCON - Military Construction
N/A - Not Applicable
O&M - Operations and Maintenance
ORD - Operational Requirements Document
OSD - Office of the Secretary of Defense
O&S - Operating and Support
PAUC - Program Acquisition Unit Cost

PB - President's Budget
PE - Program Element
PEO - Program Executive Officer
PM - Program Manager
POE - Program Office Estimate
RDT&E - Research, Development, Test, and Evaluation
SAR - Selected Acquisition Report
SCP - Service Cost Position
TBD - To Be Determined
TY - Then Year
UCR - Unit Cost Reporting
U.S. - United States
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)
USD(A&S) - Under Secretary of Defense (Acquisition and Sustainment)

Program Information

Program Name

Small Diameter Bomb Increment II (SDB II)

DoD Component

Air Force

Joint Participants

Department of the Navy

Responsible Office

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References

SAR Baseline (Production Estimate)
Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated September 23, 2015

Approved APB
Component Acquisition Executive (CAE) Approved Acquisition Program Baseline (APB) dated January 29, 2020

Mission and Description

Small Diameter Bomb Increment II (SDB II), GBU-53/B, StormBreaker, is a joint interest Air Force (AF) and Navy ACAT IC program, with the AF as the lead service. SDB II provides the warfighter the capability to attack mobile targets from stand-off, through adverse weather. The threshold aircraft for the AF is the F-15E and the threshold aircraft for the Navy are the F-35B and F-35C. Objective aircraft include the F-16, F/A-18E/F, F-22A, F-35A, B-1B, B-2, B-52, A-10, MQ-9, and AC-130. SDB II will be compatible with the BRU-61 (Bomb Rack Unit) miniature munitions carriage, the CNU-660/E (Container Miscellaneous Unit) carriage system, the Common Munitions Bit and Reprogramming Equipment and the Joint Mission Planning System. The SDB II program will develop and field a single-weapon AF storage container and a dual Navy weapon storage container.

Executive Summary

Program Highlights Since Last Report

Executive Summary:

The SDB II program achieved a significant milestone on January 17, 2020 with declaration of F-15E Required Assets Available (RAA) and is looking forward to a fielding decision mid-2020 to get this weapon in the hands of the warfighter. The program completed operational test (OT) May 2019 with a free flight reliability of 80.1%. The weapon performed nominally in Coordinate (Global Positioning System) and Laser Illuminated Attack modes. The weapon performed well in Normal Attack (RF/IR) mode when it received valid targeting data. The cumbersome process to load datalink cryptographic information was the most significant factor impacting performance. The Air Force and Navy are preparing to submit a waiver to simplify cryptographic information handling in support of network-enabled weapons. The first five lots of LRIP are on contract with 598 weapons currently in inventory. An updated APB in January 2020 established a new program cost baseline post-significant Nunn McCurdy September 2019. M-Code and exportability efforts are progressing with implementation planned FY 2023.

Nonnuclear Munitions Safety Board (NNMSB) re-assessed known weapon hazards for operational certification resulting in revised hazard acceptance levels for inadvertent deployment of fins, wings and dome cover and inadvertent fuze arming. In January 2020, the program office held a DoD stakeholder forum to address these hazards and is completing documentation for PEO and PM-level risk acceptance in preparation for fielding.

Aft section and All-up-round production is paused for Control Actuation System (CAS) fin clip specification non-compliance. Raytheon Missile Systems is developing a retrofit design modification and production is scheduled to resume in April 2020.

National Security Agency directed a Department-wide change to modernize all datalink terminals by January 2022 and will no longer produce keys for legacy equipment after that date. SDB II's TacNet™ (TN) 1.1 datalink will receive a software update to meet the modernized requirements.

The Air Force Operational Test & Evaluation Center final OT report is expected in February 2020 in preparation for fielding mid-2020. Production line will restart, incorporating the fin clip modification in April 2020 and completion of LRIP Lot 3 deliveries is projected for June 2020.

Quarterly Activity:

January – March 2019: SDB II declared an APB schedule breach for F-15E RAA. The first F/A-18E/F captive carry flight test was completed. A captive compatibility flight profile was successfully executed as part of Air Force Seek Eagle Office, Air Combat Command, and F-15 System Program Office airworthiness certification for fielding. Network Entry System Test (NEST), an end-to-end test to verify the datalink can communicate with the controller and verify Link 16/UHF keys, completed initial proof-of-concept and F-15E ground mount testing and started final qualification testing. The F/A-18E/F test asset procurement contract was awarded. The first F-35B bay modification was completed. SDB II obtained approval from Silicon Power for all required fuze switches and the Department's Priority Allocation of Industrial Resources team notified Silicon Power their program oversight has concluded.

Test Activity: OT-10/24/29 Normal Attack Joint Terminal Attack Controller supported night shots were executed. Two weapons impacted their intended target and one weapon missed its intended target. SDB II began environmental flight tests (noise & vibe tests) on the F/A-18E/F. OT-25/26/56 were successfully executed at White Sands Missile Range (WSMR).

April – June 2019: An updated APB was completed and modified the F-15E RAA objective to August 2019 and threshold to August 2020. NEST completed lab and ground testing. The weapon datalink Crypto Modernization effort and the GPS M-Code and Enhanced Anti-Jam effort both successfully completed system-level PDRs. F/A-18E/F completed noise and vibration testing. F/A-18E/F conducted its first successful jettison test. Lots 6/7 production proposal was received by the program office.

Test Activity: OT-5/13/14/17/28/34/48/49/50/51/53 were executed at WSMR. All weapons impacted their intended targets except OT-5. OT-49/51 experienced communication anomalies not related to crypto. OT-35/36/36a/37 maritime shots were executed at Eglin Range and all weapons performed nominally. In May 2019, the final four OT missions, OT-8/9/9a/16/42, were executed at the Utah Test and Training Range. All weapon-to-controller communications during the missions were successful. The Joint Reliability and Maintainability Evaluation Team/Technical Data Scoring Board scored 45 of 56 OT shots successful for a free flight reliability of 80%.

July – September 2019: NNMSB re-assessment of known weapon hazards for operational certification elevated hazard classification levels for inadvertent deployment of fins, wings and dome cover and identified the fuze non-compliant with MIL-STD-1316. The program office formed a SSWG to assess hazards and risks to the system. The F-15 program office rescinded the SDB II flight clearance. All weapons were placed in condition code J: Suspended (in stock). The AFOTEC Interim OT report was received by the program office. Multiservice Operational Test and Evaluation Phase 1 Cybersecurity testing was completed. A technical solution to upgrade the TN 1.0/1.1 datalink to meet modernized cryptographic requirements was reached and will be implemented. USD (A&S) signed an M-Code waiver extension for all programs through June 30, 2020. An obsolescence contract, Modernization through Obsolescence and Diminishing Sources (MODS), was awarded.

October – December 2019: The program office and System Safety Working Group provided the assessment of hazards and risks to the system and requested reinstatement of F-15E flight test at the NNMSB. PDR was conducted for the field retrofit CAS fin clip design. F-35A flight test points have been completed and mitigated schedule for F-35B/C. The Lot 6/7 production proposal technical evaluation was completed and the program office is preparing for business clearance and negotiations. F/A-18E/F completed jettison test points and captive carry of the original swaybrace adapter.

January 2020: The program office declared F-15E RAA completion. A NNMSB was conducted and SDB II obtained concurrence from the safety community to resume flight test activities. The F-15 program office reinstated flight clearance for test and all test assets were removed from condition code J. Lot 6/7 production contract negotiations started. An updated Acquisition Program Baseline established a new program cost baseline post-significant Nunn-McCurdy.

There are no significant software-related issues with this program at this time.

History of Significant Developments Since Program Initiation

History of Significant Developments Since Program Initiation	
Date	**Significant Development Description**
July 2009	JROC approved the SDB II CDD.
August 2010	DAE signed an ADM authorizing the program to enter the EMD phase and certified the program pursuant to section 2366b of Title 10, U.S. Code.
October 2010	DAE signed the Milestone (MS) B APB.
January 2011	Conducted the Critical Design Review (CDR). The Office of the Deputy Assistant Secretary of Defense for Systems Engineering concluded that the CDR is complete and the SDB II Program is "well situated to continue into the System Capability and Manufacturing Process Demonstration Phase."
July 2012	First Guided Test Vehicle (GTV)-1 flight test.
November 2014	First Live Fire test.
December 2014	Test, Analyze and Fix (TAAF) testing complete, culminating over 18 months of testing that totaled 2,190 hours. TAAF demonstrated a reliability of 253 hours Mean Time Between Failure which surpassed the 250 hour requirement.
January 2015	JROC approved use of SDB II CDD in lieu of CPD for production MS C. They also formally added the AC-130 as an objective aircraft.
April 2015	Systems Verification Review.
June 2015	DAE signed the MS C ADM authorizing entrance into LRIP.
June 2015	LRIP Lot 1 option exercised for the first 144 USAF weapons.
September 2015	DAE signed the MS C APB. The APB included updated F-15E Required Asset Available dates to account for previous program delays and to allow sufficient time for the remaining Developmental Testing and the upcoming Operational Testing.
September 2016	LRIP Lot 2 option exercised for 250 USAF weapons.
January 2017	LRIP Lot 3 option exercised for 312 USAF weapons.
February 2018	LRIP Lot 4 option exercised for 570 USAF and 90 Navy weapons.
May 2018	Completed Developmental Testing, including the 28-shot Government Confidence Testing.
October 2018	Follow-on J&A signed for Other Than Full and Open Competition for production beyond Lot 5, continuing sustainment and modernization.
November 2018	The first Production Reliability Incentive Demonstration flight test was completed.
December 2018	LRIP Lot 5 option exercised for 510 USAF and 750 Navy weapons.
January 2019	First F/A-18E/F flight test.
April 2019	Updated APB was signed by the SAE and changed F-15E RAA threshold/objective dates to August 2019/August 2020.
May 2019	Completed Operational Testing (OT) mission scenarios.
September 2019	Completed OT Cybersecurity Testing.
September 2019	Declared a Significant Nunn-McCurdy breach for unit cost.
December 2019	Completed all OT requirements.
January 2020	Declared F-15E Required Assets Available (RAA)

January 2020	Updated APB was signed by the SAE establishing a new cost baseline.

