Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	8.394	6.541	8.749	0.000	8.749	-	-	-	-	-	-
673587: *Air Traffic Control Systems*	-	8.394	6.541	8.749	0.000	8.749	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 7, PE 0305114F, project 673587, Man-Portable Electronically Scanned Antenna, is a new start.

A. Mission Description and Budget Item Justification

To support the Air Force worldwide flying mission, this program element funds research, development, and management of new air traffic control communications, surveillance, automation, positioning, and precision approach and landing systems. When applicable, this includes joint efforts with the Federal Aviation Administration (FAA) and coordination with the International Civil Aviation Organization and the North Atlantic Treaty Organization. ATCALS development funding currently focuses on Air Traffic Control (ATC) Future Technology (AFT)(formerly referred to as the Federal Aviation Administration (FAA) Next Generation Air Transportation System (NextGen ATS)), Notice to Airmen (NOTAMs) software development, and development of of a Man-Portable Tactical Air Navigation (TACAN) electronically scanned antenna. The program name was changed to more accurately reflect the scope of the effort which includes military and civil capabilities/requirements. In order to enable safe and efficient military flight operations in a changing global airspace, the ATC Future Technology effort is designed to identify the warfighter's emerging airspace needs, analyze technologies, formulate requirements and positions, and advise DoD aviation and air traffic communities.

These efforts support the 2018 NDAA National Defense Strategy approach to "generate decisive and sustained U.S. military advantages" by enabling "forward force maneuver and posture resilience" through the research and development of technology and strategies that support adaptive, agile basing concepts of operations while providing ATCALS capabilities necessary to ensure enduring, resilient, efficient and safe air operations. ATC Future Technology will "evolve innovative operational concepts" by modernizing airfield operations and providing adaptive ATC services and systems appropriate for the current environment, which will bolster "Dynamic Force Employment" through scalable employment operations and globally deployable forces for the four layers of the "Global Operating Model: "contact, blunt, surge, and homeland".

FY22 efforts will continue to research and develop new technologies in the areas of aircraft launch and recovery for both fixed and expeditionary operations; operations in Global Positioning System (GPS) denied environments; military and civil airspace interoperability; optimization of flight operations; expeditionary technology development and prototyping; DoD/AF or civil US and international mandates (e.g., Mode-5); improved Notice to Airmen (NOTAMs) software capabilities; conduct of service operational test and evaluations as required; mitigation of windfarm interference (e.g., with Infill Radars); technology and evaluation of new civil air traffic control and landing system technologies that may have military utility to include an Early Operational Assessment (EOA) of Remote Virtual ATC Tower System technology, and Man-Portable TACAN antenna technology. As these technologies and architectures mature, fixed base and deployable ground system upgrades will be coordinated and fielded concurrently with related aircraft avionics capabilities that may be required (manned and unmanned). ATC Future Technology analysis and recommendations

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*

may be captured in program charters and incorporated into the ATC Future Technology Strategic Roadmap. When implemented, these efforts will enable DoD aircraft to take advantage of new technologies and operational capabilities, to enhance safety, security, efficiency, affordability, and flight operations.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the ATCALS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY20 $0.000M was expended for civilian pay expenses in this program element, and in FY21 $0.000M is forecasted for civilian pay expenses in this program element.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	8.651	6.553	6.691	0.000	6.691
Current President's Budget	8.394	6.541	8.749	0.000	8.749
Total Adjustments	-0.257	-0.012	2.058	0.000	2.058
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-0.012			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.257	0.000			
• Other Adjustments	0.000	0.000	2.058	0.000	2.058

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: ATC Future Technology (AFT)	8.394	6.541	6.591	0.000	6.591
Description: Includes efforts to implement ATC Future Technologies efficiencies and capabilities. Focus is on aircraft launch and recovery, airspace interoperability, expeditionary technology development and prototyping, optimization of flight capability, adherence to mandates, technology research and analysis, Notice to Airmen software upgrades, ATC training and technology study, Early Operational Assessment of Remote Virtual Air Traffic Control Tower technology, and development of standards for certification of Infill radars to mitigate Windfarm interference to ATC surveillance radars.					
FY 2021 Plans: - Continues ATC Future Technology Analysis and Research which will include the following tasks:					

