

B-52 Commercial Engine Replacement Program (CERP)

Executive Summary

- The Air Force is conducting government-led engine source selection process with final engine selection planned for January 2021. Primary engine competitors include General Electric, Rolls Royce, and Pratt & Whitney. Competing contractors are expected to deliver initial aerodynamic models in early FY20.
- The B-52 Commercial Engine Replacement Program (CERP) Test and Evaluation Master Plan (TEMP) is in final Service coordination. Final DOT&E approval is anticipated in January 2020 to fulfill National Defense Authorization Act (NDAA) 2020 requirements.
- The B-52 CERP middle tier of acquisition (MTA) rapid prototyping development program is built around a five-phase integrated test strategy designed to maximize operational test data collection during the prototyping phase. It includes a limited operational demonstration using prototype aircraft followed by a comprehensive IOT&E using Low-Rate Initial Production (LRIP) aircraft prior to a Full-Rate Production decision.

System

- The B-52H is a long-range, all-weather bomber with a crew of two pilots, two weapon system officers, and an electronic warfare officer.
- Mission systems include a GPS-aided precision navigation system, strategic radar targeting systems, electronic combat systems, and worldwide communications and data transfer systems.
- The B-52H can carry up to 80,000 pounds of precision-guided or unguided conventional and nuclear stores in an internal bomb bay and/or external wing pylons.
- The B-52H CERP replaces the legacy TF33 engines with fuel-efficient, commercial-derivative engines, increases electrical power generation capacity, and integrates digital engine controls and displays.

Activity

- The Air Force began the B-52H CERP program in early 2018, and DOT&E placed the program on oversight in February 2018. This is the first time DOT&E has included this program in its annual report.
- The Air Force formally designated B-52H CERP as a rapid prototyping MTA program in September 2018 leading to acquisition of approximately 650 engines to modify and support the 76-aircraft B-52H fleet. The Air Force implemented a government-led engine source selection strategy coupled with a prime contractor-led integration



Mission

Theater Commanders use units equipped with the B-52H to conduct long-range, all-weather conventional and nuclear strike operations that employ a wide range of munitions against ground and maritime targets in low-to-medium adversary threat environments. B-52 theater mission tasks include strategic attack, time-sensitive targeting, air interdiction, close air support, suppression/destruction of enemy air defenses, maritime mining, and nuclear deterrence. Key B-52H mission capabilities include:

- Large and versatile internal and external weapons payload
- All-weather targeting sensors and systems
- Unrefueled intercontinental range extended by air refueling capability
- Rapid nuclear alert start and launch capabilities
- Nuclear-hardened and certified avionics and communication systems

Major Contractor

Boeing Defense, Space, and Security – St. Louis, Missouri

program. Primary engine competitors include General Electric, Rolls Royce, and Pratt & Whitney with final selection planned in January 2021. Competing contractors are expected to deliver initial aerodynamic models in early FY20.

- The Air Force is pursuing a three-part rapid prototyping strategy beginning with development of a Virtual Power Pod Prototype (vPPP) digital model for each candidate engine to assess two engine, side-by-side pod design options. Results from the vPPP models will support development of a Virtual System Prototype (vSP) full aircraft digital model of the

selected engine to support a preliminary system design assessment. System-level vSP assessments will be followed by physical modification of two B-52H prototype aircraft to support initial aircraft performance, flying quality, and structural test activities.

- The Air Force developed a fleet modification/production strategy for the remaining 74 B-52H aircraft. This strategy includes production of 11 LRIP aircraft to support the final phase of system development testing and IOT&E. The remaining 65 aircraft would be produced in 6 full-rate production lots. The Air Force continues to evaluate options to accelerate production and fielding, including the potential use of the MTA rapid fielding pathway.
- The Air Force initiated development of a B-52 CERP Capabilities Development Document (CDD) to comply with NDAA 2020 direction to establish formal operational requirements for this program.
- The Air Force developed a B-52 CERP TEMP and began Service coordination August 2020. The program established a B-52 CERP Integrated Test Team to initiate and manage the integrated test planning, execution, and data collection activities outlined in the TEMP.
- The B-52H Program Office initiated development of a comprehensive, enterprise-level cybersecurity test strategy that will progressively conduct incremental cybersecurity assessments across multiple B-52 modernization programs, including B-52 CERP. This approach is intended to maximize cyber test efficiency while supporting cyber test requirements for multiple B-52 upgrade programs.

Assessment

- The Air Force is progressing toward fulfillment of the NDAA 2020 requirement to submit a B-52 CERP TEMP for DOT&E approval. The TEMP is in final Service coordination with submission for DOT&E approval anticipated in January 2020. This document defines a five-phase integrated test strategy designed to maximize collection of operationally relevant test data during the prototyping phase and a limited operational demonstration of the two prototype aircraft. The TEMP

also defines the test requirements and resources necessary to complete an adequate IOT&E using production-representative LRIP aircraft prior to a Full-Rate Production/fleet modification decision. The TEMP will be updated, if required, following approval of the B-52 CERP CDD that will finalize program operational requirements.

- The Air Force Operational Test and Evaluation Center (AFOTEC) operational test strategy provides an adaptive framework to support progressive evaluation of system capabilities during prototype development. The AFOTEC operational test design, early data collection strategy, and cumulative reporting approach provides an adequate basis for tailored integration of operational testing with the B-52 rapid prototyping program. Prototype testing will culminate in an AFOTEC operational demonstration to assess residual conventional and nuclear mission capabilities.
- The program test strategy also includes a B-52 CERP IOT&E, using LRIP aircraft, following program transition from prototyping to a more traditional final development and production program. IOT&E will leverage all previously collected test data to support a final evaluation of production system operational effectiveness, suitability, and survivability across the full spectrum of nuclear, conventional, and training missions.

Recommendations

The Air Force should:

1. Continue to develop B-52 CERP detailed test plans to integrate developmental and operational test objectives during the rapid prototyping test phases.
2. Complete development of a comprehensive, enterprise-level B-52H cybersecurity strategy to establish a system cybersecurity baseline and progressively evaluate planned system upgrades while leveraging previous test results to reduce redundant testing. This strategy should encompass B-52 CERP and other B-52 modernization programs.