Threshold Breaches

APB Breaches		
Schedule		☐
Performance		☐
Cost	RDT&E	☐
	Procurement	☐
	MILCON	☐
	Acq O&M	☐
O&S Cost		☐
Unit Cost	PAUC	☐
	APUC	☐

Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Schedule

Schedule Events					
Events	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	
Milestone B Approval	Aug 2010	Aug 2010	Aug 2010	Jul 2010	
Milestone C Approval	May 2015	May 2015	May 2015	May 2015	
RAA for SDB II-Threshold Aircraft F-15E	Jan 2018	Aug 2019	Aug 2020	Jan 2020	
F-35B Initial Fielding	Jan 2022	Jan 2022	Jan 2023	Dec 2022	(Ch-1)
F-35C Initial Fielding	Jan 2022	Jan 2022	Jan 2023	Dec 2022	(Ch-1)
Full Rate Production	Apr 2022	Apr 2022	Apr 2023	Dec 2022	(Ch-1)

Change Explanations

(Ch-1) F-35B, F-35C and Full Rate Production current estimates moved from September 2022 to December 2022, due to the fluidity of the F-35 Joint Program Office (JPO) schedule.

Notes

RAA for SDB II Threshold Aircraft F-15E was reached January 17, 2020 and is defined as the capability to arm twelve F-15Es with two fully-loaded BRU-61 carriage systems for 1.5 sorties, which equates to 144 weapons. RAA includes associated spares, support equipment (including load crew trainers), initial training, mission planning capability, and verified technical orders. The ACC Commander, or applicable Major Command Commander (if unit is not within ACC) will declare IOC for the Air Force at the first designated SDB II capable wing based on the wing or group commander's recommendations. The weapon configuration delivered to meet the F-15E RAA will include fully qualified hardware functionality for all required employment modes.

The threshold dates for FRP, F-35B Initial Fielding, and F-35C Initial Fielding are one year beyond the objective dates due to the fluidity of the F-35 program schedule.

In FY 2013, the Navy adjusted the platform integration strategy of F/A-18E/F to deliver the multi-mode moving target capability to the warfighter ahead of the F-35. This strategy was approved and supported by OSD. The first Navy unit equipped will be an F/A-18E/F squadron aircraft. The quantity of SDB II weapons required for Navy Initial Fielding is 90 weapons.

Acronyms and Abbreviations

ACC - Air Combat Command
BRU - Bomb Rack Unit
IOC - Initial Operational Capability
OT - Operational Test
RAA - Required Assets Available

Performance

Performance Characteristics				
SAR Baseline Production Estimate	**Current APB Production Objective/Threshold**		**Demonstrated Performance**	**Current Estimate**
Scenario Weapon Effectiveness (WE)				
Given SDB II weapon delivery from an objective platform employing self targeting or an SDB II weapon delivery from a threshold or objective aircraft with third party targeting via an objective airborne platform (Paragraph 6.2.3.1.2 of CDD for SDB II dated July 28, 2009), the SDB II weapon will achieve a minimum PSSK of (OB -1) when averaged over all the target types contained in Table 6-1 of CDD for SDB II dated July 28, 2009. The Joint JROC reviewed the CDD in lieu of the CPD on November 18, 2014; the JROC subsequently signed the memorandum on January 13, 2015.	Given SDB II weapon delivery from an objective platform employing self targeting or an SDB II weapon delivery from a threshold or objective aircraft with third party targeting via an objective airborne platform (Paragraph 6.2.3.1.2 of CDD for SDB II dated July 28, 2009), the SDB II weapon will achieve a minimum PSSK of (OB -1) when averaged over all the target types contained in Table 6-1 of CDD for SDB II dated July 28, 2009. The Joint JROC reviewed the CDD in lieu of the CPD on November 18, 2014; the JROC subsequently signed the memorandum on January 13, 2015.	Given SDB II weapon delivery from a threshold aircraft employing self targeting or a threshold aircraft delivering SDB II with third party targeting via a JTAC, the SDB II weapon will achieve a minimum PSSK of (T-1) when averaged over all the target types contained in Table 6-1 of CDD for SDB II dated July 28, 2009. The JROC reviewed the CDD in lieu of the CPD on November 18, 2014; the JROC subsequently signed the memorandum on January 13, 2015.	Demonstrated performance data will be displayed when SDB II completes OT, AFOTEC provides the final report and analysis is completed.	Given SDB II weapon delivery from a threshold aircraft employing self-targeting or a threshold aircraft delivering SDB II with third party targeting via a JTAC, the SDB II weapon will achieve a minimum PSSK of (T-1) when averaged over all the target types contained in Table 6-1 of CDD for SDB II dated July 28, 2009. 1. The JROC reviewed the CDD in lieu of the CPD on November 18, 2014; the JROC subsequently signed the memorandum on January 13, 2015.
Weapon Loadout				
Four SDB II weapons integrated onto the BRU -61/A. Aircraft will be able to carry and employ both SDB I and II weapons loaded on separate BRU-61/As during the same mission.	Four SDB II weapons integrated onto the BRU -61/A. Aircraft will be able to carry and employ both SDB I and II weapons loaded on separate BRU-61/As during the same mission.	(T=O) Four SDB II weapons integrated onto the BRU-61/A. Aircraft will be able to carry and employ both SDB I and II weapons loaded on separate BRU-61/As during the same mission.	Four SDB II weapons have been integrated onto the BRU-61/A. Aircraft have carried and employed both SDB I and SDB II weapons loaded on separate BRU-	Performance has been demonstrated.

			61/As during the same mission.	
Carrier Operability (Navy Unique Requirement)				
SDB II will be compatible with carrier operations without degrading other naval operations. Compatibility includes being capable of at least fifty catapult launches and forty-nine arrested landings; able to be transported, handled, stored, prepared, uploaded, and downloaded; and capable of operating in EMI, EMC, container immersion/washdown, salt fog/salt spray, explosive atmosphere, mechanical shock (i.e., near-miss, catapult launches/arrested landings, and handling shock), acoustic noise, vibration, fluid contamination, corrosive atmosphere, fungus, humidity, ice, and rain environments of aircraft carrier and replenishment ship operations.	SDB II will be compatible with carrier operations without degrading other naval operations. Compatibility includes being capable of at least fifty catapult launches and forty-nine arrested landings; able to be transported, handled, stored, prepared, uploaded, and downloaded; and capable of operating in EMI, EMC, container immersion/washdown, salt fog/salt spray, explosive atmosphere, mechanical shock (i.e., near-miss, catapult launches/arrested landings, and handling shock), acoustic noise, vibration, fluid contamination, corrosive atmosphere, fungus, humidity, ice, and rain environments of aircraft carrier and replenishment ship operations.	(T=O) SDB II will be compatible with carrier operations without degrading other naval operations. Compatibility includes being capable of at least fifty catapult launches and forty-nine arrested landings; able to be transported, handled, stored, prepared, uploaded, and downloaded; and capable of operating in EMI, EMC, container immersion/washdown, salt fog/salt spray, explosive atmosphere, mechanical shock (i.e., near-miss, catapult launches/arrested landings, and handling shock), acoustic noise, vibration, fluid contamination, corrosive atmosphere, fungus, humidity, ice, and rain environments of aircraft carrier and replenishment ship operations.	Demonstrated performance data will be displayed when SDB II completes F-35C OT, AFOTEC provides the final report and analysis is completed.	SDB II will be compatible with carrier operations without degrading other naval operations. Compatibility includes being capable of at least fifty catapult launches and forty-nine arrested landings; able to be transported, handled, stored, prepared, uploaded, and downloaded; and capable of operating in EMI, EMC, container immersion/ washdown, salt fog/salt spray, explosive atmosphere, mechanical shock (i.e., near-miss, catapult launches/ arrested landings, and handling shock), acoustic noise, vibration, fluid contamination, corrosive atmosphere, fungus, humidity, ice, and rain environments of aircraft carrier and replenishment ship operations.
Materiel Availability				
Once 3,000 SDB II	Once 3,000 SDB II	The Materiel Availability	Demonstrated	The Materiel

