

PAIRS CASE 2022-C-0315

**CLEARED**  
**For Open Publication**

Apr 12, 2022

Department of Defense  
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

---

# B-52 COMMERCIAL ENGINE REPLACEMENT PROGRAM (B-52 CERP)

---

Selected Acquisition Report (SAR)



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

## Contents

Program Manager .....	3
Mission and Description .....	3
Executive Summary.....	4
Program Highlights Since Last Report.....	4
Significant Development since Program Initiation .....	5
Schedule.....	6
Schedule Notes .....	6
Significant Schedule Risks .....	6
Performance .....	7
Requirements Source.....	7
Performance Notes .....	7
Acquisition Budget Estimate.....	8
Total Acquisition Cost .....	8
Total End Item Quantity.....	8
Budget Notes .....	8
Risk and Sensitivity Analysis.....	9
Unit Cost.....	10
Current Baseline Compared with Current Estimate .....	10
Original Baseline Compared with Current Estimate .....	10
Unit Cost Notes .....	10
Contracts .....	11
Contract Notes.....	12
Contract Notes.....	13
Technologies and Systems Engineering.....	15
Significant Technical Risks.....	15
Deliveries and Expenditures .....	16
Deliveries.....	16
Expended and Appropriated (TY \$M) .....	16

Low Rate Initial Production..... 16

Operating and Support Costs..... 17

## Program Manager

**Name:** Lt Col Connor Benedict

**Date Assigned:** 27 April 2021

**Address:** 3001 Staff Drive  
Tinker AFB, OK 73145

**Phone:** (405) 394-0488

## Mission and Description

The B-52 Commercial Engine Replacement Program (CERP) supports nuclear and conventional operations by replacing the current TF33-PW-103 engine on the B-52H aircraft. The TF33-PW-103 engine is increasingly difficult to sustain due to diminished manufacturing sources and obsolescent technologies; the Air Force Propulsion Directorate projects the engine will become unsustainable by 2030. This sustainment program will replace the current TF33-PW-103 engine with new military derivative commercial Rolls-Royce F130 engines of similar size, weight, and thrust characteristics. Along with the new engines, CERP will replace associated subsystems, such as engine struts and nacelles, the electrical power generation system, and cockpit displays. The development, production and installation of new engines and related subsystems will replace the legacy equipment on all 76 B-52H aircraft. B-52 CERP will take advantage of advances in technology and ongoing development efforts to acquire engines and integrate them into the B-52. The use of new technology will increase both the overall reliability/maintainability of the propulsion system and produce additional electrical power generation capabilities for emerging requirements. The B-52 CERP will allow the operational command (Air Force Global Strike Command) to fully utilize the capabilities of the B-52H aircraft to employ an array of nuclear and conventional weapons while saving fuel and extending the range/loiter capabilities of the aircraft. In addition, applicable training devices must also be developed, modified and/or upgraded in conjunction with the aircraft modifications. This upgrade will also require corresponding modification of a B-52 Weapon System Trainer. As CERP brings additional capability to the B-52, emerging security/certification requirements (nuclear hardening, cyber security, program protection, etc.) will also need to be addressed.

## Executive Summary

### *Program Highlights Since Last Report*

This is an early SAR submission in advance of Milestone B for the B-52 CERP as directed by the FY 2022 National Defense Authorization Act (NDAA). The FY 2022 NDAA establishes an original baseline estimate for CERP set to FY 2020 program estimate. This is prior to the program completing the Preliminary Design Review (PDR) and Milestone B projected for FY 2023. Establishing a cost baseline prior to PDR adds risk to the program as the baseline estimate is not based on an established allocated baseline system design, which could create future program issues. The program plans to establish the Acquisition Program Baseline (APB) and associated program certification in accordance with title 10 United States Code Section 4252 at Milestone B, planned in the 4th Quarter of FY 2023. Full funding to execute the program will be approved at Milestone B and will be included in the relevant future budget submissions.