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
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C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
-- Continues NOTAMs software upgrade. -- Continues development and maturation of technology to support Aircraft Launch and Recovery for both expeditionary and fixed operations. -- Continues supporting advancement in airspace interoperability between civilian and military fleets in both national and international airspace. -- Continues to monitor emerging DoD/USAF and civil US and International mandates to ensure compliance of USAF fleets. -- Continues Early Operational Assessment of a Remote Virtual Air Traffic Control Tower capability to assess ability to meet AF flying/ATC missions in lieu of brick and mortar control towers. -- Continues preparation of source selection documentation and contract award for Man-Portable TACAN high power beacon transponder. -- Continues Rapid Innovation Funds (RIF) contract award for multi-function radar -- Continues development of Infill radar requirements and threshold parameters to enable operational validation for use in the National Airspace System. -- Completes effort with FAA and Air Force Research Laboratory to develop air traffic control management technology and procedures/tools to ensure unmanned and manned aircraft can safely operate in civil airspace. -- Completes ATC Training and Technology Study					
FY 2022 Base Plans: - Will continue ATC Future Technology Analysis and Research which will include the following tasks: -- Will continue development and maturation of technology to support Aircraft Launch and Recovery for both expeditionary and fixed operations, such as the Small Footprint Precision Approach and Landing Capability -- Will continue supporting advancement in airspace interoperability between civilian and military fleets in both national and international airspace. -- Will continue to monitor emerging DoD/USAF and civil US and International mandates to ensure compliance of USAF fleets. -- Will complete Early Operational Assessment of a Remote Virtual Air Traffic Control Tower capability to assess ability to meet AF flying/ATC missions in lieu of brick and mortar control towers. -- Will award contract for Man-Portable TACAN high power beacon transponder. -- Will continue multi-function radar development -- Will continue development of Infill radar requirements and threshold parameters to enable operational validation for use in the National Airspace System.					

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
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C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
-- Will begin monitoring complementary and GPS alternative Position, Navigation, and Timing (PNT) developments to ensure early integration into ATCALS plans and programs ***FY 2022 OCO Plans:*** None. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A					
Title: Man-Portable Electronically Scanned Antenna ***Description:*** Develops new electronically scanned antenna to replace the existing Man-Portable Tactical Air Navigation (TACAN) mechanical antenna. The new antenna will reduce system weight, improve reliability, and extend battery life. The Man-Portable TACAN provides aircraft with point-to-point navigating and instrument flight approaches to forward operating sites/landing zones and is critical to mission success in adverse weather conditions. It replaces 40+ year old legacy systems which are no longer supportable. The Man-Portable TACAN also supports the 2018 NDAA National Defense Strategy for rapidly deployable, adaptive, and scalable family of systems. A total of 68 systems will be procured (58 for the Active Duty and 10 for that Air National Guard. ***FY 2021 Plans:*** N/A ***FY 2022 Base Plans:*** - Will begin development of electronically scanned antenna to replace mechanical antenna and reduce weight, improve reliability, and extend battery life. ***FY 2022 OCO Plans:*** None ***FY 2021 to FY 2022 Increase/Decrease Statement:*** New start.	0.000	0.000	1.737	0.000	1.737
Title: NOTAMs Software ***Description:*** The DoD NOTAMs system provides aircrews and airfield operations personnel with airfield conditions, temporary flight restrictions, navigation aid and airfield lighting outages, and special instructions for departing or landing at DoD airfields. Funding continues NOTAMs software development to incorporate	0.000	0.000	0.421	0.000	0.421

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
International Civil Aviation Organization (ICAO) required digital codes, formats, and queries which enhance flight safety. ***FY 2021 Plans:*** NOTAMs software development FY20/21 funding included under ATC Future Technology (formerly NextGen Air Transportation System). In FY22, separate NOTAMs line established for continuation of NOTAMs Software. ***FY 2022 Base Plans:*** - Will continue NOTAMs software development. ***FY 2022 OCO Plans:*** None. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY22, NOTAMs program moved from the AFT and established as a separate program.					
Accomplishments/Planned Programs Subtotals	8.394	6.541	8.749	0.000	8.749

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• OPAF 03 0305114F: *Air Traffic Control/Approach/ Landing System (ATCALS)*	0.000	0.000	6.331	0.000	6.331	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

ATCALS is a basket program element with multiple programs in various stages of acquisition which provide the air traffic control infrastructure to support peacetime and wartime missions. The overall strategy for ATC Future Technology is focused on developing a long-term strategy for and executing the development of lightweight, scalable, readily deployable ATC equipment in order to support the National Defense Strategy.

