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 0207138F / *F-22A Squadrons*							
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	0.000	537.232	663.825	647.296	0.000	647.296	-	-	-	-	-	-
674785: *F-22*	0.000	334.748	513.216	647.224	0.000	647.224	-	-	-	-	-	-
674788: *F-22 Tactical Mandates*	0.000	202.484	150.609	0.072	0.000	0.072	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The F-22 Raptor provides air superiority to the Joint Force, access in the highly contested operational environment, as well as homeland and cruise missile defense for the next 25+ years (2045+). The F-22 is a multi-mission fighter aircraft that combines low observability, supercruise, maneuverability and integrated avionics to make it the world's most capable air superiority aircraft. The program is continuing planned, incremental modernization development that enhances both F-22 Air Superiority and Global Strike capabilities. The F-22 modernization program upgrades the air vehicle, engine, and training systems to improve F-22 weapons, communications, navigations, pilot systems, and electronic warfare.

The F-22 Raptor's modernization development is conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a scheduled cadence for capabilities as they mature.

Determined attempts to deny US air superiority from peer threats within the Indo-Pacific region have driven a Congressional Interest Item (CII), Emergency and Special Program (ESP) Code G3, to highlight investments and activities that will build forces that are lethal, resilient, ready, and postured to respond quickly and effectively against aggression. The F-22 Raptor is a key component of the Pacific Deterrence Initiative (PDI) for increasing joint force lethality and maintaining a credible deterrent in theater.

Funds may be used to resolve emerging safety of flight and diminishing manufacturing sources issues, accommodate technology insertion and fulfill Federal Aviation Administration or other mandates necessary to ensure continued aircrew safety and mission effectiveness.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such programs funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY20 $0.736M was expended for civilian pay expenses in this program element, and in FY21 $2.064M 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.

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 0207138F / *F-22A Squadrons*			
B. Program Change Summary ($ in Millions)	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**
Previous President's Budget	546.298	665.038	597.965	0.000	597.965
Current President's Budget	537.232	663.825	647.296	0.000	647.296
Total Adjustments	-9.066	-1.213	49.331	0.000	49.331
• Congressional General Reductions	0.000	-1.213			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	9.999	0.000			
• SBIR/STTR Transfer	-18.595	0.000			
• Other Adjustments	-0.470	0.000	49.331	0.000	49.331

Change Summary Explanation

FY20: -$18.595M Small Business Innovation Research (SBIR) reduction; +$9.999M Below Threshold Reprogramming (BTR) for F-22 Modernization; -$0.470M Other Adjustments

FY21: -$1.213M Congressional General Reduction

FY22: +$49.331M Increase for F-22 Sensor Enhancements and Communication Systems

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / *F-22A Squadrons*	Project (Number/Name) 674785 / *F-22*	

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
674785: *F-22*	0.000	334.748	513.216	647.224	0.000	647.224	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The F-22 Raptor provides air superiority to the Joint Force, access in the highly contested operational environment, as well as homeland and cruise missile defense for the next 25+ years (2045+). The F-22 is a multi-mission fighter aircraft that combines low observability, supercruise, maneuverability and integrated avionics to make it the world's most capable air superiority aircraft. The program is continuing planned, incremental modernization development that enhances both F-22 Air Superiority and Global Strike capabilities. The F-22 modernization program upgrades the air vehicle, engine, and training systems to improve F-22 weapons, communications, navigation, pilot systems, and electronic warfare.

The F-22 Raptor's modernization development is conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a scheduled cadence for capabilities as they mature.

Actual and planned execution within Communication Systems and Sensor Systems for FY20 and FY21 will differ from totals shown in each Major Thrust due to balancing program funding at the Budget Program Activity Code (BPAC) level. All content under BPAC 674788 F-22 Tactical Mandates will be consolidated into BPAC 674785 F-22 Squadrons beginning in FY22. This facilitates budget execution by aligning all F-22 modernization efforts under the same BPAC and eliminates references to F-22 Tactical Mandates beyond FY21.