The program began in March 2018 with a Materiel Development Decision. In September 2018, the Service Acquisition Executive (SAE) approved B-52 CERP as a Rapid Prototype Section 804 program with two distinct prototype deliveries, virtual and physical, and delegated Source Selection Authority for the B-52 CERP engine contract to the PEO for Fighters and Bombers. In December 2018, the program awarded a Risk Reduction Requirements contract to Boeing to conduct early risk reduction and system requirements activities culminating in the creation of a B-52 engine procurement specification. In December 2019, the SAE approved the updated Acquisition Strategy (AS), the program execution tracking parameters, and the award of the Rapid Prototype 1 (RP1) contract to Boeing. Boeing will develop an end-item virtual System Prototype system configuration that will serve as the CERP program's prototype for Rapid Virtual Prototyping (RVP) and will be the product that defines and encapsulates the CERP modification that is proposed for the B-52 aircraft. The program awarded the engine contract to Rolls-Royce in September 2021 for the new military derivative commercial F130 engine. Rapid Prototype Material contracts 0 and 1 (RPM0, RPM1) were awarded by the program as undefinitized contract actions in March and October 2021 respectively for the development and delivery of long-lead material to support the test aircraft. The program expects to definitize RPM0 and RPM1 no later than the fourth quarter of FY 2022.

In FY 2019, B-52 CERP received a \$2.6M Congressional mark due to the delayed new start. In FY 2020, Congress rescinded \$10M based on funding execution. In FY 2021, Congress marked B-52 CERP \$25.5M with the rationale of "excess to need." In FY 2022, Congress marked B-52 CERP \$55M due to the Rapid Prototyping Material Contract delay.

The B-52 System Program Manager requested approval from the SAE to adapt the AS and plan to transition the program to an MCA effort entering at Milestone B prior to the completion of the current RVP MTA. The SAE concurred with the transition plan. Formal approval of the transition plan and direction is forthcoming in an acquisition decision memorandum. B-52 CERP plans to update the AS and develop Milestone B entrance criteria no later than the fourth quarter of FY 2022.

*Significant Development since Program Initiation*

History of Significant Developments Since Program Initiation	
Date	Significant Development Description
March 2018	The SAE approved the B-52 CERP Materiel Development Decision.
September 2018	The SAE approved B-52 CERP as a Rapid Prototype Section 804 program with two distinct prototype deliveries, virtual and physical and delegated Source Selection Authority for the B-52 CERP engine contract to the PEO for Fighters and Bombers.
December 2018	The B-52 CERP awarded the Risk Reduction Requirements contract to Boeing.
October 2019	The B-52 CERP conducted the System Requirements Review.
December 2019	The SAE approved the award of the Rapid Prototyping 1 contract.
February 2020	The B-52 CERP conducted the System Functional Review.
February 2020	The B-52 CERP awarded the Rapid Prototyping 1 contract to Boeing.
March 2021	The B-52 CERP awarded the Rapid Prototype Material Phase 0 Unfinalized Contract Action to Boeing.
September 2021	Boeing delivered the B-52 CERP Virtual System Prototype Increment 1.
September 2021	The B-52 CERP awarded the Engine contract to Rolls-Royce.

## Schedule

Schedule Events					
Events	Technology APB Objective	Current APB Technology Objective/Threshold		Current Estimate/Actual	Deviation
Material Development Decision	Mar 2018	Mar 2018	Mar 2018	03/09/2018	
Middle Tier Acquisition (MTA) Designation Date	Sep 2018	Sep 2018	Sep 2018	09/20/2018	
MTA Funds First Obligated	Dec 2018	Dec 2018	Dec 2018	12/20/2018	
virtual System Prototype Decision Point (MTA)	Dec 2019	Dec 2019	Dec 2019	12/19/2019	
MTA Operational Demonstration	Sep 2021	Sep 2021	Sep 2021	09/24/2021	
Milestone B	May 2023	May 2023	Dec 2023	Sep 2023	
MTA Program Completion Date	Dec 2023	Dec 2023	Dec 2023	Dec 2023	

### Schedule Notes

The B-52 CERP was directed by the FY 2022 National Defense Authorization Act to submit a SAR in advance of Milestone B. The Milestone B dates in the schedule table represents proposed dates based on AS transition planning and is not yet established by the Milestone Decision Authority in a formal APB process.