weapons are in the inventory, the Materiel Availability for SDB II will be no less than .95.	weapons are in the inventory, the Materiel Availability for SDB II will be no less than .95.	for SDB II will follow this graduated scale: Greater than 500 weapons in inventory - no less than .75 Greater than 1,000 weapons in inventory - no less than .80 Greater than 3,000 weapons in inventory - no less than .90.	performance data will be collected and displayed when 500 weapons are placed in inventory and available for use.	Availability for SDB II will follow this graduated scale: Greater than 500 weapons in inventory - no less than .75 Greater than 1000 weapons in inventory - no less than .80 Greater than 3000 weapons in inventory - no less than .90.
Net Ready				
I) Support net-centric military operations: A) Mission: Positive weapon control during engagement of mobile (moving and stationary) targets enabled by digital communications as planned and/or event -driven. 1) Measure: Receipt of weapon control directives = less than or equal to 12 seconds (Link 16); Transmission of situation awareness messages = less than or equal to 30 seconds UHF. 2) Conditions: Secure and available communications (DoD Chief Information Officer net-centric attribute). B) Mission Activities: Enable target acquisition; Target tracking. 1) Measure: Link 16 Target location accuracy** = 60 meters TLE90 and UHF** = 100 meters TLE90. 2) Conditions: SWE and WE conditions. II) Enter and be managed in the network: A) Link 16 tactical data link	I) Support net-centric military operations: A) Mission: Positive weapon control during engagement of mobile (moving and stationary) targets enabled by digital communications as planned and/or event -driven. 1) Measure: Receipt of weapon control directives = less than or equal to 12 seconds (Link 16); Transmission of situation awareness messages = less than or equal to 30 seconds UHF. 2) Conditions: Secure and available communications (DoD Chief Information Officer net-centric attribute). B) Mission Activities: Enable target acquisition; Target tracking. 1) Measure: Link 16 Target location accuracy** = 60 meters TLE90 and UHF** = 100 meters TLE90. 2) Conditions: SWE and WE conditions. II) Enter and be managed in the network: A) Link 16 tactical data link	(T=O) I) Support net-centric military operations: A) Mission: Positive weapon control during engagement of mobile (moving and stationary) targets enabled by digital communications as planned and/or event-driven. 1) Measure: Receipt of weapon control directives = less than or equal to 12 seconds (Link 16); Transmission of situation awareness messages = less than or equal to 30 seconds UHF. 2) Conditions: Secure and available communications (DoD Chief Information Officer net-centric attribute). B) Mission Activities: Enable target acquisition; Target tracking. 1) Measure: Link 16 Target location accuracy** = 60 meters TLE90 and UHF** = 100 meters TLE90. 2) Conditions: SWE and WE conditions. II) Enter and be managed in the network: A) Link 16	Demonstrated performance data will be displayed when SDB II completes OT, AFOTEC provides the final report and analysis is completed.	I) Support net-centric military operations: A) Mission: Positive weapon control during engagement of mobile (moving and stationary) targets enabled by digital communications as planned and/or event- driven. 1) Measure: Receipt of weapon control directives = less than or equal to 12 seconds (Link 16); Transmission of situation awareness messages = less than or equal to 30 seconds UHF. 2) Conditions: Secure and available communications (DoD Chief Information Officer net-centric attribute). B) Mission Activities: Enable

network. 1) Measure: Time to fine synchronization = less than or equal to 60 seconds; Terminal performance = 99% availability; Messaging = MER of less than or equal to 1%. 2) Conditions: Operational network; Type 1 encryption; Spectrum availability. B) Line-of-sight UHF tactical data link network. 1) Measure: Time to fine synchronization = less than or equal to 60 seconds; Terminal Performance = 99% availability; Messaging = MER less than or equal to 1%. 2) Conditions: Operational network; Type 1 encryption; spectrum availability. III) Exchange Information: A) Link 16 weapon control: 1) Measure: Periodicity*** = less than or equal to 12 seconds; Timeliness**** = less than or equal to 3 seconds; Throughput***** = 53.76 kilobits per second; Size****** = 0.56 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available. B) UHF weapon control JTAC2: 1) Measure: Periodicity******* = less than or equal to 30 seconds; Timeliness******** = less than or equal to 6 seconds; Throughput********* = 16 kilobits per second; Size********** = 1.12	network. 1) Measure: Time to fine synchronization = less than or equal to 60 seconds; Terminal performance = 99% availability; Messaging = MER of less than or equal to 1%. 2) Conditions: Operational network; Type 1 encryption; Spectrum availability. B) Line-of-sight UHF tactical data link network. 1) Measure: Time to fine synchronization = less than or equal to 60 seconds; Terminal Performance = 99% availability; Messaging = MER less than or equal to 1%. 2) Conditions: Operational network; Type 1 encryption; spectrum availability. III) Exchange Information: A) Link 16 weapon control: 1) Measure: Periodicity*** = less than or equal to 12 seconds; Timeliness**** = less than or equal to 3 seconds; Throughput***** = 53.76 kilobits per second; Size****** = 0.56 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available. B) UHF weapon control JTAC2: 1) Measure: Periodicity******* = less than or equal to 30 seconds; Timeliness******** = less than or equal to 6 seconds; Throughput********* = 16 kilobits per second; Size********** = 1.12	tactical data link network. 1) Measure: Time to fine synchronization = less than or equal to 60 seconds; Terminal performance = 99% availability; Messaging = MER of less than or equal to 1%. 2) Conditions: Operational network; Type 1 encryption; Spectrum availability. B) Line-of-sight UHF tactical data link network. 1) Measure: Time to fine synchronization = less than or equal to 60 seconds; Terminal Performance = 99% availability; Messaging = MER less than or equal to 1%. 2) Conditions: Operational network; Type 1 encryption; spectrum availability. III) Exchange Information: A) Link 16 weapon control: 1) Measure: Periodicity*** = less than or equal to 12 seconds; Timeliness**** = less than or equal to 3 seconds; Throughput***** = 53.76 kilobits per second; Size****** = 0.56 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available. B) UHF weapon control JTAC2: 1) Measure: Periodicity******* = less than or equal to 30 seconds; Timeliness******** = less than or equal to 6 seconds; Throughput********* = 16 kilobits per second;		target acquisition; Target tracking. 1) Measure: Link 16 Target location accuracy = 60 meters TLE90 and UHF = 100 meters TLE90. 2) Conditions: SWE and WE conditions. II) Enter and be managed in the network: A) Link 16 tactical data link network. 1) Measure: Time to fine synchronization = less than or equal to 60 seconds; Terminal performance = 99% availability; Messaging = MER of less than or equal to 1%. 2) Conditions: Operational network; Type 1 encryption; Spectrum availability. B) Line-of-sight UHF tactical data link network. 1) Measure: Time to fine 2) Conditions: Operational network; Type 1 encryption; spectrum availability. III) Exchange Information: A) Link 16 weapon control: 1) Measure: Periodicity = less than or equal to 12 seconds; Timeliness = less than or equal to 3

kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available. C) Link 16 precise participant location and identification TDL 1: 1) Measure: Periodicity********** = less than or equal to 12 seconds; Timeliness********** = less than or equal to 3 seconds; Throughput***** = 53.76 kilobits per second; Size********** = 0.315 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available.	kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available. C) Link 16 precise participant location and identification TDL 1: 1) Measure: Periodicity********** = less than or equal to 12 seconds; Timeliness********** = less than or equal to 3 seconds; Throughput***** = 53.76 kilobits per second; Size********** = 0.315 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available.	Size********* = 1.12 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available. C) Link 16 precise participant location and identification (TDL 1): 1) Measure: Periodicity********** = less than or equal to 12 seconds; Timeliness********** = less than or equal to 3 seconds; Throughput***** = 53.76 kilobits per second; Size********** = 0.315 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available.		seconds; Throughput = 53.76 kilobits per second; Size = 0.56 kilobits. 2) Conditions: Operational network; Type I encryption; Required spectrum is available. B) UHF weapon control JTAC2: 1) Measure Periodicity = less than or equal to 30 seconds; Timeliness = less than or equal to 6 seconds; Throughput = 16 kilobits per second; Size = 1.12 kilobits. 2) Conditions: Operational network; Type 1 encryption; Required spectrum is available. C) Link 16 precise participant location and identification TDL 1: 1) Measure: Periodicity = less than or equal to 12 seconds; Timeliness = less than or equal to 3 seconds; Throughput = 53.76 kilobits per second; Size = 0.315 kilobits. 2) Conditions: Operational network; Type 1 encryption; Required spectrum is available.

Weapon Effectiveness				
Given meeting the threshold of WE the SDB II will achieve a minimum PSSK of (O-3), when averaged over various environmental/threat condition cases listed in Appendix F of CDD for SDB II dated July 28, 2009. The JROC reviewed the CDD in lieu of the CPD on November 18, 2014, the JROC subsequently signed the memorandum on January 13, 2015.	Given meeting the threshold of WE the SDB II will achieve a minimum PSSK of (O-3), when averaged over various environmental/threat condition cases listed in Appendix F of CDD for SDB II dated July 28, 2009. The JROC reviewed the CDD in lieu of the CPD on November 18, 2014, the JROC subsequently signed the memorandum on January 13, 2015.	SDB II will achieve a minimum PSSK of (T-3) for each target type (Table 6-1 of CDD for SDB II dated July 28, 2009) in each environmental/threat condition case listed in Appendix F of CDD for SDB II dated July 28, 2009. The JROC reviewed the CDD in lieu of the CPD on November 18, 2014, the JROC subsequently signed the memorandum on January 13, 2015.	Demonstrated performance data will be displayed when SDB II completes OT, AFOTEC provides the final report and analysis is completed.	SDB II will achieve a minimum PSSK of (T-3) for each target type (Table 6-1 of CDD for SDB II dated July 28, 2009) in each environmental/ threat condition case listed in Appendix F of CDD for SDB II dated July 28, 2009. The JROC reviewed the CDD in lieu of the CPD on November 18, 2014; the JROC subsequently signed the memorandum on January 13, 2015.

