

# F-22A – Raptor Advanced Tactical Fighter Aircraft



In FY22, the F-22 program completed FOT&E on the first of several planned annual Capability Releases. DOT&E assessed the Release 1 (R1) operational flight program and its associated capabilities as effective but identified one suitability concern and one cyber survivability issue, with details available in the November 2022 classified test report. The program is currently executing FOT&E on the Release 2 (R2) operational flight program, but Federal Aviation Administration (FAA) restrictions are prohibiting Link 16 transmission – a major impediment to both testing and utilizing a combat capability already installed in the aircraft.

## SYSTEM DESCRIPTION

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The F-22A Raptor is a fifth-generation, air-superiority fighter aircraft that delivers low observability to threat radars, high maneuverability, sustained supersonic speed, and advanced integrated avionics. The capability release program adds to the F-22's already significant combat capability on an incremental, annual basis. The specific capabilities delivered in each release are available in the November 2022 classified test report.

## MISSION

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Units equipped with the F-22A conduct offensive counter-air, defensive counter-air, and limited ground attack missions in high threat environments, delivering air dominance to enable the range of coalition air operations.

## PROGRAM

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The F-22A Raptor started as a Major Defense Acquisition Program, with the first production aircraft fielding in 2003. Since 2019, the Air Force has been implementing hardware and software modernization efforts as Capability Releases using Section 804, Middle Tier of Acquisition, rapid prototyping and fielding acquisition authorities. The Tactical Link 16 and Tactical Mandates Test and Evaluation Master Plans, approved by DOT&E

in 2018, provide the capstone test strategy and concepts for the capability release pipeline. The Air Force completed the R1 Force Development Evaluation (FDE) in March 2022, and DOT&E approved the R2 FDE test plan in September 2022. The Air Force tasked the U.S. Air Force Warfare Center's 53d Wing to execute the R2 FDE, which is planned for October and November 2022.

### » MAJOR CONTRACTOR

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- Lockheed Martin Aeronautics Company – Fort Worth, Texas

## TEST ADEQUACY

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The Air Force conducted the R1 FDE in accordance with the DOT&E-approved test plan, and DOT&E observed the events. The FDE adequately assessed the effectiveness and suitability of new software and hardware systems, but fell short of adequately assessing overall mission effectiveness with the new capabilities incorporated. The adequacy shortfall stemmed from delays in fielding the Common Range Integrated Instrumentation System (CRIIS), the most current flight test instrumentation system, which was a known limitation prior to test plan approval. The FDE completed in March 2022 and included the following events: 286 test sorties totaling 332 flight hours; successful employment of Joint Direct Attack Munitions, Air Intercept Missile (AIM)-120 Advanced Medium Range Air-to-Air Missiles, and AIM-9X

Sidewinder missiles; and five large-force employment mission trials covering both defensive and offensive counter-air mission tasks. Cyber survivability testing adequately assessed the Integrated Maintenance Information System and other mission systems in FY22. However, for F-22 and other Agile software development programs, limited test capacity often results in operational flight programs and other mission software packages fielding prior to completion of a full software effectiveness and cybersecurity assessment.

The DOT&E-approved R2 FDE test plan includes five large-force employment mission trials, similar to those executed in the R1 FDE, with initial incorporation of the CRIIS. This will enable high-fidelity mission evaluation under the Open Air Battle Shaping construct, once fully implemented.

## PERFORMANCE

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### » EFFECTIVENESS

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The F-22 with R1 capabilities demonstrated effectiveness in tasked missions; however, the FAA restrictions on Link 16 transmissions continue to prevent testing and fielding of one of the core enhancements delivered with R1. Final evaluation of Link 16 capability will occur as soon as the FAA lifts the restrictions.

### » SUITABILITY

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The F-22 hardware and software systems with R1 enhancements

are mostly suitable, except for one identified issue detailed in the November 2022 classified DOT&E test report.

## » **SURVIVABILITY**

DOT&E assessed the F-22 as survivable, with one identified issue and final results pending completion of the Integrated Maintenance Information System cyber adversarial assessment in September 2022.

## **RECOMMENDATIONS**

The DOD should:

1. Solidify a plan to accomplish Link 16 testing that demonstrates mission effectiveness and cyber survivability while accommodating FAA protocols, restrictions, and test-specific operating procedures.
2. Conduct a holistic assessment of the T&E enterprise's ability to keep pace with Agile development processes. This assessment should cover program management, test infrastructure, test community

workforce, cost effectiveness, and overall capacity, focusing particularly on cyber survivability test capacity.

The Air Force should:

3. Conduct all future FDEs with an accredited flight test instrumentation system, such as CRIIS, to enable high-fidelity, holistic mission evaluations with new capabilities in operationally representative environments.
4. Correct identified deficiencies affecting suitability and cyber survivability.