

# Advanced Pilot Training (APT)



T-7A Red Hawk Student Pilot Flight Training

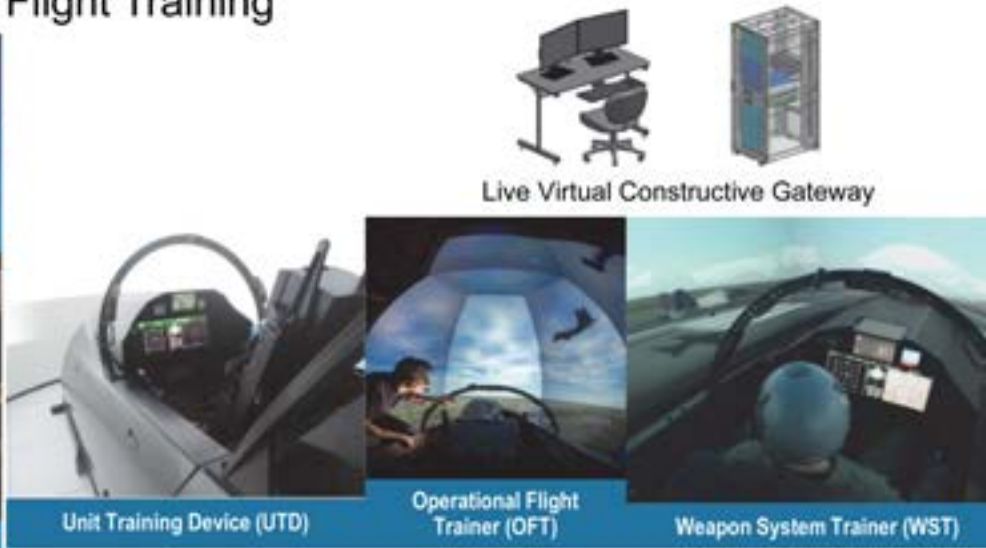


Part Task Trainer

Aircrew Ground Egress Trainer (AGET)

Ejection Seat Trainer (EST)

Debrief System (DS)



Live Virtual Constructive Gateway

Unit Training Device (UTD)

Operational Flight Trainer (OFT)

Weapon System Trainer (WST)

Student Pilot Ground Training

Student Pilot Ground Simulator Training

The Advanced Pilot Training (APT) program is re-baselining its schedule with IOT&E to support a Full-Rate Production decision anticipated in FY26. The top critical issues for the Air Force to address are the T-7A emergency escape system (including the bird strike capability of the canopy), the lack of an Automatic Ground Collision Avoidance System (AGCAS), the On-Board Oxygen Generation System (OBOGS), and cyber survivability.

## SYSTEM DESCRIPTION

The APT Family of Systems (FoS) includes the T-7A Red Hawk aircraft and associated ground based training systems (GBTS) to replace the aging fleet of 429 T-38C aircraft and associated ground training systems. The T-7A is a two seat trainer powered by a single afterburning-turbofan engine, with digital avionics and fly-by-wire flight controls. GBTS devices include the aircrew ground-egress trainer, part-task trainer, weapons-system trainer, ejection-seat trainer, and operational-flight trainer. The weapons-system trainer and operational-flight trainer are two types of simulators that incorporate a dynamic-motion seat and g-suit inflation to provide a physical sensation of high g force flight maneuvers.



## MISSION

Air Education and Training Command (AETC) instructor pilots will use the APT FoS to train student pilots to be prepared to fly 4th- and 5th-generation fighter and bomber aircraft after graduating from pilot training. Pilot training in the T-7A will include the basic and advanced fighter fundamentals

taught in the T-38C, and will add sustained high-g maneuvering, advanced sensor management, night-vision goggle operations, and in-flight refueling training.

## PROGRAM

APT is an Acquisition Category IB program. The Air Force awarded the contract to Boeing on September 27, 2018. The contract is a fixed price incentive firm contract for Engineering and Manufacturing Development, and a fixed price incentive firm target with a transition to a firm fixed price contract for production. AETC plans to procure 351 T-7A aircraft, 46 simulators, and other associated GBTS for deployment to the five pilot training bases: Joint Base San Antonio-Randolph, Texas; Columbus AFB, Mississippi; Laughlin AFB, Texas; Vance AFB, Oklahoma; and Sheppard AFB, Texas.

DOT&E approved the Milestone B Test and Evaluation Master Plan in January 2018. The program is re-baselining the schedule and expects the Milestone C to occur in FY24. IOT&E will support the Full-Rate Production decision anticipated in FY26.