The B-52 CERP is in the process of revising its AS and planning to transition CERP to a program under the Major Capability Acquisition pathway versus entering a second MTA. The CERP plans to enter at Milestone B prior to the completion of the current RVP MTA. The program schedule will be updated in subsequent SAR submission.

### Significant Schedule Risks

Significant Schedule Risks	
Current Estimate (December 2021)	
1.	CERP Baseline: If the CERP prototype aircraft does not include Radar Modernization Program (RMP) and Advanced Extremely High Frequency (AEHF), then: 1) engineering re-design will be required (environmental control systems and electrical loads needed from RMP), 2) aircraft modification planning will be impacted (schedule), 3) additional testing will be required once a combined configuration is available (test schedule extended).
2.	Cybersecurity: If commercial-off-the-shelf and government-off-the-shelf components do not meet cybersecurity requirements, then additional development and/or revisions may be required, resulting in increased scope and schedule delay.
3.	Total Program Schedule: If Integrated Test - 4 completion date is later than fourth quarter FY 2026, then the CERP Production Decision Point will be delayed.

## Performance

Performance Characteristics for 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.

## Requirements Source

Capability Development Document for B-52H Commercial Engine Replacement Program (CERP), Approved by AF/CV on May 20, 2020.

## Performance Notes

The B-52 CERP was directed by the FY 2022 National Defense Authorization Act to submit a SAR in advance of Milestone B.



## Acquisition Budget Estimate

### *Total Acquisition Cost*

Category	Base Year	Development APB	Current APB (3/11/2020)		Budget Estimate PB 2023		Deviation
		Objective (BY\$)	Objective (BY\$)	Threshold (BY\$)	BY\$	TY\$	
RDT&E	2019	2,201.6	2,201.6	2,421.8	3,205.3	3,701.3	
Procurement	2019	6,757.4	6,757.4	7,433.1	6,028.6	8,065.9	
MILCON							
Acq. O&M							
<b>Total</b>							
PAUC	2019	117.882	117.882	129.670	121.498	N/A	
APUC	2019	91.316	91.316	100.447	81.467	N/A	

### *Total End Item Quantity*

Quantity Category	Current APB Quantity	Current Estimate Quantity
Development	2	2
Procurement	74	74

### Budget Notes

The B-52 CERP was directed by the FY 2022 National Defense Authorization Act (NDAA) to submit a SAR in advance of Milestone B. The NDAA establishes an original baseline estimate for CERP prior to the program completing the Preliminary Design Review (PDR) and Milestone B projected for FY 2023. The values above that represent the APB have proposed cost objectives and thresholds and are yet to be blessed by the Milestone Decision Authority in a formal APB.

The Development APB and Current APB are from the Air Force Cost Analysis Agency's cost estimate dated March 11, 2020 and is based on analogous systems to determine the most probable weapon system cost. The current estimate is based on budgetary actuals for FY 2018 – FY 2021 (decreased budget authority by program realignments and marks), FY 2023 Air Force budget authority for FY 2022 – FY 2023, and 2022 draft Program Office Estimate for FY 2024 – FY 2035.

*Risk and Sensitivity Analysis*

Risks and Sensitivity Analysis	
Current Procurement Cost (December 2021)	
1.	There are no significant risks to the program at this time. The estimate for B-52 CERP is based upon analogous historical re-engine programs and takes inherited risks/issues from those programs into account.
Original Baseline Estimate (March 2020)	
1.	The B-52 CERP is Pre-Milestone B. There were no significant risks to the program at the time of the 2020 Air Force Cost Analysis Agency's cost estimate. The estimate for B-52 CERP was based upon analogous historical re-engine programs and took inherited risks/issues from those programs into account.
Revised Original Estimate (N/A)	
None	
Admin Baseline Estimate (March 2020)	
1.	The B-52 CERP is Pre-Milestone B. There were no significant risks to the program at the time of the 2020 Air Force Cost Analysis Agency's cost estimate. The estimate for B-52 CERP was based upon analogous historical re-engine programs and took inherited risks/issues from those programs into account.