Current contracting efforts include, but are not limited to, Early Operational Assessment (EOA) of Remote Virtual ATC Control Tower technology, Expeditionary Technology Development (including Man-Portable TACAN high power beacon transponder, Small Footprint PALC, multi-function radar, etc.), Prototyping, NOTAMs software upgrades, and Man-Portable TACAN Electronically Scanned Antenna development. Multiple ATC Future Technology Enterprise Architecture Implementation Tasks, Infill radar certification, and ATC Management of UASs are being executed via Military Inter-Departmental Purchase Requests, and Project Orders with various

organizations (FAA, MITRE, Army, Air Force Research Laboratory, and Air Force Flight Standards Agency). The Remote Virtual ATC Control Tower EOA contract award was a full and open competition using Other Transaction Authority (OTA) procedures. The Expeditionary Technology Development and Prototyping and Man-Portable TACAN efforts will use full and open competition and Other Transaction Authority (OTA) procedures.

The Air Force Program Executive Officer (PEO) Digital is the PEO for ATCALS and is also the delegated milestone decision authority. Program management, contracts, logistics, and financial management support is provided by the Air Force Life Cycle Management Center Aerospace Management Systems Division (AFLCMC/HBA) which is aligned under PEO/Digital.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*	**Project (Number/Name)** 673587 / *Air Traffic Control Systems*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Man-Portable TACAN Electronically Scanned Antenna	C/CPFF	AFLCMC/HBAA : Tinker AFB, OK	-	0.000		0.000		1.512	Mar 2022	-		1.512	-	-	-
AFT Expeditionary Technology Development and Prototyping	C/FFP	AFLCMC/HBA : Hanscom AFB, MA	-	3.287	Jan 2020	3.138	May 2021	3.297	Mar 2022	-		3.297	-	-	-
NOTAM Software	C/FFP	AFDW/PK : JB Andrews, MD	-	0.571	Feb 2021	0.424	Jun 2021	0.417	May 2022	-		0.417	-	-	-
		Subtotal	-	3.858		3.562		5.226		-		5.226	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AFT Research/Analysis	MIPR	FAA : Washington, DC	-	0.000	Mar 2020	1.546	Feb 2021	2.188	Nov 2021	-		2.188	-	-	-
Travel	Various	Not specified. : TBD	-	0.112	Mar 2020	0.058	May 2021	0.090	Jan 2022	-		0.090	-	-	-
		Subtotal	-	0.112		1.604		2.278		-		2.278	-	-	N/A

Remarks

Various contract types, performing activity and city/states are result of the use of Military Interdepartmental Purchase Requests (MIPR), Work Request (WR), Purchase Requests (PR), Project Orders (PO), etc. that are sent to multiple agencies in support of some tasks.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AFT Remote Air Traffic Control Tower Capability EOA	WR	Various : Various	-	0.848	Feb 2020	0.850	Apr 2021	0.500	Feb 2022	-		0.500	-	-	-
AFT ATCALS Operational Test & Evaluation (OT&E)	WR	Various : Various	-	0.225	Dec 2020	0.225	Jun 2021	0.250	Jan 2022	-		0.250	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*	**Project (Number/Name)** 673587 / *Air Traffic Control Systems*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AFT Infill Radar Certification	MIPR	FAA/AFRL : Washington/Griffiss, DC	-	3.000	May 2020	-		-		-		-	-	-	-
		Subtotal	-	4.073		1.075		0.750		-		0.750	-	-	N/A

Remarks

Various contract types, performing activity and city/states are result of the use of Military Interdepartmental Purchase Requests (MIPR), Work Request (WR), Purchase Requests (PR), Project Orders (PO), etc. that are sent to multiple agencies in support of some tasks.

