

F-22A – Raptor Advanced Tactical Fighter Aircraft

The F-22 Raptor Release 1 (R1) Force Development Evaluation (FDE) will need to address several challenges to meet operational effectiveness and suitability requirements. A major limitation to delivering the originally planned F-22 R1 capability include Federal Aviation Administration restrictions that prohibit the use of Link-16 transmit capabilities. A final evaluation of F-22 R1 effectiveness, suitability, and survivability should be available in early CY22 pending completion of the Phase 2 dedicated mission trials and cybersecurity testing.



System Description

The F-22A Raptor is an air superiority, fifth-generation fighter aircraft that delivers low observability to threat radars, high maneuverability, sustained supersonic speed, and advanced integrated avionics. Units equipped with the F-22A conduct offensive counter-air, defensive counter-air, and limited ground attack missions in high-threat environments. The latest hardware and software modernization efforts, termed R1, provide capabilities detailed in the Controlled Unclassified Information edition of this report as per the F-22 Security Classification Guide.

Program

The F-22A Raptor started as a Major Defense Acquisition Program, with the first production aircraft fielding in 2003. The Air Force has since been implementing hardware and software modernization efforts known as capability “Releases” using rapid prototyping and rapid fielding acquisition authorities. The first such program is the F-22 Raptor R1 FDE. The Tactical Link-16 (TACLINK) and Tactical Mandates (TACMAN) Test and Evaluation Master Plans, approved by DOT&E in 2018, provide the capstone test strategy and concepts for the R1 FDE test plan approved by DOT&E in July 2020. TACLINK and TACMAN were originally planned as Acquisition Category II programs but will now deliver capability incrementally through the Section 804 Middle Tier of Acquisition (MTA) F-22 Rapid Prototyping and F-22 Rapid Fielding MTA programs. Since R1 only provides a fraction of the overall TACMAN and TACLINK capabilities, the Air Force tasked the USAF Warfare Center, 53rd Wing to execute the R1 FDE.

Major Contractor

Lockheed Martin Aeronautics Company – Fort Worth, Texas.

Test Adequacy

DOT&E approved the USAF Warfare Center F-22 Raptor R1 FDE test plan as adequate for evaluating current R1 capabilities. The R1 test design is divided into three phases. Phase 1 includes early operational test support to developmental testing and operational testing with early, non-fielding capabilities. Phase 2 includes dedicated operational testing during mission trial events, and Phase 3 includes post-fielding monitoring. With limited F-22 developmental testing resources, the early operational test support in Phase 1 supplemented developmental testing by providing necessary assets, generating a significant amount of additional data, and incorporating testing in an operational environment for early R1 releases. R1 developmental testing was completed on August 16, 2021 with a total of 263 sorties and 308 flight hours. Software development included 14 software drops (at an agile 4-6 week release cycle) and over 3,600 hours of testing. During Phase 1 FDE, operational test aircraft accumulated 286 sorties and 332 flight hours. Weapons employment included successful live drops of the Joint Direct Attack Munition, and live shots with the Advanced Medium-Range Air-to-Air Missile and Air Intercept Missile (AIM)-9X Sidewinder. Phase 2 FDE operational testing started in August 2021, and will include three offensive counter-air and two defensive counter-air mission trial events at the Nevada Test and Training Range, Nevada. These mission trial events are to assess R1 capabilities in an operationally representative threat environment, and in the configuration Air Combat Command will release to the field. R1 cybersecurity testing focuses on the F-22 Integrated Maintenance

Information System and is due to complete in early CY22.

Performance

Effectiveness

F-22 R1 will need to continue to address several challenges to meet operational effectiveness requirements. Phase 1 testing identified areas of concern that will continue to be assessed during Phase 2 testing. A major limitation to delivering the originally planned F-22 R1 capability are the Federal Aviation Administration restrictions that prohibit the use of Link-16 transmit. A final evaluation of the F-22 R1 operational effectiveness in mission-level, advanced threat, and operationally realistic scenarios should be available in early CY22 pending completion of the Phase 2 dedicated mission trials.

Suitability

F-22 R1 will need to continue to address several challenges to meet operational suitability requirements. In accordance with the F-22 Security Classification Guide, additional details are provided in the Controlled Unclassified Information edition of this report.

Survivability

The survivability assessment of F-22 R1 in a cyber-contested environment is pending completion of R1 cybersecurity testing, scheduled in early CY22.

Recommendation

1. The Air Force should continue to resolve the identified deficiencies and imposed limitations to successfully demonstrate the F-22 R1 warfighting capability.