## Unit Cost

### *Current Baseline Compared with Current Estimate*

Category (BY19\$M)	Current APB	Current Estimate	% Change	NMC Breach
<b>PAUC</b>				
Cost	8,959.0	9,233.86	3.07	-
Quantity	76	76		-
Unit Cost	117.882	121.498	3.07	
<b>APUC</b>				
Cost	6,757.4	6,028.58	-10.79	-
Quantity	74	74		-
Unit Cost	91.316	81.467	-10.79	

### *Original Baseline Compared with Current Estimate*

Category (\$M)	Original APB	Current Estimate	% Change	NMC Breach
<b>PAUC</b>				
Cost	8,959.0	9,233.86	3.07	-
Quantity	76	76		-
Unit Cost	117.882	121.498	3.07	
<b>APUC</b>				
Cost	6,757.4	6,028.58	-10.79	-
Quantity	74	74		-
Unit Cost	91.316	81.467	-10.79	

## Unit Cost Notes

The B-52 CERP was directed by the FY 2022 National Defense Authorization Act to submit a SAR in advance of Milestone B. The values in the table represent the most current cost information and are not yet established by the Milestone Decision Authority in a formal APB process. The current estimate is based on budgetary actuals for FY 2018 – FY 2021 (decreased budget authority by program realignments and marks), FY 2023 Air Force budget authority for FY 2022 – FY 2023, and 2022 draft Program Office Estimate for FY 2024 – FY 2035.

## Contracts

Rapid Prototype 1 (RP1) Contract Data (\$TYM)		
Contract Number	FA8626-19-D-1000	
Effort Number		
Contract Type	Cost Plus Incentive Fee	
Modification Number		
Award Date	February 14, 2020	
Definitization Date	February 14, 2020	
Order Number	FA8107-20-F-0001	
CAGE Code/CAGE Legal Name	1N929 / The Boeing Company	
Contract Title	B-52 Commercial Engine Replacement Program (CERP) Rapid Prototyping 1 (RP1)	
Contract Address	6001 S. Air Depot Blvd, Oklahoma City, OK 73135-5922	
Contracts/Effort Price, Quantity, and Performance (\$M)		
Initial Target Price	Current Target Price	
281.6	348.0	
Initial Ceiling Price	Current Ceiling Price	
N/A	N/A	
Contract's EAC	PM's EAC	
347.1	359.5	
Initial Quantity	Current Quantity	Delivered Quantity
1	1	0
BAC	BCWP	ACWP
302.2	189.7	205.8
BCWS	Cost Variance	Schedule Variance
239.0	-16.1	-49.3

### Cost Variance:

The unfavorable Cost Variance is primarily due to bulk allocation to the actual direct cost incurred. In addition, cost variance is attributed to accumulation of bulk cost on the cumulative engineering direct charging base. Also, the team has been able to work more efficiently than planned. Some of the positive cost variance has been offset by unplanned, but in-scope, tasks.

### Schedule Variance:

The majority of the unfavorable schedule variance is due to engine source selection delay and a delay of a Boeing subcontract with Collins for the Electrical Power Generation System.

Rapid Prototyping Material Phase 0 (RPM0) Contract Data (\$TYM)		
Contract Number	FA8626-19-D-1000	
Effort Number		
Contract Type	Cost Plus Fixed Fee	
Modification Number		
Award Date	March 31, 2021	
Definitization Date		
Order Number	FA8107-21-F-0008	
CAGE Code/CAGE Legal Name	1N929 / The Boeing Company	
Contract Title	B-52 Commercial Engine Replacement Program (CERP) Rapid Prototyping Material Phase 0 (RPM0)	
Contract Address	6001 S. Air Depot Blvd, Oklahoma City, OK 73135-5922	
Contracts/Effort Price, Quantity, and Performance (\$M)		
Initial Target Price	Current Target Price	
665.3	665.3	
Initial Ceiling Price	Current Ceiling Price	
N/A	N/A	
Contract's EAC	PM's EAC	
665.3	665.3	
Initial Quantity	Current Quantity	Delivered Quantity
N/A	N/A	N/A
BAC	BCWP	ACWP
664.5	30.3	31.7
BCWS	Cost Variance	Schedule Variance
42.8	-1.4	-12.6

### Contract Notes

Rapid Prototype Material contract 0 (RPM0) was awarded by the program as an undefinitized contract action in March 2021 for the development and delivery of long-lead material to support the test aircraft. The program expects to definitize RPM0 no later than the 4<sup>th</sup> Quarter of FY 2022.