The Sensor Systems Major Thrust is executing $82.4M of FY20 funds in BPAC 674785, to include a $50.0M Congressional Add; Communication Systems is executing $236.3M of FY20 funds in BPAC 674788. Sensor Systems is executing $258.4M of FY21 funds in BPAC 674785, while Communication Systems is executing $153.1M of FY21 funds BPAC 674788.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such programs funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY20 $0.736M was expended for civilian pay expenses in this program element, and in FY21 $2.064M is forecasted for civilian pay expenses in this program element.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Update 6	5.616	0.000	0.000
Description: Update 6 (U6) Interoperability, is an Operational Flight Program (OFP) update providing cryptographic updates required by the National Security Agency (NSA) to maintain interoperability with Link-16 and secure voice networks. The U6 Interoperability program builds upon the development work already accomplished in the KOV-20 cryptographic modernization program and integrates that development into a single OFP for fleet release. In addition, U6 Interoperability will correct other			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
software deficiencies identified during operations. The F-22 Update 6 program is conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a scheduled cadence for capabilities as they mature. ***FY 2021 Plans:*** U6 development program ended in 2020. ***FY 2022 Plans:*** U6 development program ended in 2020; no FY22 funds requested. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A			
Title: Infrastructure ***Description:*** This major thrust is comprised of: Combined Test Force (CTF), Laboratory Test and Operations (LTO), Operational Software Development, F-22 Small Projects, and Reliability and Maintainability Program (RAMP) projects. Labs and CTF are continuous activities that plan and conduct development, integration, test, and verification of Operational Flight Programs (OFPs) and other software and hardware in support of the F-22 Raptor. Labs provide maintenance, staffing, and operation of sixteen (16) development labs including four unique major System Integration Laboratories (SILs): Agile Integration Lab (AIL) with the Flying Test Bed (FTB), Ogden Test Enterprise (OTE) Lab, Air Combat Simulation (ACS) Lab, and the Vehicle System Simulator (VSS) Lab. The F-22 CTF located at Edwards Air Force Base conducts full-up weapons system testing to assess the effect of the F-22 combined characteristics of stealth, speed, maneuverability, and integrated avionics upon mission accomplishment. The CTF uses operationally significant ground and flight test scenarios to identify system performance deficiencies early before they are more difficult and costly to resolve. It also maintains six installed production engines and two spares, as well as two installed Engineering, Manufacturing and Development (EMD) engines, supporting all F-22 CTF requirements. F-22 Infrastructure efforts include the technical refresh of F-22 test equipment for both the F-22 CTF and the F-22 labs. This major thrust also covers efforts relating to Virtual Next Gen Labs and Joint Simulated Environment (JSE) / F-22 In a Box. F-22 Small Projects provides technology studies, demonstrations and integration of capabilities to include, but not limited to, Low Observable (LO) signature management, threat modeling support, Developmental Test (DT) weapon assets, Pilot Training (PT), future crypto upgrades, dynamic Synthetic Aperture Radar (SAR), cyber security, flight test engine refurbishment, support equipment development, Government Furnished Equipment (GFE), Engine Enhancements (or similar), and Electronic Warfare (EW) system enhancements to counter evolving threats.	168.347	186.165	198.912