Requirements Reference

Miniature Munitions Capability ORD dated April 8, 2005, CDD dated July 28, 2009, and JROC Memorandum dated January 13, 2015

Change Explanations

None

Notes

Threshold aircraft is defined as F-15E for the Air Force and F-35B and F-35C for the Navy. Program schedule for the Air Force will not be delayed due to availability of the F-35B and F-35C. Both targeting methods (threshold aircraft or JTAC) must be employed in any combination to achieve an average over the target set.

Acronyms and Abbreviations

AFOTEC - Air Force Operational Test & Evaluation Center
BRU - Bomb Rack Unit
EMC - Electromagnetic Compatibility
EMI - Electromagnetic Interference
JTAC - Joint Terminal Attack Controller
MER - Message Error Rate
OB - Objective
PSSK - Probability of Single Shot Kill
SWE - Scenario Weapon Effectiveness
T - Threshold
TDL - Tactical Data Link
TLE - Target Location Error
UHF - Ultra High Frequency
WE - Weapon Effectiveness

Track to Budget

RDT&E

Appn	BA	PE
Navy	05	0604329N

Project	Name	
3072	Small Diameter Bomb	(Shared)

Appn	BA	PE
Air Force	05	0604329F

Project	Name
655191	Small Diameter Bomb Increment II

Procurement

Appn	BA	PE
Navy	02	0204162N

Line Item	Name	
2238	Small Diameter Bomb II	

Appn	BA	PE
Air Force	02	0207327F

Line Item	Name	
SDB000	Small Diameter Bomb	(Shared)
Notes:	Until FY 2018	
SDB002	Small Diameter Bomb II	
Notes:	FY 2019 on	

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 2015 $M			BY 2015 $M	TY $M		
	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	SAR Baseline Production Estimate	Current APB Production Objective	Current Estimate
RDT&E	1678.1	1893.3	2082.6	1980.0	1648.9	1901.1	2007.1
Procurement	2376.8	2956.8	3252.5	3033.3	2792.0	3494.2	3651.5
Flyaway	--	--	--	2753.5	--	--	3325.8
Recurring	--	--	--	2753.5	--	--	3325.8
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	279.8	--	--	325.7
Other Support	--	--	--	279.8	--	--	325.7
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	4054.9	4850.1	N/A	5013.3	4440.9	5395.3	5658.6

Current APB Cost Estimate Reference

Annual SDB II Program Office Estimate dated October 22, 2019

Cost Notes

CAPE Cost Risks: Risk and uncertainty in each cost estimate Work Breakdown Structure element was analyzed by the cost estimating team and monetized using probabilistic methods per the AF Cost Risk and Uncertainty Handbook. Risk dollars were added to the estimate to mitigate those cost risks. Most cost elements were rated low to low moderate for risk adding 9% overall cost risk to the estimate. The major risk item in the estimate was Military-Code (M-Code), rated as moderate risk. The M-Code receiver is still being developed. The receiver will require an additional antenna and cable, and require the relocation of the power/limiter from the antenna to the receiver. As a result, the probabilistic risk simulation for M-Code added 29.48% to the M-Code point estimate as funding based mitigation.

Total Quantity			
Quantity	SAR Baseline Production Estimate	Current APB Production	Current Estimate
RDT&E	163	163	163
Procurement	17000	17000	17000
Total	17163	17163	17163

Cost and Funding

Funding Summary

Appropriation Summary FY 2021 President's Budget / December 2019 SAR (TY$ M)									
Appropriation	Prior	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	To Complete	Total
RDT&E	1528.3	91.3	72.6	86.5	78.4	74.3	75.7	0.0	2007.1
Procurement	520.6	291.8	352.2	388.4	404.0	347.5	309.1	1037.9	3651.5
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2021 Total	2048.9	383.1	424.8	474.9	482.4	421.8	384.8	1037.9	5658.6
PB 2020 Total	2063.2	408.0	524.2	471.0	472.9	369.8	342.8	0.0	4651.9
Delta	-14.3	-24.9	-99.4	3.9	9.5	52.0	42.0	1037.9	1006.7

Quantity Summary FY 2021 President's Budget / December 2019 SAR (TY$ M)										
Quantity	Undistributed	Prior	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	To Complete	Total
Development	163	0	0	0	0	0	0	0	0	163
Production	0	2626	1687	1490	1749	1775	1662	1376	4635	17000
PB 2021 Total	163	2626	1687	1490	1749	1775	1662	1376	4635	17163
PB 2020 Total	163	2626	1925	2910	2718	2832	2065	1924	0	17163
Delta	0	0	-238	-1420	-969	-1057	-403	-548	4635	0

Cost and Funding

Annual Funding By Appropriation

Annual Funding 3600 | RDT&E | Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2006	--	--	--	--	--	--	24.7
2007	--	--	--	--	--	--	92.0
2008	--	--	--	--	--	--	139.6
2009	--	--	--	--	--	--	107.1
2010	--	--	--	--	--	--	126.5
2011	--	--	--	--	--	--	100.0
2012	--	--	--	--	--	--	138.8
2013	--	--	--	--	--	--	125.1
2014	--	--	--	--	--	--	109.6
2015	--	--	--	--	--	--	65.9
2016	--	--	--	--	--	--	28.0
2017	--	--	--	--	--	--	37.6
2018	--	--	--	--	--	--	40.8
2019	--	--	--	--	--	--	75.3
2020	--	--	--	--	--	--	45.2
2021	--	--	--	--	--	--	17.3
2022	--	--	--	--	--	--	27.4
2023	--	--	--	--	--	--	27.9
2024	--	--	--	--	--	--	28.4
2025	--	--	--	--	--	--	28.9
Subtotal	136	--	--	--	--	--	1386.1

Annual Funding 3600 | RDT&E | Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	BY 2015 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2006	--	--	--	--	--	--	28.4
2007	--	--	--	--	--	--	103.0
2008	--	--	--	--	--	--	153.2
2009	--	--	--	--	--	--	116.0
2010	--	--	--	--	--	--	135.3
2011	--	--	--	--	--	--	105.0
2012	--	--	--	--	--	--	143.2
2013	--	--	--	--	--	--	126.9
2014	--	--	--	--	--	--	109.7
2015	--	--	--	--	--	--	65.3
2016	--	--	--	--	--	--	27.3
2017	--	--	--	--	--	--	36.0
2018	--	--	--	--	--	--	38.2
2019	--	--	--	--	--	--	69.2
2020	--	--	--	--	--	--	40.7
2021	--	--	--	--	--	--	15.3
2022	--	--	--	--	--	--	23.7
2023	--	--	--	--	--	--	23.7
2024	--	--	--	--	--	--	23.6
2025	--	--	--	--	--	--	23.6
Subtotal	136	--	--	--	--	--	1407.3

Costs for FY 2006 - FY 2019 based on sunk amounts. FY 2020 - FY 2027 costs based on approved CY 2019 SDB II RDT&E cost estimate excursion.

FY 2021 PB included a FY 2025 baseline extension of $28.9M

FY 2020 includes a $14M Congressional add for precise navigation and seeker cost reduction

Annual Funding 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2005	--	--	--	--	--	--	8.8
2006	--	--	--	--	--	--	11.7
2007	--	--	--	--	--	--	9.7
2008	--	--	--	--	--	--	11.1
2009	--	--	--	--	--	--	15.8
2010	--	--	--	--	--	--	7.6
2011	--	--	--	--	--	--	13.4
2012	--	--	--	--	--	--	17.9
2013	--	--	--	--	--	--	16.6
2014	--	--	--	--	--	--	18.0
2015	--	--	--	--	--	--	11.2
2016	--	--	--	--	--	--	28.4
2017	--	--	--	--	--	--	37.6
2018	--	--	--	--	--	--	56.6
2019	--	--	--	--	--	--	52.9
2020	--	--	--	--	--	--	46.1
2021	--	--	--	--	--	--	55.3
2022	--	--	--	--	--	--	59.1
2023	--	--	--	--	--	--	50.5
2024	--	--	--	--	--	--	45.9
2025	--	--	--	--	--	--	46.8
Subtotal	27	--	--	--	--	--	621.0

Annual Funding 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	BY 2015 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2005	--	--	--	--	--	--	10.4
2006	--	--	--	--	--	--	13.4
2007	--	--	--	--	--	--	10.8
2008	--	--	--	--	--	--	12.2
2009	--	--	--	--	--	--	17.1
2010	--	--	--	--	--	--	8.1
2011	--	--	--	--	--	--	13.9
2012	--	--	--	--	--	--	18.3
2013	--	--	--	--	--	--	16.8
2014	--	--	--	--	--	--	18.0
2015	--	--	--	--	--	--	11.0
2016	--	--	--	--	--	--	27.5
2017	--	--	--	--	--	--	35.8
2018	--	--	--	--	--	--	52.6
2019	--	--	--	--	--	--	48.2
2020	--	--	--	--	--	--	41.2
2021	--	--	--	--	--	--	48.4
2022	--	--	--	--	--	--	50.7
2023	--	--	--	--	--	--	42.5
2024	--	--	--	--	--	--	37.9
2025	--	--	--	--	--	--	37.9
Subtotal	27	--	--	--	--	--	572.7

Includes weapon development only; does not include bomb rack development.
Costs for FY 2005 - FY 2019 based on sunk amounts. FY 2020 - FY 2027 costs based on approved CY 2019 SDB II RDT&E cost estimate excursion. Yearly adjustments to align with F-35 schedule changes.

