PAIRS CASE 2022-C-0297

ADVANCED PILOT TRAINING (APT)

Selected Acquisition Report (SAR)

AS OF THE FY 2023 PRESIDENT'S BUDGET

U.S. AIR FORCE

Contents

Program Manager

Name: Col Kirt Cassell

Date Assigned: March 19, 2021

Address: 1970 Monahan Way, Wright-Patterson AFB, Ohio 45433-7211

Phone: 937-904-4224

Mission and Description

The Advanced Pilot Training (APT) program will replace the T-38C and associated Ground Based Training System (GBTS) used in the United States Air Force's Specialized Undergraduate Pilot Training program, which provides advanced training for pilots in Air Education and Training Command's fighter and bomber track as well as its Introduction to Fighter Fundamentals course. The APT system is commonly called the T-7A Red Hawk. The T-38C currently used for advanced pilot training first entered service in 1961. The APT (T-7A Red Hawk) aircraft, with updated avionics and an improved GBTS, will bring new capabilities including improved high gravitational force and high angle of attack maneuvering, and will provide training opportunities more closely aligned with today's fourth- and fifth-generation fighters.

The new aircraft and training systems will be fielded at five bases: Joint Base San Antonio-Randolph, Texas; Laughlin Air Force Base (AFB), Texas; Vance AFB, Oklahoma; Columbus AFB, Mississippi; and Sheppard AFB, Texas.

Executive Summary

Program Highlights Since Last Report

With the award of the Engineering and Manufacturing Development effort, the program has proceeded with system design, development, and test. The Ground Based Training System (GBTS) Critical Design Review (CDR) was successfully completed July 7, 2020, and Air Vehicle and System CDR were successfully completed August 14, 2020. The Preliminary Integrated Interactive Multimedia Instruction Review was completed September 28, 2021. This event ensured that the initial Interactive Multimedia Instruction design is appropriately documented. The program has increased schedule risk based on control laws (software), escape system, 8K projectors, and COVID. Refinement of flight control laws will require future software updates throughout developmental testing. The program does not have software issues at this time.

In accordance with 10 U.S.C. 2366b certification for APT made at MS B, the Milestone Decision Authority (MDA) approved two waivers. The requirement pursuant to 10 U.S.C. 2366b(a)(1) to conduct a PDR prior to MS B was waived on September 11, 2018, and in accordance with the waiver, the program office successfully accomplished the Air Vehicle and GBTS PDRs, meeting the Pre-MS B PDR waiver. The MDA also approved a waiver on September 24, 2018, for the requirement to determine that the program complies with all relevant policies, regulations, and directives of the DoD as it pertains to compliance with the DoD policy on the development of an Independent Technical Risk Assessment (ITRA). The USAF will perform an ITRA prior to its Milestone C decision.

The fabrication of the five Engineering, Manufacturing, and Development aircraft is in progress, comprising of materials sourced throughout the global supply chain and at Boeing-St Louis.

There are no significant software-related issues with this program at this time.

History of Significant Developments Since Program Initiation

Date	Significant Development Description
September 2018	The Milestone Decision Authority approved Milestone (MS) B on September 25, 2018.
November 2018	The program conducted a Post-Award Conference from November 13-15, 2018.
February 2019	The program conducted a System Requirements Review (SRR).
August 2019	The program conducted a Ground Based Training System (GBTS) Preliminary Design Review (PDR).
September 2019	The program conducted an Aircraft PDR / Critical Design Review (CDR).
July 2020	The program completed GBTS CDR.
August 2020	The program completed Air Vehicle CDR.
September 2021	The program completed Preliminary Integrated Interactive Multimedia Instruction Review.

Schedule

Schedule Events

Schedule Events					
Events	**Development APB Objective**	**Current APB Development Objective/Threshold**		**Current Estimate/Actual**	**Deviation**
Milestone B	Sep 2018	Sep 2018	Sep 2018	September 25, 2018	
CDR	Mar 2020	Mar 2020	Sep 2020	August 14, 2020	
Milestone C	Jun 2023	Jun 2023	Dec 2023	Nov 2023	
FRP Decision	Apr 2025	Apr 2025	Sep 2025	Sep 2025	
RAA	Oct 2025	Oct 2025	Mar 2026	Jul 2025	

Schedule Notes

The CDR schedule event current estimate changed from March 2020 to August 14, 2020 to reflect the actual completion date.