### » MAJOR CONTRACTORS

- The Boeing Company, Defense, Space & Security – St. Louis, Missouri
- SAAB AB – Linköping, Sweden and Lafayette, Indiana

## TEST ADEQUACY

Phase one of testing, currently underway, consists of flying qualities and envelope expansion using the Boeing-owned T1 and T2 aircraft with the Federal Aviation Administration experimental certification. Testing is conducted at the contractor's facilities in St. Louis, Missouri. Air Force test personnel established distributed test operations (DTO) to permit real-time observation at Edwards AFB, California.

Since May 2019, the Air Force Operational Test and Evaluation Center (AFOTEC) Detachment 5 test team maximized early involvement by incorporating operational perspective into the contractor-led developmental testing of the two Boeing prototype aircraft, along with design reviews and simulator test events. On February 7, 2022, AFOTEC published a fourth APT Periodic Report to inform stakeholders of their assessment of developmental test planning, APT FoS design considerations, and IOT&E readiness. APT Periodic Report-4 added 6 new unclassified recommendations to the 22 open recommendations from previous reports. A classified annex, published on April 20, 2022, added three classified recommendations.

DOT&E concurs with the AFOTEC assessments and recommendations. AFOTEC's early involvement enables them to provide an operational perspective, assessments, and continuous feedback on program development, which have the potential to reduce

costs by identifying and resolving issues at the earliest opportunity rather than waiting until the end of the IOT&E.

## PERFORMANCE

### » EFFECTIVENESS

Early tests demonstrated the T-7A can sustain high-g maneuvering capability, which is necessary to teach student pilots the fundamental concepts required for transition to 5th-generation aircraft. Fighter aircraft employ AGCAS to prevent loss of life during high-g maneuvers when sustained high g-forces can cause the pilot to lose consciousness. Although the formal requirements for APT did not include a requirement for AGCAS, AETC has requested funding in FY24 to plan and implement AGCAS.

To support the Milestone C decision in FY24, DOT&E will assess the progress of operational effectiveness of the APT FoS to enable AETC instructor pilots to train student pilots.

### » SUITABILITY

The designs of the emergency escape system and canopy bird strike capability of the Engineering and Manufacturing Development aircraft have failed to meet minimum safety requirements during subsystem qualification tests. Both systems require design changes prior to low-rate initial production and IOT&E to ensure the safety of instructor and student

pilots. The Air Force should work with Boeing to correct these design issues.

Initial qualification testing of the OBOGS system consisted of unmanned altitude chamber tests. The OBOGS system met MIL-STD-3050 and the latest draft of MIL-STD-3050A requirements related to mask pressure and oxygen concentration. Results from this unmanned testing support entry into the next phase of qualification tests that includes human altitude chamber and centrifuge testing. The T-7A program needs technically adequate OBOGS flight test data as well, to include operationally representative flight profiles. These data should be consistent with the FY22 NDAA Section 224 mandate to assess and correct deficiencies in pilot breathing systems, even though the T-7A is not a fielded fighter aircraft and not included in the FY22 Section 224 mandate.

### » SURVIVABILITY

The APT cybersecurity integrated test team used the Mission-based Risk Assessment Process for Cyber Report, signed August 2021, to focus resources on the most critical areas of concern for the cyber threat to confidentiality, integrity, and availability. AFOTEC highlighted three areas of concern in their classified annex to Periodic Report-4 based on the current system design and potential cyber threats. The next step is to develop the Milestone C Test and Evaluation Master Plan and

IOT&E plans using details from the Mission-based Risk Assessment Process for Cyber Report.

DOT&E will assess cyber survivability of the APT FoS to support the Milestone C and Full-Rate Production decisions.

## RECOMMENDATIONS

The Air Force should:

1. Address the AFOTEC Periodic Report recommendations and make necessary design changes prior to the start of IOT&E; the program should not wait until the end of the firm fixed price production contract.
2. Resolve the emergency escape system design issues (including the bird strike capability of the canopy) with Boeing to prevent further program delays and resolve safety concerns.
3. Support AETC's request to add an AGCAS capability to the T-7A before production begins to reduce safety risks and loss of life.
4. Procure OBOGS flight-test instrumentation to collect breathing pressures, air delivery response timing and flow, and g-forces during operationally representative flight profiles.
5. Incorporate on-aircraft cybersecurity assessments during integrated testing and IOT&E.