
GROUND BASED STRATEGIC DETERRENT (GBSD)

Selected Acquisition Report (SAR)



AS OF THE FY 2023 PRESIDENT'S BUDGET
U.S. AIR FORCE

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Mission and Description

The Ground Based Strategic Deterrent (GBSD) program is a full recapitalization of the Minuteman (MM) III Intercontinental Ballistic Missile (ICBM) weapon system, which includes 400 deployed missiles, associated spares, and 450 launch facilities (LF). The replacement program includes new missile systems, new command and control systems, ground systems, and the conversion of the MM III silos and Launch Control Centers. The GBSD weapon system will be designed to be operationally capable through FY 2075. The program's mission is to deliver the next generation of ICBM nuclear deterrence for America.

Executive Summary

Program Highlights since Last Report

This is the initial SAR submission for the Ground Based Strategic Deterrent (GBSD) program.

The GBSD program office continues to make progress along the path laid out at Milestone B (MS B) and has been working with Northrop Grumman (NG) to refine the baseline with sub-contractors and suppliers.

To provide fidelity and better align activities, the GBSD Systems Program Office (SPO), GBSD Mission Partners, and NG conducted an Enterprise Integrated Baseline Review (EIBR) June 15-17, 2021. EIBR was the event/process established by the SPO to baseline and integrate the government activities/products (i.e., construction, environmental assessments, crypto) provided by other government organizations with NG's baseline. These government activities intersect with the Engineering and Manufacturing Development (EMD) contract and are required for time-certain delivery. As the year progressed, there has been significant progress made on linking the NG schedule to the Government Enterprise schedule and verifying several hundred giver/receiver linkages and Government Furnished Equipment delivery dates. NG is reporting a schedule variance to their baseline plan. Despite this variance, the program remains on-track to meet all key government milestones.

The program accomplished many risk reduction activities throughout the year. The EMD contractor constructed a full-scale version of a legacy LF and will now convert to an operational configuration to prove out the design and reduce the learning curve during deployment. Additionally, a 95% design review for the contractor support area was completed in June 2021. This provided an opportunity to address final design considerations early in EMD by minimizing potential design change orders. The program conducted centrifuge testing on developmental Inertial Measurement Units (IMU) to gain insight on launch environments and reduce integration risk associated with first flight. Additionally, the program prototyped the Altitude Control Engine (ACE) and conducted ground testing with the newly manufactured flight nozzles. The testing was successful in proving out the pitch and yaw prototype thruster for the Post Boost Attitude Control Module (PBACM) reducing integration risk to first flight.

Digital Intelligence continues to drive successes throughout the Program Office and has been crucial for EIBR/IBR success. GBSD is the first large acquisition program to use the Integrated Program Management Data & Analysis Report standard, setting the stage for other DoD acquisition programs to adopt.

Major events planned for FY 2022 include wind tunnel tests for May; a missile modal (structural) test for September; and rocket motor static fire tests planned for October through December. In the 2nd Quarter FY 2022, Program Office activities will include: the Enhanced Ground Testing Sled Test; Critical Design Reviews (CDRs) for encryption devices, and Stage 1 through 3 Thrust Vector Control.

Construction planning includes a 95% design review of LFs at VSBF, a design charrette of the operational wing LFs, the Strategic Missile Test and Production Complex MM III conversion for November, and a 35% design review for the F.E. Warren (FEW) AFB Integrated Training Center will also occur in 2022.

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
September 2020	MDA approved Milestone B on September 4, 2020.
September 2020	GBSD awarded the EMD Contract on September 8, 2020.
March 2021	NG conducted an Integrated Baseline Review.
August 2021	The United States Government delivered Vandenberg Space Force Base (VSFB) Launch Facility to NG.
September 2021	First GBSD Holloman High Speed Test Track mass-mock run.
September 2021	The United States Government delivered VSFB Missile Alert Facility to NG.
October 2021	Enhanced Ground Test (sled test) conducted at Holloman AFB.
October 2021	GBSD closed out the encryption preliminary design review with Sandia National Labs.
November 2021	Program Office conducted sled test with Strategic Resonating Beam Accelerometer (SRBA) at Holloman AFB.
December 2021	SPO delivered the updated Test and Evaluation Master Plan (TEMP) to the Office of Secretary of Defense (OSD).