The Milestone C schedule event current estimate changed from March 2022 to November 2023 to reflect the currently projected date by the Program Manager.

The FRP Decision schedule event current estimate changed from March 2024 to September 2025 to reflect the currently projected date for FRP contract award.

The RAA schedule event current estimate changed from July 2024 to July 2025 to reflect currently projected date 20 months after Milestone C.

Significant Schedule Risks

	Current Estimate (December 2021)
1.	There were no significant schedule risks identified at Milestone B.
2.	Escape System Qualification is a High Schedule Risk.
3.	Insufficient time to complete cert/verification on all APT Tech Manuals & SE procedures is a High Schedule Risk.
4.	Type 1 Mx Training on Aircraft is a Moderate Schedule Risk.
	Milestone B (September 2018)
1.	There were no significant schedule risks identified at Milestone B.

Performance

Performance Characteristics					
Development APB Objective	**Current APB Development Objective/Threshold**	**Demonstrated Performance (include Date of Demonstration)**	**Current Estimate/Actual**	**Deviation**	
Sustainment – Operational Availability (Ao) for Aircraft Sustainment – Materiel Availability (Am) for Aircraft Sustainment – Operational Availability (Ao) for each GBTS simulator (WST, OFT, UTD)					
Ao ≥ 80% at 20,000 fleet hours. (Am) ≥ 76% at 20,000 fleet hours. Ao ≥ 95%	Ao ≥ 80% at 20,000 fleet hours. (Am) ≥ 76% at 20,000 fleet hours. Ao ≥ 95%	(T=O) Ao ≥ 80% at 20,000 fleet hours. (Am) ≥ 76% at 20,000 fleet hours. Ao ≥ 95%	TBD	Ao is estimated for 93.17%. (Am) is estimated for 80%. Ao ≥ 98%.	
Sustained G for Aircraft.					
≥ 7.5 Gs	≥ 7.5 Gs	≥ 6.5 Gs	TBD	≥ 7.0 Gs	
GBTS– The ability to accurately display objects as well as the ability to accurately replicate aircraft performance to enable positive transference of skill sets from the GBTS to the aircraft					
Visual Acuity - The mean visual resolution for the WST and OFT (at 9,000 feet and 6,000 feet respectively) shall be less than or equal to 2.5 arc-minutes per optical line pair and must include accurate and relative aircraft sizing, shape, features, angle off, aspect angle and closure rates at these distances. Performance Fidelity - The WST and OFT shall replicate in form all cockpit controls, switches and avionics systems as well as applicable cockpit controls, switches and avionics systems in function. The WST and OFT performance shall enable positive transference of syllabus required skill sets from the	Visual Acuity - The mean visual resolution for the WST and OFT (at 9,000 feet and 6,000 feet respectively) shall be less than or equal to 2.5 arc-minutes per optical line pair and must include accurate and relative aircraft sizing, shape, features, angle off, aspect angle and closure rates at these distances. Performance Fidelity - The WST and OFT shall replicate in form all cockpit controls, switches and avionics systems as well as applicable cockpit controls, switches and avionics systems in function. The WST and OFT performance shall enable positive transference of syllabus required skill sets from the	(T=O) Visual Acuity - The mean visual resolution for the WST and OFT (at 9,000 feet and 6,000 feet respectively) shall be less than or equal to 2.5 arc-minutes per optical line pair and must include accurate and relative aircraft sizing, shape, features, angle off, aspect angle and closure rates at these distances. Performance Fidelity - The WST and OFT shall replicate in form all cockpit controls, switches and avionics systems as well as applicable cockpit controls, switches and avionics systems in function. The WST and OFT performance shall enable positive transference of syllabus required skill sets from the	TBD	Visual Acuity - The mean visual resolution for the WST and OFT (at 9,000 feet and 6,000 feet respectively) shall be less than or equal to 2.5 arc-minutes per optical line pair and must include accurate and relative aircraft sizing, shape, features, angle off, aspect angle and closure rates at these distances. Performance Fidelity - The WST and OFT shall replicate in form all cockpit controls, switches and avionics systems as well as applicable cockpit controls, switches and avionics systems in function. The WST and OFT performance shall enable positive transference of syllabus required skill sets from the GBTS to the aircraft.	