Operational FY22.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Man-Portable TACAN Electronically Scanned Antenna Program Management Administration (PMA)	C/CPAF	Various : OK City, Tinker AFB	-	-		-		0.225	Jan 2022	-		0.225	-	-	-
AFT PMA	C/CPFF	Various : Hanscom AFB, MA	-	0.351	Aug 2020	0.300	Dec 2020	0.270	Oct 2021	-		0.270	-	-	-
		Subtotal	-	0.351		0.300		0.495		-		0.495	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	8.394		6.541		8.749		-		8.749	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*	**Project (Number/Name)** 673587 / *Air Traffic Control Systems*

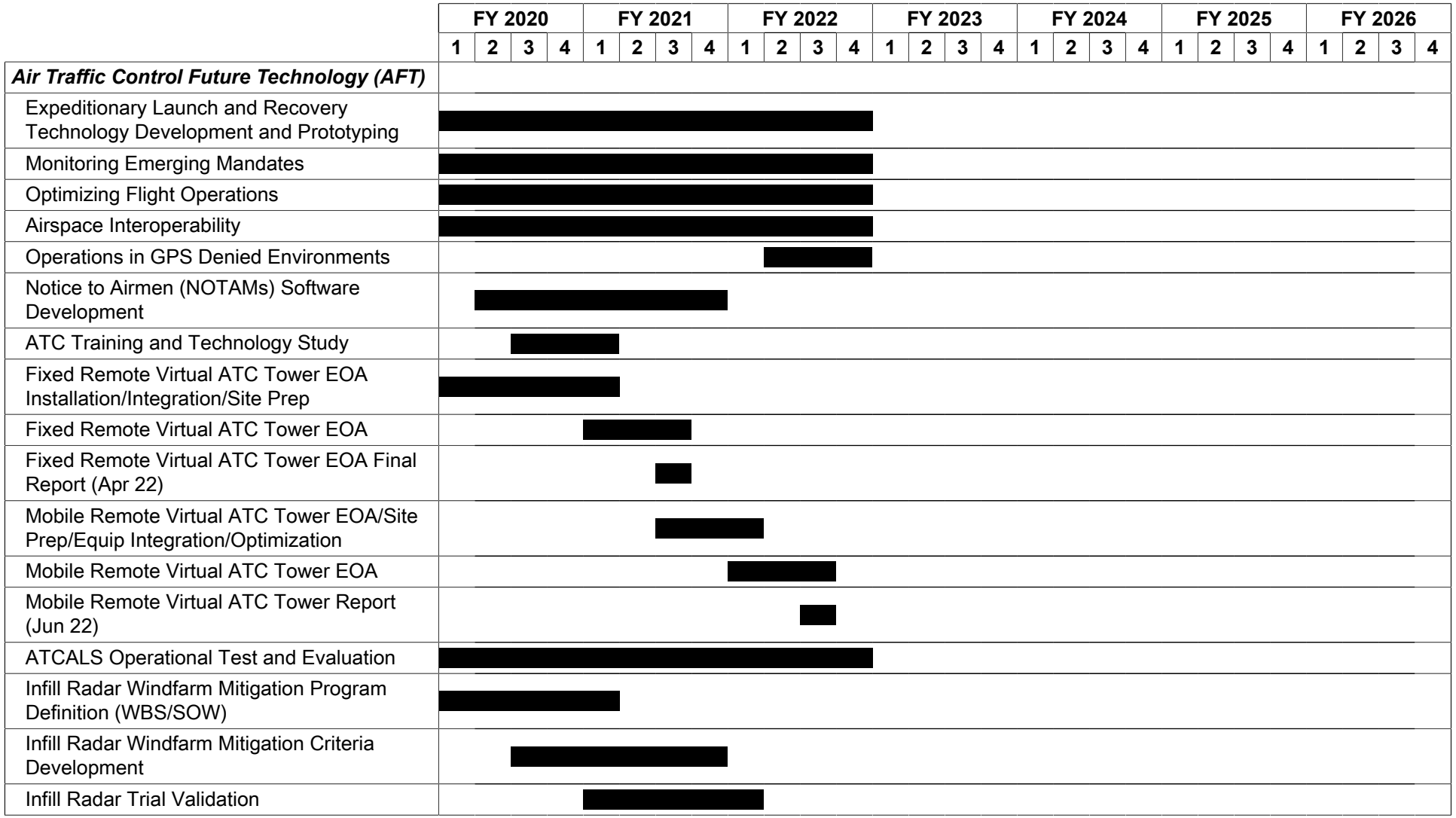

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*	**Project (Number/Name)** 673587 / *Air Traffic Control Systems*