Annual Funding 3020 | Procurement | Missile Procurement, Air Force							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2015	144	35.1	--	--	35.1	--	35.1
2016	250	55.9	--	--	55.9	10.1	66.0
2017	375	89.2	--	--	89.2	11.2	100.4
2018	507	59.9	--	--	59.9	46.0	105.9
2019	510	65.6	--	--	65.6	35.3	100.9
2020	1175	163.0	--	--	163.0	20.3	183.3
2021	1133	237.0	--	--	237.0	36.3	273.3
2022	1385	291.8	--	--	291.8	16.0	307.8
2023	1416	304.9	--	--	304.9	16.6	321.5
2024	1282	253.7	--	--	253.7	9.6	263.3
2025	998	214.1	--	--	214.1	9.1	223.2
2026	1372	314.0	--	--	314.0	16.0	330.0
2027	1453	329.0	--	--	329.0	16.0	345.0
Subtotal	12000	2413.2	--	--	2413.2	242.5	2655.7

Annual Funding 3020 | Procurement | Missile Procurement, Air Force							
Fiscal Year	Quantity	BY 2015 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2015	144	34.1	--	--	34.1	--	34.1
2016	250	53.4	--	--	53.4	9.6	63.0
2017	375	83.3	--	--	83.3	10.4	93.7
2018	507	54.8	--	--	54.8	42.1	96.9
2019	510	58.9	--	--	58.9	31.6	90.5
2020	1175	143.3	--	--	143.3	17.8	161.1
2021	1133	204.2	--	--	204.2	31.3	235.5
2022	1385	246.5	--	--	246.5	13.6	260.1
2023	1416	252.6	--	--	252.6	13.7	266.3
2024	1282	206.0	--	--	206.0	7.8	213.8
2025	998	170.5	--	--	170.5	7.2	177.7
2026	1372	245.1	--	--	245.1	12.5	257.6
2027	1453	251.8	--	--	251.8	12.2	264.0
Subtotal	12000	2004.5	--	--	2004.5	209.8	2214.3

Costs for FY 2015 - FY 2019 based on sunk amounts. FY 2020 - FY 2027 costs based on approved CY 2019 SDB II procurement cost estimate excursion. Cost increased due to Lot 2 Cost Software Data Report, Military-Code, exportability, and addition of a lot integration test requirement.

FY 2020 -$29.2M mark for Restoring Acquisition Accountability

FY 2021 -$60M USAF budget realigned to FY 2024

Annual Funding 1507 | Procurement | Weapons Procurement, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2018	90	14.6	--	--	14.6	8.9	23.5
2019	750	79.1	--	--	79.1	9.7	88.8
2020	512	99.6	--	--	99.6	8.9	108.5
2021	357	69.2	--	--	69.2	9.7	78.9
2022	364	72.7	--	--	72.7	7.9	80.6
2023	359	74.5	--	--	74.5	8.0	82.5
2024	380	78.2	--	--	78.2	6.0	84.2
2025	378	79.6	--	--	79.6	6.3	85.9
2026	905	172.6	--	--	172.6	8.9	181.5
2027	905	172.5	--	--	172.5	8.9	181.4
Subtotal	5000	912.6	--	--	912.6	83.2	995.8

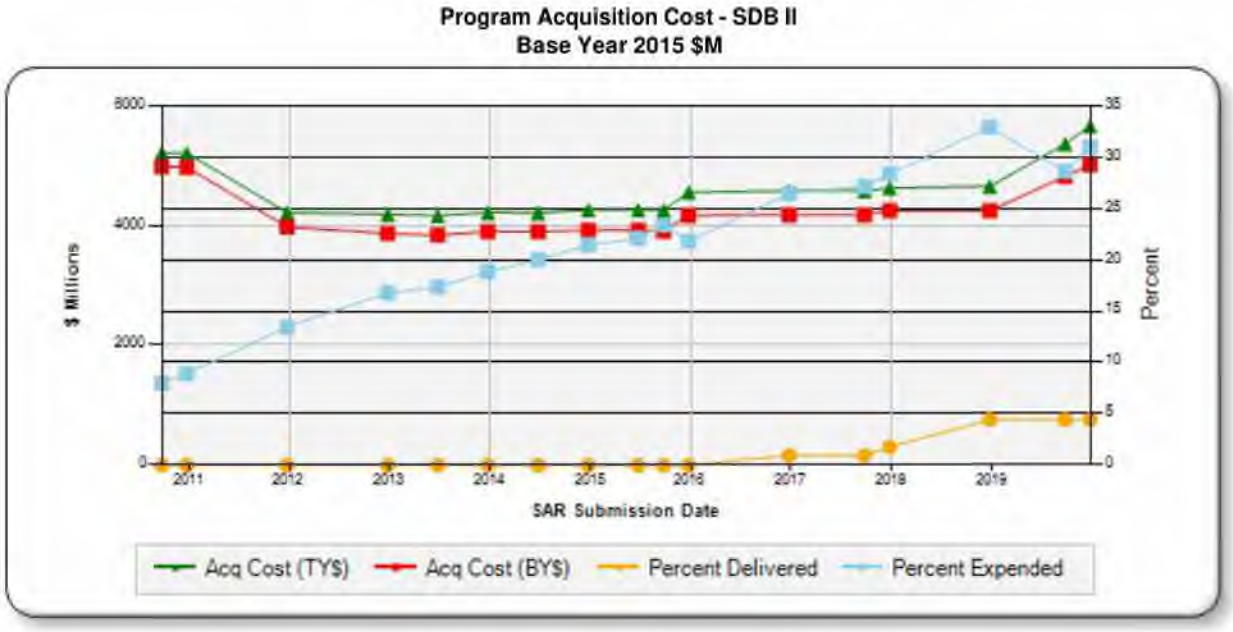
Annual Funding 1507 | Procurement | Weapons Procurement, Navy							
Fiscal Year	Quantity	BY 2015 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2018	90	13.4	--	--	13.4	8.1	21.5
2019	750	71.0	--	--	71.0	8.7	79.7
2020	512	87.6	--	--	87.6	7.9	95.5
2021	357	59.7	--	--	59.7	8.4	68.1
2022	364	61.5	--	--	61.5	6.7	68.2
2023	359	61.8	--	--	61.8	6.6	68.4
2024	380	63.6	--	--	63.6	4.8	68.4
2025	378	63.4	--	--	63.4	5.1	68.5
2026	905	134.9	--	--	134.9	6.9	141.8
2027	905	132.1	--	--	132.1	6.8	138.9
Subtotal	5000	749.0	--	--	749.0	70.0	819.0

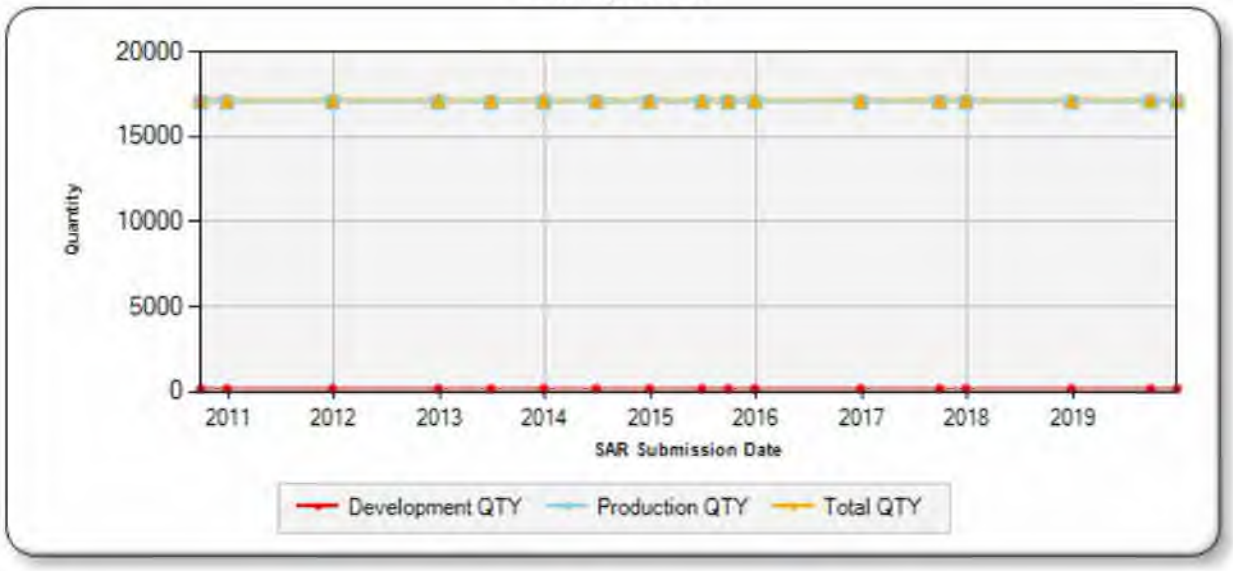
Costs for FY 2006 - FY 2019 based on sunk amounts. FY 2020 - FY 2027 costs based on approved CY 2019 SDB II RDT&E cost estimate excursion. Cost increased due to Lot 2 Cost Software Data Report showing significant increases in subsystem unit costs, Military-Code, and exportability.