Schedule

Schedule Events

Schedule Events						
Events	APB Development Estimate	Current APB Development Objective/Threshold		Current Estimate	Actual	Deviation
Milestone B	Aug 2020	Aug 2020	Sep 2020	-	September 8, 2020	
System Critical Design Review (CDR)	Jul 2023	Jul 2023	Jul 2024	May 2024		
Milestone C	May 2026	May 2026	May 2027	Jan 2026		
Initial Operational Capability (IOC)	Jun 2029	Jun 2029	Jun 2030	May 2029		
Full Rate Production (FRP) Decision Point	Sep 2029	Sep 2029	Sep 2030	Jul 2029		

Significant Schedule Risks

Significant Schedule Risks	
Milestone B (September 2020)	
1.	Details of Schedule Risks of this program are Controlled Unclassified Information (CUI) and have been removed per paragraph (i) of title 10 United States Code 4351 which required the SAR be submitted without any designation relation to dissemination control.
Current Estimate (January 2022)	
1.	Details of Schedule Risks of this program are Controlled Unclassified Information (CUI) and have been removed per paragraph (i) of title 10 United States Code 4351 which required the SAR be submitted without any designation relation to dissemination control.

Performance

Classified Performance information is provided in the classified annex to this submission.

Acquisition Budget Estimate

Total Acquisition Cost

Category	Base Year	Development APB	Current APB Development		Budget Estimate PB 2023		Deviation
		Objective (BY\$)	Objective (BY\$)	Threshold (BY\$)	BY\$	TY\$	
RDT&E	2020	22,978.000	22,978.000	25,275.800	22,978.000	25,514.700	
Procurement	2020	47,858.400	47,585.400	52,644.200	47,858.400	61,593.100	
MILCON	2020	6,904.300	6,904.300	7,594.700	6,904.300	8,730.700	
Acq. O&M							
Total		77,740.7	77,740.7	N/A	77,740.7	95,838.5	
PAUC	2020	117.968	117.968	129.765	117.968	145.430	
APUC	2020	75.486	75.486	83.035	75.486	97.150	

Total End Item Quantity

Quantity Category	Current APB Quantity	Current Estimate Quantity
Development	25	25
Procurement	634	634

Risk and Sensitivity Analysis

Risks and Sensitivity Analysis	
Current Baseline Estimate (January 2022)	
1.	<p>The program office estimate is composed primarily of parametric and analogous methodologies. The program office is closely monitoring monthly Earned Value submissions and other contractor data with the intent to inform the cost / schedule risk assessments.</p> <p>In addition to Original Baseline Estimate risks and sensitivities, the program office is monitoring and analyzing impacts to the cost of key inputs to include Aerospace Vehicle Equipment (AVE) components, operational ground deployment & construction (i.e., LFs, Launch Centers, utility corridor, and support facilities), and software.</p> <p>AVE is closely monitored as the GBSD AVE subsystem composes more than 50% of the acquisition cost. Cost adjustments to AVE have potentially significant cost impacts.</p> <p>Operational ground deployment and construction contains many variables to include: NEPA, LF deployment rates, requirement maturity, utility corridor and real estate acquisition. All these variables have significant impacts on cost and schedule in the Production and Deployment Phase of the program. Requirement refinement in utility corridor and real estate acquisition are ongoing and will be updated in future Program Office Estimates. COVID-19 is a cost impact that has not been completely considered as evidence of raw material costs remain above pre-COVID levels.</p> <p>Software includes traditional code development activities and Nuclear Safety Cross Check Analysis (NSCCA). The size, integration, and independent review of the software creates significant cost and schedule challenges. The program office estimate incorporates the detailed analysis of the integrated software oversight team in developing the cost / schedule risk assessment for each Computer Software Configuration Item.</p>
Original Baseline Estimate (September 2020)	
1.	<p>In preparing the GBSD Program Office Estimate, risk and uncertainty were assessed on the significant cost inputs (e.g., software, complex strategy, industry labor rates, etc.) into the model. The program office analyzed the distribution shape and developed minimum and maximum values using historical data and subject matter experts. The program model used a risk simulation as recommended by the Joint Agency Cost Schedule Risk and Uncertainty Handbook (CSRUH). Estimates were presented at the mean, which included approximately \$1.3B in the EMD phase, \$2.8B in the production phase, and \$0.5B for MILCON risk and uncertainty. In preparing the Independent Cost Estimate (ICE) for GBSD Milestone B Review, OSD reviewed and included additional resources, citing the following reasons: ICBM industrial base, design/build concurrency, software, environmental, MBSE/Agile/DevSecOps, and contracting strategy.</p>
Revised Original Estimate (N/A)	
1.	There are no known risks for this program at this time.
Current Procurement Cost (December 2021)	
1.	There are no known risks for this program at this time.