Performance Characteristics					
Development APB Objective	Current APB Development Objective/Threshold		Demonstrated Performance (include Date of Demonstration)	Current Estimate/Actual	Deviation
GBTS to the aircraft.	GBTS to the aircraft.	GBTS to the aircraft.			
Net-Ready					
N/A	N/A	N/A	N/A	N/A	
Force Protection					
N/A	N/A	N/A	N/A	N/A	
System Survivability					
N/A	N/A	N/A	N/A	NN/A	
Energy: Fuel capacity for Aircraft					
The aircraft's unrefueled range shall be sufficient to effectively complete the most fuel-demanding APT syllabus directed sortie.	The aircraft's unrefueled range shall be sufficient to effectively complete the most fuel-demanding APT syllabus directed sortie.	(T=O) The aircraft's unrefueled range shall be sufficient to effectively complete the most fuel-demanding APT syllabus directed sortie.	TBD	The aircraft's unrefueled range shall be sufficient to effectively complete the most fuel-demanding APT syllabus directed sortie.	
Training					
Core personnel (pilots, GBTS operators and maintainers) shall be trained with the APT FoS to the proficiency level relevant to flight test requirements (AFMC) and SUPT, PIT, and IFF syllabi (AETC) as well as associated maintenance directives. Core AFMC pilots and maintainers will complete training NLT 60 days prior to the first EMD aircraft delivery. Core AETC pilots and maintainers will complete training NLT 60 days prior to the first AETC assigned aircraft delivery; Core GBTS operators will complete training NLT 30 days prior to	Core personnel (pilots, GBTS operators and maintainers) shall be trained with the APT FoS to the proficiency level relevant to flight test requirements (AFMC) and SUPT, PIT, and IFF syllabi (AETC) as well as associated maintenance directives. Core AFMC pilots and maintainers will complete training NLT 60 days prior to the first EMD aircraft delivery. Core AETC pilots and maintainers will complete training NLT 60 days prior to the first AETC assigned aircraft delivery; Core GBTS operators	(T=O) Core personnel (pilots, GBTS operators and maintainers) shall be trained with the APT FoS to the proficiency level relevant to flight test requirements (AFMC) and SUPT, PIT, and IFF syllabi (AETC) as well as associated maintenance directives. Core AFMC pilots and maintainers will complete training NLT 60 days prior to the first EMD aircraft delivery. Core AETC pilots and maintainers will complete training NLT 60 days prior to the first AETC assigned aircraft delivery; Core	TBD	Core personnel (pilots, GBTS operators and maintainers) shall be trained with the APT FoS to the proficiency level relevant to flight test requirements (AFMC) and SUPT, PIT, and IFF syllabi (AETC) as well as associated maintenance directives. Core AFMC pilots and maintainers will complete training NLT 60 days prior to the first EMD aircraft delivery. Core AETC pilots and maintainers will complete training NLT 60 days prior to the first AETC assigned aircraft delivery; Core GBTS operators will complete training NLT 30 days prior to delivery of GBTS components (WST, OFT, UTD)	

Performance Characteristics					
Development APB Objective	Current APB Development Objective/Threshold		Demonstrated Performance (include Date of Demonstration)	Current Estimate/Actual	Deviation
delivery of GBTS components (WST, OFT, UTD)	will complete training NLT 30 days prior to delivery of GBTS components (WST, OFT, UTD)	GBTS operators will complete training NLT 30 days prior to delivery of GBTS components (WST, OFT, UTD)			

Requirements Source

Capability Development Document (CDD) for Advanced Pilot Training Family of Systems approved by Joint Requirements Oversight Council Memorandum dated October 31, 2016.