FY 2021 - FY 2024 yearly adjustments for other priorities

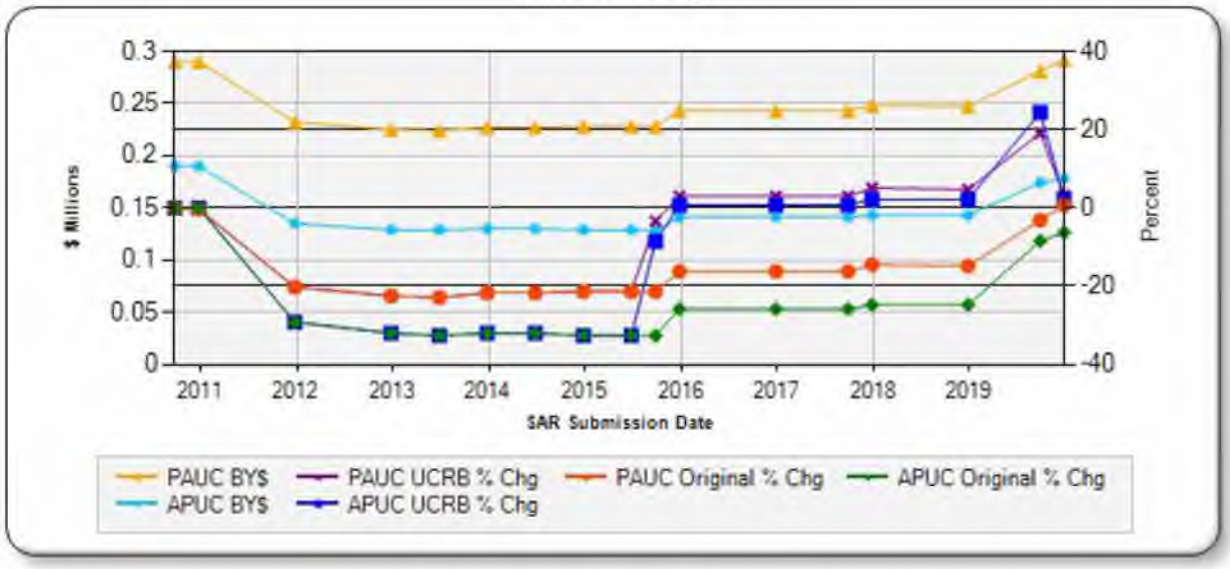
Charts

SDB II first began SAR reporting in September 2010





Unit Cost - SDB II
Base Year 2015 $M



The shift in the percent variance in the PAUC and APUC in 2015 correlates to the program's successful Milestone C and the re-baselining of the program APB. The adjusted PAUC and APUC in 2019 align with the revised APB approved January 2020.

Risks

Significant Schedule and Technical Risks

Significant Schedule and Technical Risks	
Milestone B (July 2010)	
1.	Risk (Performance): F-35 B/C Integration – Environmental: SDB II is designed to meet the requirements of the F-35 Environmental Description Document; however, impacts to SDB II have yet to be assessed. Mitigation: Conduct and review thermal/acoustic/vibration analyses of SDB II in the F-35 bay; Evaluate impacts of engineering redesign and operational impacts of placarding flight envelope. Status: Risk remains open until SDB II is qualified to F-35 data.
2.	Risk (Performance): Real Time Classification: Given that the classifier algorithm is a new technology, it requires extensive training and test data from all targets to support algorithm development and to verify performance. Mitigation: Conduct Captive Flight Test (CFT); Conduct post-test review followed by Modeling & Simulation performance verification with inputs from CFT to improve classifier algorithm. Status: Risk closed in August 2014 after successful Guided Test Vehicle-7 with correct real-time classification.
3.	Risk (Performance): Weapon Effectiveness (WE) – Weather: The seeker may not meet its allocated requirements to support WE for the 8 non-classification weather cases. Mitigation: Conduct Seeker summits; Conduct Captive Flight Tests and weather data, and verify the results in Modeling & Simulation. Status: Risk closed in October 2013 after all mitigation objectives were met.
4.	Risk (Performance): Weapon Effectiveness (WE) Requirements Verification: Given the number of required backgrounds, environments and targets, it is likely that planned testing alone will not provide sufficient verification of the WE requirements. Mitigation: Establish a Working Group to define Verification and Validation (V&V) strategy and Integrated Flight Simulation model with appropriate V&V to the Program Manager for accreditation. Status: Risk closed in March 2015 after WE using empirical seeker models and validation data from Guided Test Vehicles (7, 9, and 10) complies with the requirements.
5.	Risk (Performance): Multi-Mode Seeker Reliability: Seeker hardware and software do not perform reliably for all Key System Attribute 16 scenarios. Mitigation: Conduct hardware/software bench tests, Environmental Stress Screening tests, and Captive Flight Tests (CFT) to collect data and drive changes. Status: Risk closed in October 2011 after successful CFT-1A completed with over 100 runs with the Engineering and Manufacturing Development seeker hardware.
Milestone C (June 2015)	
1.	Risk (Performance): F-35 B/C Integration – Environmental: SDB II is designed to F-35 Environmental Description Document, however, impacts to SDB II have yet to be assessed. Mitigation: Conduct and review thermal/acoustic/vibration analyses of SDB II in the F-35 bay; Evaluate impacts of engineering redesign and operational impacts of placarding flight envelop. Status: Risk remains open until SDB II is qualified to F-35 data.
2.	Risk (Performance): F-35 B/C Integration – Separation: F-35 bay door flexes that exceeds modeling could drive restricted carriage. Mitigation: Conduct full F-35B/C Pit test and perform high fidelity separation analysis using separation Wind Tunnel Testing and Pit test data. Status: Risk remains open until flight sciences jettison and separation tests are conducted.
3.	Risk (Performance): Targeting System Accuracy: F-35 Ground Moving Target Track (GMTT) targeting accuracy specification does not meet SDB II's needs. Mitigation: Discuss with F-35 Joint Program Office actual GMTT accuracy vs. specification to initiate an Indefinite Delivery & Indefinite Quantity (IDIQ) task for Raytheon Missile Systems to analyze SDB II performance. Establish an IDIQ task and review the results. Status: Risk remains open until the IDIQ task is complete.

4.	Risk (Performance/Schedule): Lot 1/Operational Test Readiness Review free flight reliability values (growth projection) will not support Scenario Weapon Effectiveness, Weapon Effectiveness, and Coordinate Attack Mode Weapon Effectiveness thresholds and may slip schedule to complete testing. Mitigation: Conduct Failure Mode Effects and Criticality Analysis; Perform environmental test/Highly Accelerated Life Test/Test, analyze and fix/flight test, and verify design. Status: Risk remains open until Operational Test is complete.
5.	Risk (Schedule): Cybersecurity – Testing: If significant vulnerabilities are identified during cybersecurity Developmental Test & Evaluation (DT&E), then mitigation may be required before cybersecurity Operational Test & Evaluation can begin. Mitigation: Develop cybersecurity test plan with Air Force Operational Test & Evaluation Center and 46TS and execute the test plan. Present the findings to the Initial Operational Test & Evaluation Test Director. Status: Risk remains open until the DT&E cybersecurity test is complete.
Current Estimate (December 2019)	
1.	Risk (Performance): F-35 B/C Integration – Environmental: SDB II is designed to F-35 Environmental Description Document, however, impacts to SDB II have yet to be assessed. Mitigation: Conduct and review thermal/acoustic/vibration/shock analyses of SDB II with BRU-61 in the F-35 bay; Conduct SDB II F-35 flight sciences tests as part of Block 4; Evaluate whether SDB II environmental qualification testing meets measured F-35 Instrumented Measurement Vehicle data. Status: Risk remains open until SDB II is qualified to F-35 data.
2.	Risk (Performance): F-35 B/C Integration – Separation: F-35 bay door flexes that exceeds modeling could drive restricted carriage. Mitigation: Conduct full F-35B/C Pit test and perform high fidelity separation analysis using separation Wind Tunnel Testing and Pit test data. Status: Risk remains open until flight sciences jettison and separation tests are conducted and analysis completed.
3.	Risk (Performance/Schedule): Demonstrated free flight reliability values (growth projection) may not support Scenario Weapon Effectiveness, Weapon Effectiveness and Coordinate Attack Mode Weapon Effectiveness thresholds at completion of Initial Operational Test and Evaluation (IOT&E). Mitigation: Conduct Failure Mode Effects and Criticality Analysis; Perform environmental test/Highly Accelerated Life Test/Test, analyze and fix/flight test and verify design. Status: Risk remains open until IOT&E analysis is complete.
4.	Risk (Schedule): Timing of IOT&E and F-15E Required Assets Available (RAA) by the threshold date of January 2019. Status: IOT&E Phase 1 is complete and RAA was declared January 17, 2020. Risk is now CLOSED.