#### Cost Variance:

Cost variance is primarily due to delays in Boeing getting the Electrical Power Generation System vendor, Collins, on contract.

#### Schedule Variance:

Schedule variance is primarily due to delays in Boeing getting the Electrical Power Generation System vendor, Collins, on contract as well as delays to the engine source selection and getting the selected engine vendor on contract.

Rapid Prototyping Material Phase 1 (RPM1) Contract Data (\$TYM)		
Contract Number	FA8626-19-D-1000	
Effort Number		
Contract Type	Cost Plus Fixed Fee	
Modification Number		
Award Date	October 15, 2021	
Definitization Date		
Order Number	FA8107-22-F-0002	
CAGE Code/CAGE Legal Name	1N929 / The Boeing Company	
Contract Title	B-52 Commercial Engine Replacement Program (CERP) Rapid Prototyping Material Phase 1 (RPM1)	
Contract Address	6001 S. Air Depot Blvd, Oklahoma City, OK 73135-5922	
Contracts/Effort Price, Quantity, and Performance (\$M)		
Initial Target Price	Current Target Price	
295.6	295.6	
Initial Ceiling Price	Current Ceiling Price	
N/A	N/A	
Contract's EAC	PM's EAC	
295.6	295.6	
Initial Quantity	Current Quantity	Delivered Quantity
N/A	N/A	N/A
BAC	BCWP	ACWP
294.8	0.22	0.03
BCWS	Cost Variance	Schedule Variance
0.22	0.19	0.0

### Contract Notes

Rapid Prototype Material contract 1 (RPM1) was awarded by the program as an undefinitized contract action in March 2021 for the development and delivery of long-lead material to support the test aircraft. The program expects to definitize RPM1 no later than the fourth quarter of FY 2022.

### Cost Variance:

The favorable cost variance does not exceed the established reporting threshold.

Engine Contract Data (\$TYM)		
Contract Number	FA8107-21-D-0001	
Effort Number		
Contract Type	Firm Fixed Price	
Modification Number		
Award Date	September 24, 2021	
Definitization Date	September 24, 2021	
Order Number	FA8107-21-F-0009	
CAGE Code/CAGE Legal Name	63005 / Rolls-Royce Corporation	
Contract Title	B-52 CERP Engine Contract	
Contract Address	450 S Meridian St Indianapolis, IN, 46225-1103	
Contracts/Effort Price, Quantity, and Performance (\$M)		
Initial Target Price	Current Target Price	
2,604.3	2,604.3	
Initial Ceiling Price	Current Ceiling Price	
N/A	N/A	
Contract's EAC	PM's EAC	
2,604.3	2,604.3	
Initial Quantity:	Current Quantity	Delivered Quantity
652	652	0
BAC:	BCWP	ACWP
N/A	N/A	N/A
BCWS	Cost Variance	Schedule Variance
N/A	N/A	N/A

## Technologies and Systems Engineering

### *Significant Technical Risks*

Significant Technical Risks
Current Estimate (December 2021)
1. There are no significant technical risks with this program at this time.



## Deliveries and Expenditures

### *Deliveries*

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	2	0.00%
Production	0	0	74	0.00%
Total Program Quantity Delivered	0	0	76	0.00%

### *Expended and Appropriated (TY \$M)*

Total Acquisition Cost: \$11,767.18  
 Expended to Date: \$372.43  
 Percent Expended: 3.1%  
 Total Funding Years: 18  
 Years Appropriated: 5  
 Percent Years Appropriated: 27.8%  
 Appropriated to Date: \$883.68  
 Percent Appropriated: 7.5%

## Low Rate Initial Production

An official LRIP will be approved by the MDA upon transition to a Major Capability Acquisition program at Milestone B FY 2023.

## Operating and Support Costs

O&S costs are currently not tracked separately for B-52 CERP. O&S costs are included in the overall operational costs for the existing B-52 fleet managed by the program office at Tinker Air Force Base. The program will continue to improve the O&S estimates for B-52 CERP with future iterations seeking to provide the net delta that the CERP modification will have on the legacy B-52 O&S cost baseline.