Performance Notes

Net-Ready, Force Protection, and System Survivability KPPs considered "not-applicable" by JROC per Joint Staff J6 adjudication as of the October 31, 2016 JROC Memorandum.

Acquisition Budget Estimate

Total Acquisition Cost

Category	Base Year	Development APB Objective (BY$)	APB Name (Current) Mm/dd/yyyy) Objective (BY$)	APB Name (Current) Mm/dd/yyyy) Threshold (BY$)	Budget Estimate PB 2023 BY$	Budget Estimate PB 2023 TY$	Deviation
RDT&E	2018	1237.4	1237.4	1361.1	1197.0	1296.6	
Procurement	2018	6669.0	6669.0	7335.9	6421.0	8478.7	
MILCON	2018	169.0	169.0	185.9	410.1	502.1	YES
Acq. O&M							
Total		8075.4	8075.4	8882.9	8028.1	10277.4	
PAUC	2018	23.007	23.007	25.308	22.872	29.280	
APUC	2018	19.275	19.275	21.203	18.558	24.505	

Total End Item Quantity

Quantity Category	Current APB Quantity	Current Estimate Quantity
Development	5	5
Procurement	346	346

Budget Notes

RDT&E: Revised estimate due to program schedule adjustments and refined risk adjustments. Realignment of funding to higher priority Air Force programs. Above Threshold Reprogramming of $13M and Below Threshold Reprogramming of $9.94M for FY 2021. Reduction of $72M to FY 2023 for OSD/Air Force initiatives.

Procurement: Revised estimate due to Milestone C buy profile shift and change in estimating assumptions.

MILCON: Revised estimate to align to the Air Education and Training Command current requirements.

Cost Deviations Explanations

The MILCON APB cost breach was previously reported in the December 2019 SAR. A Program Deviation Report was submitted (December 16, 2019), to the MDA, recommending a re-baseline of the program to clear this breach at the Milestone C Decision.

Risk and Sensitivity Analysis

Risks and Sensitivity Analysis	
Current Procurement Cost (December 2021)	
1.	Ejection seat/escape system qualification may cause additional government testing costs. The Program Office Estimate incorporated costs for the associated schedule risk to government test support requirements.
Original Baseline Estimate (September 2018)	
1.	Original and Current baseline risks are the same. See Current Baseline Estimate (September 2018) for details.
Revised Original Estimate (N/A)	
None	
Current Baseline Estimate (September 2018)	
1.	Total Acquisition Cost - $8,075.4M (BY 2018); PAUC - $23.007M; Schedule Risk to EMD: The September 2018 SCP accounts for the condensed acquisition timeline for EMD on this program. Therefore, there is a risk that Milestone C may not occur in FY 2022, potentially impacting cost and production timeline. Risk mitigation for this schedule risk includes the program proactively engaging with the contractor to ensure milestones are met and the government restricts any scope creep that could potentially impact schedule.
2.	Contract Type Risk for Production: As with any long-term fixed price production contract, the SCP recognizes that the Economic Price Adjustment (EPA) clause may not sufficiently account for changes to the economic environment. If the EPA does not prove sufficient to economic realities, the contractor may be at risk for financial instability.

Unit Cost

Current Baseline Compared with Current Estimate

Category ($M)	Current APB	Current Estimate	% Change	NMC Breach
PAUC				
Cost	8075.4	8028.1	-	-
Quantity	351	351	-	-
Unit Cost	23.007	22.872	-0.59%	
APUC				
Cost	6669.0	6421.0	-	-
Quantity	346	346	-	-
Unit Cost	19.275	18.558	-3.72%	

Original Baseline Compared with Current Estimate

Category ($M)	Current APB	Current Estimate	% Change	NMC Breach
PAUC				
Cost	8075.4	8028.1	-	-
Quantity	351	351	-	-
Unit Cost	23.007	22.872	-0.59%	
APUC2.				
Cost	6669.0	6421.0	-	-
Quantity	346	346	-	-
Unit Cost	19.275	18.558	-3.72%	