Risks

Risk and Sensitivity Analysis

Risks and Sensitivity Analysis	
Current Baseline Estimate (January 2020)	
1.	USD AT&L directed the SDB II Program to be funded to the Joint Service Cost Position estimate. The cost risk is the difference in the cost estimates and resource requirements, which total approximately TY $181M.
Original Baseline Estimate (October 2010)	
1.	USD AT&L directed the SDB II Program to be funded to the Joint Service Cost Position estimate. The cost risk is the difference in the cost estimates and resource requirements, which total approximately TY $181M.
Revised Original Estimate (N/A)	
1.	None
Current Procurement Cost (December 2019)	
1.	The Interim Cost and Software Data Report (CSDR) dated April 22, 2019 for production Lot 2 was used to estimate the production costs for Lots 6-11. The cost estimate includes risk dollars utilizing approved methods per the AF Cost Risk and Uncertainty Handbook. Risk dollars were applied across production lots at varying lower level work breakdown cost elements in accordance with the identified SDB II program schedule and technical risks. SDB II began LRIP in FY 2015. The final Lot 1 CSDR and Lot 2 interim CSDR have been delivered.

Low Rate Initial Production

Item	Initial LRIP Decision	Current Total LRIP
Approval Date	8/6/2010	6/4/2015
Approved Quantity	4034	9947
Reference	Milestone B ADM	Milestone C ADM
Start Year	2013	2015
End Year	2018	2022

The Current Total LRIP Quantity is more than 10% of the total production quantity due to a delay in the completion of Operational Test (OT) and Evaluation caused by schedule revisions to the F-35 program, a threshold aircraft. Since the SDB II EMD contract award, the F-35 schedule has been further delayed, which requires an additional increase in the LRIP quantities to 9,947; this change was approved by the Milestone C ADM and accounts for max quantities in Lots 1-5 and most probable quantities in Lots 6-8. These quantities were necessary to provide production-configured or representative articles for OT, to establish an initial production base for the system, and to permit an orderly increase in the production rate for the system sufficient to lead to FRP.

Foreign Military Sales

Notes

The Defense Security Cooperation Agency (DSCA) has allocated $71M from Special Defense Acquisition Funds (SDAF) to complete development and integration of exportability features into SDB II. $52M has been obligated to date. The remaining $19M will be obligated in FY 2020. Funding enables cost sharing over all projected sales to FMS customers.

Letter of Offer and Acceptance AT-D-YAH, signed February 23, 2018, will provide the Commonwealth of Australia (CoA) with SDB II test and training assets and support. CoA requirements were included in SDB II Lot 6/7 proposal received April 26, 2019. Lot 6/7 negotiations are ongoing with projected contract award March 2020.

SDB II has provided Price and Availability data to Norway, Turkey, Netherlands, Belgium, Finland, and Republic of Korea. Interest has also been expressed by Israel and Sweden. Future RFIs are anticipated from additional F-35 partners and customers.

Nuclear Costs

None

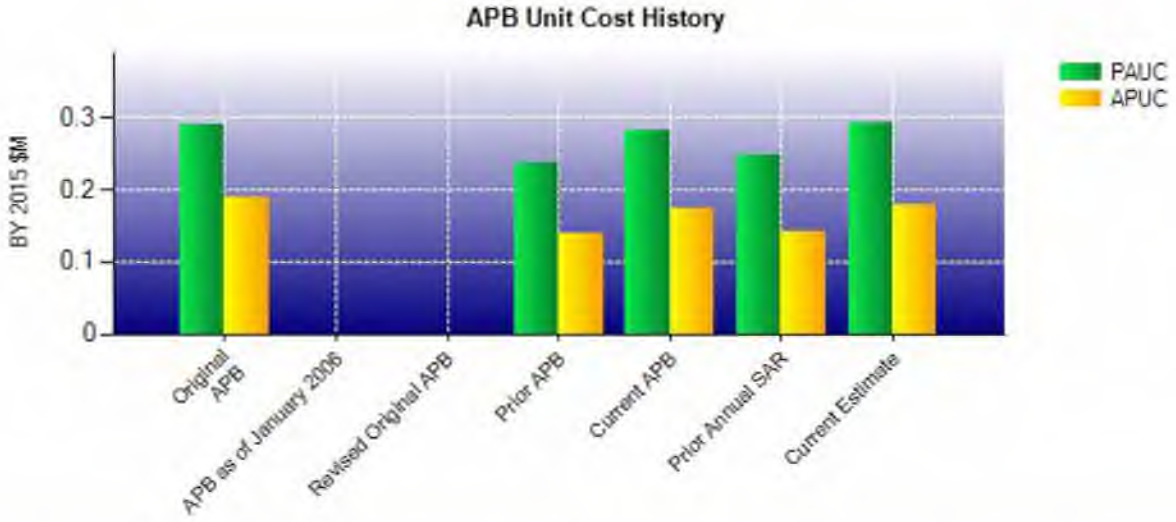
Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2015 $M Current UCR Baseline (Jan 2020 APB)	BY 2015 $M Current Estimate (Dec 2019 SAR)	% Change
Program Acquisition Unit Cost			
Cost	4850.1	5013.3	
Quantity	17163	17163	
Unit Cost	0.283	0.292	+3.18
Average Procurement Unit Cost			
Cost	2956.8	3033.3	
Quantity	17000	17000	
Unit Cost	0.174	0.178	+2.30

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2015 $M Original UCR Baseline (Oct 2010 APB)	BY 2015 $M Current Estimate (Dec 2019 SAR)	% Change
Program Acquisition Unit Cost			
Cost	4979.8	5013.3	
Quantity	17163	17163	
Unit Cost	0.290	0.292	+0.69
Average Procurement Unit Cost			
Cost	3237.9	3033.3	
Quantity	17000	17000	
Unit Cost	0.190	0.178	-6.32

APUC increased from $.174M to $.178M due to constraining the estimate to the budget and creating a To Complete requirement in FYs 2026-2027

PAUC increased from $.283M to $.292M because the total cost increased a net $164.8M due to updating Navy RDT&E sunk costs to actuals



APB Unit Cost History					
Item	Date	BY 2015 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	Oct 2010	0.290	0.190	0.304	0.209
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	Apr 2019	0.236	0.140	0.259	0.164
Current APB	Jan 2020	0.283	0.174	0.314	0.206
Prior Annual SAR	Dec 2018	0.247	0.143	0.271	0.168
Current Estimate	Dec 2019	0.292	0.178	0.330	0.215

SAR Unit Cost History

Initial SAR Baseline to Current SAR Baseline (TY $M)									
Initial PAUC Development Estimate	Changes								PAUC Production Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.304	0.006	0.000	0.001	0.000	-0.049	0.000	-0.003	-0.045	0.259

Current SAR Baseline to Current Estimate (TY $M)									
PAUC Production Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.259	0.000	0.000	0.007	0.007	0.056	0.000	0.001	0.071	0.330

Initial SAR Baseline to Current SAR Baseline (TY $M)									
Initial APUC Development Estimate	Changes								APUC Production Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.209	0.005	0.000	0.001	0.000	-0.048	0.000	-0.003	-0.045	0.164

Current SAR Baseline to Current Estimate (TY $M)									
APUC Production Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.164	0.000	0.000	0.007	0.000	0.043	0.000	0.001	0.051	0.215

SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	N/A	N/A	N/A
Milestone B	N/A	Jul 2010	Aug 2010	Jul 2010
Milestone C	N/A	Jan 2013	May 2015	May 2015
IOC	N/A	Jul 2016	Jan 2018	Jan 2020
Total Cost (TY $M)	N/A	5210.4	4440.9	5658.6
Total Quantity	N/A	17163	17163	17163
PAUC	N/A	0.304	0.259	0.330

The IOC event above uses the F-15E Required Assets Available (RAA) milestone which is a surrogate for IOC. The F-15E is the initial aircraft with SDB II capability. There are three additional IOCs for this program, F/A-18E/F, F-35B and F-35C Initial Fielding, all occurring after the F-15E RAA milestone.

Cost Variance

Summary TY $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Production Estimate)	1648.9	2792.0	--	4440.9
Previous Changes				
Economic	+3.3	+3.4	--	+6.7
Quantity	--	--	--	--
Schedule	--	-0.4	--	-0.4
Engineering	+120.8	--	--	+120.8
Estimating	+92.2	+731.2	--	+823.4
Other	--	--	--	--
Support	--	-32.0	--	-32.0
Subtotal	+216.3	+702.2	--	+918.5
Current Changes				
Economic	+0.4	+1.4	--	+1.8
Quantity	--	--	--	--
Schedule	--	+113.8	--	+113.8
Engineering	--	--	--	--
Estimating	+141.5	-7.8	--	+133.7
Other	--	--	--	--
Support	--	+49.9	--	+49.9
Subtotal	+141.9	+157.3	--	+299.2
Total Changes	+358.2	+859.5	--	+1217.7
Current Estimate	2007.1	3651.5	--	5658.6

Summary BY 2015 $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Production Estimate)	1678.1	2376.8	--	4054.9
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	+7.1	--	+7.1
Engineering	+112.5	--	--	+112.5
Estimating	+71.7	+600.0	--	+671.7
Other	--	--	--	--
Support	--	-27.1	--	-27.1
Subtotal	+184.2	+580.0	--	+764.2
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	+37.4	--	+37.4
Engineering	--	--	--	--
Estimating	+117.7	+1.0	--	+118.7
Other	--	--	--	--
Support	--	+38.1	--	+38.1
Subtotal	+117.7	+76.5	--	+194.2
Total Changes	+301.9	+656.5	--	+958.4
Current Estimate	1980.0	3033.3	--	5013.3

Previous Estimate: September 2019

Cost Variance Notes

Cost inputs for this submission have been updated to reflect sinking of actual costs through FY 2019 and updated estimates for completion of M-Code and crypto modernization efforts.