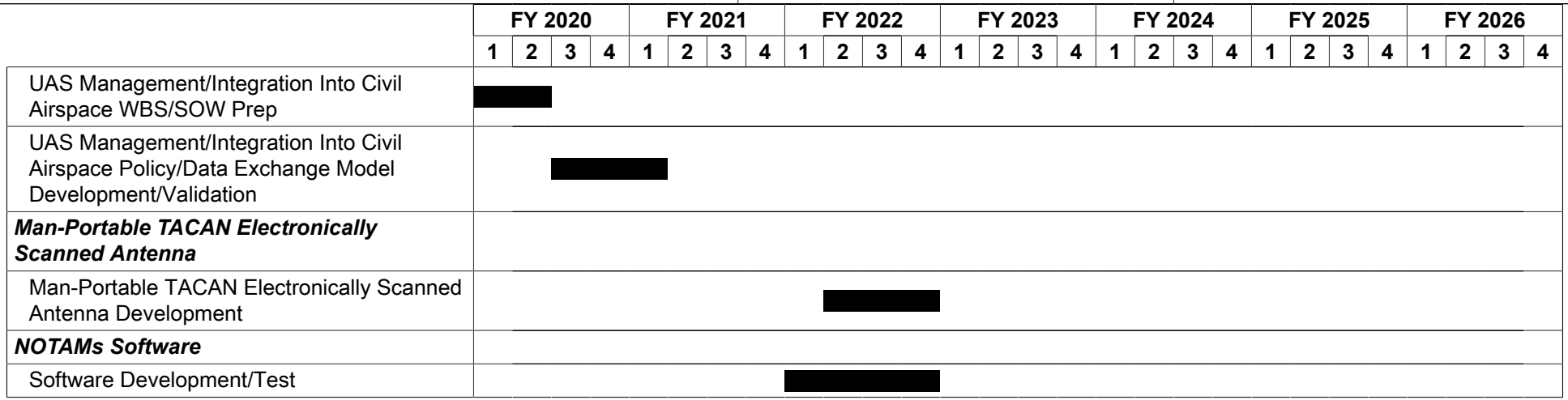

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*	**Project (Number/Name)** 673587 / *Air Traffic Control Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Air Traffic Control Future Technology (AFT)				
Expeditionary Launch and Recovery Technology Development and Prototyping	1	2020	4	2022
Monitoring Emerging Mandates	1	2020	4	2022
Optimizing Flight Operations	1	2020	4	2022
Airspace Interoperability	1	2020	4	2022
Operations in GPS Denied Environments	2	2022	4	2022
Notice to Airmen (NOTAMs) Software Development	2	2020	4	2021
ATC Training and Technology Study	3	2020	1	2021
Fixed Remote Virtual ATC Tower EOA Installation/Integration/Site Prep	1	2020	1	2021
Fixed Remote Virtual ATC Tower EOA	1	2021	3	2021
Fixed Remote Virtual ATC Tower EOA Final Report (Apr 22)	3	2021	3	2021
Mobile Remote Virtual ATC Tower EOA/Site Prep/Equip Integration/Optimization	3	2021	1	2022
Mobile Remote Virtual ATC Tower EOA	1	2022	3	2022
Mobile Remote Virtual ATC Tower Report (Jun 22)	3	2022	3	2022
ATCALS Operational Test and Evaluation	1	2020	4	2022
Infill Radar Windfarm Mitigation Program Definition (WBS/SOW)	1	2020	1	2021
Infill Radar Windfarm Mitigation Criteria Development	3	2020	4	2021
Infill Radar Trial Validation	1	2021	1	2022
UAS Management/Integration Into Civil Airspace WBS/SOW Prep	1	2020	2	2020
UAS Management/Integration Into Civil Airspace Policy/Data Exchange Model Development/Validation	3	2020	1	2021
Man-Portable TACAN Electronically Scanned Antenna				

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0305114F / *Air Traffic Control, Approach, and Landing System (ATCALS)*	**Project (Number/Name)** 673587 / *Air Traffic Control Systems*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Man-Portable TACAN Electronically Scanned Antenna Development	2	2022	4	2022
NOTAMs Software				
Software Development/Test	1	2022	4	2022