Contracts

Contract Data ($TYM)		
Contract Number	FA8617-18-F-8001(FPIF) and FA8617-18-D-6219 (FFP)	
Effort Number		
Modification Number	P00028	
Contract Type	Fixed Price Incentive Firm and Firm Fixed Price	
Award Date	September 27, 2018	
Definitization Date	September 27, 2018	
Order Number		
CAGE Code/CAGE Legal Name	76301/Boeing Company	
Contract Title	Advanced Pilot Training	
Contract Address	6200 JS McDonnell Blvd Saint Louis, MO 63134-1939	
Contracts/Effort Price, Quantity, and Performance ($M)		
Initial Target Price	Current Target Price	
$813.4	$813.4	
Initial Ceiling Price	Current Ceiling Price	
$865.3	$865.3	
Contract's EAC	PM's EAC	
$844.46		$919.76
Initial Quantity	Current Quantity	Delivered Quantity
5	5	0
BAC	BCWP	ACWP
$642.0	$465.6	$547.8
BCWS	Cost Variance	Schedule Variance
$572.9	-82.2	-107.3

Contract Notes

Data from Integrated Program Management Report dated October 28, 2021.

Above table includes Firm Fixed Price portion of the contract totaling $87.46M.

Cost Variance (CV):

The unfavorable cumulative CV has multiple drivers: The Mission Computer/Embedded Software discrete control account contributed to the cumulative CV primarily driven by the complexity of the navigation elements of the software which was higher than anticipated. In addition, there were some initial inefficiencies as engineers new to the program came up the learning curve.

Schedule Variance (SV):

The primary driver for the unfavorable SV is delayed Saab non-recurring and aircraft deliveries. Due to initial delays that occurred during design there was a downstream impact to procurement and part delivery, and subsequent critical part shortages that resulted in delayed aft deliveries.

Technologies and Systems Engineering

Significant Technical Risks

Significant Technical Risks	
Current Estimate (December 2021)	
1.	Integration of 8K Native Constant Resolution Visual System into Weapon System Trainer / Operational Flight Trainer Design is a Moderate Performance Risk.
2.	High Angle of Attack Performance Concerns is a Moderate Performance Risk.

Deliveries and Expenditures

Deliveries

Deliveries				
Delivered to Date	**Planned to Date**	**Actual to Date**	**Total Quantity**	**Percent Delivered**
Development	0	0	5	0.00%
Production	0	0	346	0.00%
Total Program Quantity Delivered	0	0	351	0.00%

Expended and Appropriated (TY $M)

Total Acquisition Cost: 9674.2
Expended to Date: 638.43
Percent Expended: 6.54%
Total Funding Years: 25
Years Appropriated: 12
Percent Years Appropriated: 48.00%
Appropriated to Date: 1074.54
Percent Appropriated: 11.00%

Deliveries and Expenditures Notes

This table reflect RDT&E and Procurement only for expenditure calculations.

Low Rate Initial Production

Item	Initial LRIP Decision	Current Total LRIP
Approval Date	September 11, 2018	September 11, 2018
Approved Quantity	35	35
Reference	Milestone B ADM	Milestone B ADM
Start Year	2023	2023
End Year	2025	2025

Rationale if Current Total LRIP Quantity exceeds 10% of the total Procurement quantities:

The Milestone B ADM signed on September 11, 2018 approved an LRIP quantity of 35 aircraft. The program is acquiring 351 production aircraft composed of 346 procurement funded aircraft and 5 RDT&E funded aircraft. The five RDT&E funded aircraft will be upgraded to the production configuration.

Operating and Support Costs

Total Program O&S Cost Compared with Baseline

	Current APB Objective (BY$)	Current APB Threshold (BY$)	Current Estimate (BY$)	Current Estimate (TY$)	Deviation
Total O&S ($ Millions)	44666.9	49133.6	42355.4	84865.9	

O&S Cost Breakdown

Category (BY$ Million)	APT
Unit-Level Manpower	7137.68
Unit Operations	11202.77
Maintenance	19236.25
Sustaining Support	1735.03
Continued System Improvements	1989.75
Other	
Total O&S	42355.4