RDT&E: FY 2015-2020 variance due to sinking of prior year costs and constraining of FY 2020 estimate to budget; FY 2021 -2025 variance due to update of Navy requirements.

PROC: Variance due to update of quantity phasing to match FY 2021 PB.

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+0.4
Revised estimate to reflect actuals and FY 2021 PB (Estimating)	+130.7	+158.0
Revised estimate to reflect actuals and FY 2021 PB (Estimating)	-12.6	-16.1
Adjustment for current and prior escalation. (Estimating)	-0.4	-0.4
RDT&E Subtotal	+117.7	+141.9

Procurement	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+1.4
Shift in procurement buy profile from FY 2020-2021 to FY 2024-2025 based on FY 2021 PB (Air Force). (Schedule)	0.0	+43.3
Shift in procurement buy profile from FY 2020-2021 to FY 2025 based on FY 2021 PB (Navy). (Schedule)	0.0	+29.3
Shift in procurement buy profile based on FY 2021 PB (AF). Inventory objective remains 12,000. (Schedule) (QR)	+37.4	+41.2
Additional schedule variance to reflect updated yearly production quantity; phasing to reflect FY 2021 PB. Inventory objective remains 5,000. (Schedule) (QR)	0.0	0.0
Shift in procurement buy profile based on FY 2021 PB. Air Force inventory objective remains 12,000. FY 2015-2020 actual costs. (Estimating)	+0.1	+0.2
Shift in procurement buy profile to match FY 2021 PB; Navy inventory objective remains 5,000. (Estimating)	+1.0	-7.5
Adjustment for current and prior escalation. (Estimating)	-0.1	-0.5
Adjustment for current and prior escalation. (Support)	-0.2	+0.2
Increase in Other Support (Air Force). Cost estimated updated for FY 2021 PB. (Support)	+24.7	+31.8
Increase in Other Support (Navy). Cost estimated updated for FY 2021 PB. (Support)	+13.6	+17.9
Procurement Subtotal	+76.5	+157.3

(QR) Quantity Related

Contracts

Contract Identification

Appropriation: Procurement
Contract Name: Low Rate Initial Production Lot 3
Contractor: Raytheon Missile Systems
Contractor Location: 1151 E. Hermans Rd
Tucson, AZ 85756
Contract Number: FA8672-17-C-0010/3
Contract Type: Fixed Price Incentive(Firm Target) (FPIF)
Award Date: January 27, 2017
Definitization Date: January 27, 2017

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
62.4	70.8	312	62.4	70.8	312	70.8	70.8

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (9/30/2019)	-24.4	-5.5
Previous Cumulative Variances	-21.2	+11.1
Net Change	-3.2	-16.6

Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to continued cost overruns driven by contractor business base issues and supplier price increases. Contract price is at ceiling and is expected to be at ceiling upon completion of all deliverables.

The unfavorable net change in the schedule variance is due to production issues that have delayed deliveries.

Notes

The SDB II LRIP Lot 3 contract option was exercised for 312 Munitions, 413 Single Weapon Containers, 20 Tactical Weapon conversions to Guided Test Vehicles, 20 Production Reliability Incentive Demonstration Effort captive vehicles, and 24 Weapon Load Crew Trainers/Conventional Munitions Maintenance Trainers.

The SDB II LRIP Lot 3 Integrated Baseline Review was February 2018.

EVM submission has been suspended until Lot 3 deliveries restart June 2020.

Contract Identification

Appropriation: Procurement
Contract Name: Low Rate Initial Production Lot 4
Contractor: Raytheon Missile Systems
Contractor Location: 1151 E. Herma's Rd
Tucson, AZ
Contract Number: FA8762-18-C-0010
Contract Type: Firm Fixed Price (FFP)
Award Date: February 28, 2018
Definitization Date: February 28, 2018

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
77.3	N/A	570	87.7	N/A	660	87.7	87.7

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to addition of 90 DoN weapons and 10 dual weapon containers added to the contract.

Cost and Schedule Variance Explanations

Cost and Schedule Variance reporting is not required on this (FFP) contract.

Notes

The SDB II LRIP Lot 4 option was exercised for 570 Munitions, 398 Single Weapon Containers, 126 Dual Weapon Containers, 20 Production Reliability Incentive Demonstration Effort captive vehicles, 20 PRIDE test vehicles, and 45 Weapon Load Crew Trainers. Within 60 days, the Government exercised its unilateral right to add additional quantities to the contract adding 90 additional munitions and 10 Dual Weapon Containers (570 Air Force, 90 Navy).

Contract Identification

Appropriation: Procurement
Contract Name: Low Rate Initial Production Lot 5
Contractor: Raytheon Missile Systems
Contractor Location: 1152 E. Hermans Rd
Tucson, AZ 85756
Contract Number: FA8672-17-C-0010
Contract Type: Firm Fixed Price (FFP)
Award Date: December 17, 2018
Definitization Date: December 17, 2018

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
141.4	N/A	1260	141.4	N/A	1260	141.4	141.4

Cost and Schedule Variance Explanations

Cost and Schedule Variance reporting is not required on this (FFP) contract.

Notes

The SDB II LRIP Lot 5 option was exercised for 1,260 Munitions, 389 Single Weapon Containers, 344 Dual Weapon Containers, 20 Production Reliability Incentive Demonstration Effort (PRIDE) captive vehicles, 20 PRIDE test vehicles, and 36 Weapon Load Crew Trainers.

Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	163	163	163	100.00%
Production	459	598	17000	3.52%
Total Program Quantity Delivered	622	761	17163	4.43%

Expended and Appropriated (TY $M)			
Total Acquisition Cost	5658.6	Years Appropriated	16
Expended to Date	1750.6	Percent Years Appropriated	69.57%
Percent Expended	30.94%	Appropriated to Date	2432.0
Total Funding Years	23	Percent Appropriated	42.98%

The above data is current as of February 10, 2020.

Notes

The Government does not take delivery of the 163 Developmental Test (DT) assets. The DT assets will not go to inventory. The 17,000 sustainment quantity will be delivered to inventory.

Operating and Support Cost

Cost Estimate Details

Date of Estimate:	June 17, 2016
Source of Estimate:	POE
Quantity to Sustain:	17000
Unit of Measure:	Total Quantity
Service Life per Unit:	20.00 Years
Fiscal Years in Service:	FY 2014 - FY 2046

The 163 developmental units will not be sustained.

Sustainment Strategy

SDB II is an All Up Round (AUR) weapon, requiring no scheduled preventative maintenance, field level corrosion control for in-container storage, or periodic testing. The maintenance strategy will comply with standard USAF two-level maintenance concept: organizational level (flightline and back shop maintenance) and depot level operations, and the standard Navy three level maintenance concept: organizational level (flight deck maintenance), intermediate level (below decks maintenance), and depot level operations. The weapon will utilize the existing munitions support infrastructure and Lots 1-5 are covered by a warranty for a maximum of 20 years supplemented by Contractor Logistics Support (CLS). Depot Maintenance will cover warranty repairs and will be conducted at Raytheon Missile Systems Tucson. Non-warranty repairs will be covered under CLS which will also provide in-service engineering, logistics, technical publication updates, and software updates. The use of CLS as a Product Support strategy was approved by the MDA as part of the Milestone B Acquisition Strategy. The CLS will cover warranty and non-warranty repairs, sustaining engineering, fielding support (training, software and OFP updates), and WSEP support. The program office awarded an Interim CLS contract for FY 2019 through FY 2022 to support test assets and non-warranty repair of operational assets. The Interim CLS will also allow data gathering in order to develop and award a more refined and cost effective follow-on CLS Product Support Agreement (PSA). This PSA will be reviewed and updated at the end of each contractual period of performance.

Antecedent Information

No Antecedent. The SDB II weapon is a new acquisition program that provides Joint fighter/bomber aircraft the capability to engage mobile targets in adverse weather from stand-off ranges by utilizing a multi-mode seeker and a post-release communications weapon data link. SDB II will not replace SDB I.

Annual O&S Costs BY2015 $M		
Cost Element	**SDB II Average Annual Cost Per Total Quantity**	**No Antecedent (Antecedent) N/A**
Unit-Level Manpower	0.800	--
Unit Operations	0.000	--
Maintenance	5.800	--
Sustaining Support	11.147	--
Continuing System Improvements	2.890	--
Indirect Support	0.588	--
Other	0.000	--
Total	21.225	--

Item	Total O&S Cost $M			
	SDB II			No Antecedent (Antecedent)
	Current Production APB Objective/Threshold		Current Estimate	
Base Year	782.6	860.9	782.6	N/A
Then Year	1180.4	N/A	11180.4	N/A

Equation to Translate Annual Cost to Total Cost

O&S costs are from the Total O&S cost is equal to the average annual total inventory cost per year times the total number of years in the O&S phase, $21.225M * 34 years + disposal costs = $782.6M (BY 2015). Costs are from approved December 12, 2019 SDB II O&S estimate.

O&S Cost Variance		
Category	**BY 2015 $M**	**Change Explanations**
Prior SAR Total O&S Estimates - Sep 2019 SAR	821.0	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	-38.4	Fielding of weapon delayed due to various programmatic issues.
Total Changes	-38.4	
Current Estimate	782.6	

Disposal Estimate Details

Date of Estimate:	December 12, 2019
Source of Estimate:	POE
Disposal/Demilitarization Total Cost (BY 2015 $M):	40.7

Cost from CY19 SDB II POE