Unit Cost

Current Baseline Compared with Current Estimate

Category (\$M)	Current APB	Current Estimate	% Change	NMC Breach
PAUC				
Cost	77,740.700	77,740.700	-	-
Quantity	659	659	-	-
Unit Cost	117.968	117.968	0.00%	
APUC				
Cost	47858.400	47858.400	-	-
Quantity	634	634	-	-
Unit Cost	75.486	75.486	0.00%	

Original Baseline Compared with Current Estimate

Category (\$M)	Current APB	Current Estimate	% Change	NMC Breach
PAUC				
Cost	77,740.700	77,740.700	-	-
Quantity	659	659	-	-
Unit Cost	117.968	117.968	0.00%	
APUC				
Cost	47,858.400	47,858.400	-	-
Quantity	634	634	-	-
Unit Cost	75.486	75.486	0.00%	

Unit Cost Notes

Current Estimate Source: Prior through FY 2027 source is FY 2023 PB; FY 2028+ source MS-B ICE approved August 22, 2020

Contracts

Contract Data (\$TYM)		
Contract Number	FA8219-20-C-0006	
Effort Number		
Contract Type	Cost Plus Incentive Fee	
Modification Number	15	
Award Date	September 8, 2020	
Definitization Date	September 8, 2020	
Order Number		
CAGE Code/CAGE Legal Name	NORTHROP GRUMMAN SYSTEMS CORPORATION / 8MQW5	
Contract Title	GBSD EMD & Early Production and Deployment	
Contract Address	5770 S Missile Way Roy, UT 84067	
Contracts/Effort Price, Quantity, and Performance (\$M)		
Initial Target Price	Current Target Price	
13,293.600	13,293.600	
Initial Ceiling Price	Current Ceiling Price	
N/A	N/A	
Contract's EAC	PM's EAC	
12,103.700	12,637.800	
Initial Quantity	Current Quantity	Delivered Quantity
N/A	N/A	N/A
BAC	BCWP	ACWP
11,291.600	11,659.400	1,1,721.600
BCWS	Cost Variance	Schedule Variance
1,51,745.600	-62.2	-86.200

Contract Notes

The difference between the Contractor EAC and the PM EAC is in the way they are calculated. The Contractor EAC = PMB EAC + Undistributed Budget + Issues + Factored Risks – Factored Opportunities. The PM EAC = EAC calculated using CPI + Management Reserve.

Cost Variance:

Despite the unfavorable cost variance, cost continues to track to OSD goals.

Schedule Variance:

The current unfavorable schedule variance is due to the following drivers: cleared personnel staffing, classified IT infrastructure challenges, and booster electronics development. Originally, NG set an aggressive baseline targeting delivery prior to the maximum schedule incentive dates, which drove a cost profile outside of contractual funding for FY 2021 and FY 2022. NG has since realigned their baseline to fit within the contract funding. Additionally, COVID impacts to the supply chain are being evaluated as designs are matured in FY 2022.

Technologies and Systems Engineering

Significant Technical Risks

Significant Technical Risks	
Current Estimate (January 2022)	
1.	Technical Risk are held at a higher classification level
Milestone B (September 2020)	
1.	N/A

Deliveries and Expenditures

Deliveries

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	25	0.00%
Production	0	0	634	0.00%
Total Program Quantity Delivered	0	0	659	0.00%

Expended and Appropriated (TY\$M)

Total Acquisition Cost: 95,838.50

Expended to Date: 3,490.40

Percent Expended: 3.64%

Total Funding Years: 26

Years Appropriated: 7

Percent Years Appropriated: 26.92%

Appropriated to Date: 5,672.83

Percent Appropriated: 5.92%

Low-Rate Initial Production

Item	Initial LRIP Decision	Current Total LRIP
Approval Date	9/4/2020	9/4/2020
Approved Quantity	211	211
Reference	Milestone B ADM	Milestone B ADM
Start Year	2026	2026
End Year	2029	2029

Rationale if Current Total LRIP Quantity exceeds 10% of the total Procurement quantities:

The four LRIP lots are required for the equipment and labor needed to deploy, transport, operate, maintain, train, and sustain the GBSD Weapon System (i.e. spares, training, installation, transportation, support equipment, etc.).

Operating and Support Costs

Total Program O&S Cost Compared with Baseline

	Current APB Objective (BY\$M)	Current APB Threshold (BY\$M)	Current Estimate (BY\$)	Current Estimate (TY\$)	Deviation
Total O&S (\$Millions)	84,598.000	93,057.800	84,598.000	93,057.800	

O&S Note

The current estimate shown is based upon Milestone B ICE.

O&S Cost Breakdown

Category (BY\$ Million)	GBSD
Unit-Level Manpower	31,987.040
Unit Operations	2,062.401
Maintenance	18,420.995
Sustaining Support	1,432.930
Continued System Improvements	27,732.016
Indirect	2,443.144
Other	519.474
Total O&S	84,598.000