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Operational Software Development utilizes commercially available agile and lean best practices to transform and accelerate the F-22 Raptor's modernization processes to develop, test, and field new capability enhancements. This includes, but is not limited to, the expansion of a cloud-based software development environment and partnering with commercial companies to adopt industry product development best practices. The Reliability and Maintainability Program provides for solution identification and integration of modifications to improve reliability, availability and maintainability for F-22 test aircraft, located at Edwards AFB and the sixteen (16) F-22 labs. RAMP includes modifications to address corrosion, reduce maintenance hours, increase safety, and provide urgent response requirements to the F-22 CTF. F-22 Infrastructure efforts are conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a scheduled cadence for capabilities as they mature. Program mission support costs are included in this major thrust. ***FY 2021 Plans:*** LTO plans to incorporate support of F-22 In a Box / JSE which is scheduled to deliver in 2021. Provide support to the SILs for faster testing and assessment of F-22 enhancements. Continue to update critical systems required to support new aircraft configurations and capabilities. Further continue Lab test planning using agile methods for the following programs: Mode 5 IFF, Link 16, OFP releases, Sensor Systems and ATD to hand off to the CTF for testing. Small projects continues technology planning studies and demonstrations for DT weapon assets, threat modeling support, test support, test aircraft modifications, Common Range Integrated Instrumentation System (CRIIS) development, cyber security, dynamic SAR, GFE, PT, and EW enhancements. Operational Software Development continues maturing and scaling cloud-based computing environment to leverage commercially-based agile software and hardware development best practices and tools to increase the speed and quality of product delivery to the warfighter. RAMP continues retrofit modifications on F-22 test aircraft in order to improve system/component reliability, maintainability and reduce F-22 weapon system life cycle costs.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY21 total includes $22M for estimated SBIR/STTR transfer. ***FY 2022 Plans:*** Provide support to the SILs for faster testing and assessment of F-22 enhancements. Continue to update critical systems required to support new aircraft configurations and capabilities. Further continue Lab test planning using agile methods for the following programs: Mode 5 IFF, Link 16, OFP releases, Sensor Systems and ATD to hand off to the CTF for testing. Continue to update critical systems to include technology refresh and laboratory improvements (including Virtual Next Gen Labs components) required to support new aircraft configurations and capabilities. Continued development of F-22 In-a-Box / JSE. Small projects continues technology planning studies and demonstrations for DT weapon assets, threat modeling support, test support, test aircraft modifications, CRIIS development, cyber security, engine enhancements, crypto, dynamic SAR, GFE, PT, and EW enhancements. Operational Software Development continues maturing and scaling cloud-based computing environment to leverage commercially-based agile software and hardware development best practices and tools to increase the speed and quality of product delivery to the warfighter. RAMP continues retrofit modifications on F-22 test aircraft in order to improve system/component reliability, maintainability and reduce F-22 weapon system life cycle costs. FY22 total includes $22M for estimated SBIR/STTR transfer. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase of $12.747M from FY21 to FY22 reflects the continuation of Labs and CTF efforts, small projects, and other development/test efforts to support F-22 planned development, testing, and integration efforts.			
Title: Advanced Technology Development (ATD)	79.876	57.130	28.080
Description: Technology maturation, risk reduction, studies, demonstrations and prototypes of classified F-22 development efforts. The F-22 Advanced Technology Development (ATD) program is conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/ hardware from multiple programs (product lines) using a scheduled cadence for capabilities as they mature. The F-22 program may incorporate technologies developed by NGAD based on emerging threats, AF priorities, and development pipeline capacity. Incorporating NGAD developed technologies will include developing, integrating, and testing capabilities on the F-22 weapon system.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Continue technology maturation and risk reduction projects in support of various classified F-22 development efforts. Continue technology maturation and acquisition planning for the F-22 Sensor Systems program. Additionally, continue to mature the Low Drag Pylon and Tank capabilities as part of its risk reduction activities. ***FY 2022 Plans:*** Continue technology maturation and risk reduction projects in support of various classified F-22 development efforts. Continue technology maturation and acquisition planning for the F-22 Sensor Systems program. Additionally, continue to mature the Low Drag Pylon and Tank capabilities as part of its risk reduction activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease of $29.050M from FY21 to FY22 is due to the planned completion of the Sensor Systems ATD effort in FY22.			
Title: Sensor Systems	75.685	260.921	262.972
Description: As part of the F-22 Rapid Prototyping Middle Tier Acquisition (MTA) program, previously known as the Capability Pipeline, Sensor Systems improves sensor capabilities to maintain air dominance and preserve first look, first shot, and first kill capability. The F-22 Sensor System programs are conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a scheduled cadence for capabilities as they mature. ***FY 2021 Plans:*** Continue Sensor Enhancements software and hardware development for future fleet release. Purchase of test assets. ***FY 2022 Plans:*** Continue Sensor Enhancements software and hardware development for future fleet release. Complete purchase of test assets, continue development environment standup, lab/system/airframe integration, and logistics planning. Continue technology maturation and risk reduction efforts for multiple development activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Marginal increase from FY21 to FY22 attributable to the completion of test asset purchases.			
Title: Navigation Systems	5.224	9.000	25.540
Description: The Navigation Systems product line consists of the software and hardware development, integration, test, and fielding necessary to ensure the F-22's ability to maintain Precision, Navigation and Timing (PNT) capabilities, particularly in Global Positioning System (GPS) degraded environments. As part of the F-22 Rapid Prototyping Middle Tier Acquisition (MTA) program, previously known as the Capability Pipeline, this effort will include the integration of Embedded GPS/Inertial Navigation System (INS) Modernization (EGI-M) for M-Code, replacement of the legacy GPS antenna with a robust Controlled Reception			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Pattern Antenna (CRPA), as well as other capabilities, all working together to prevent exploitation of the weapon system by adversaries and to provide an anti-jam PNT solution. F-22 Navigation Systems is conducted using a rapid acquisition construct leveraging commercial best practices such as Agile and Lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a scheduled cadence for matured capabilities. ***FY 2021 Plans:*** Continue to work development activities for F-22 GPS CRPA. FY21 activities will include system level testing of the CRPA, design and purchase of retrofit kits, and integration of the antenna with existing navigation system software. EGI-M work will include continued refinement of Requirements and Engineering deliverables, initial development of EGI-M software, and integration for ongoing development of the new hardware. ***FY 2022 Plans:*** Continue with CRPA retrofit kit manufacturing and purchase, begin actual retrofits to support Developmental and Operational testing. Work towards completing the next series of Engineering milestones. Ongoing development and integration of new EGI-M hardware. Delivery of the updated software to support EGI-M integration. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase of $16.540M from FY21 to FY22 reflects the continuance of kit manufacturing, testing, and integration.			
Title: Communication Systems	0.000	0.000	131.720
Description: As part of the F-22 Rapid Prototyping Middle Tier Acquisition (MTA) program, previously known as the Capability Pipeline, Link 16 and Mode 5 IFF consists of software and hardware development necessary to field both the Link 16 Transmit capability, and tactical Mode 5 IFF Transpond and Interrogate on the F-22. Link 16 Transmit will be accomplished via an Open System Architecture (OSA) integrated with F-22 legacy avionics. The OSA implementation will provide a pathway to more competitive and open F-22 modernization. Mode 5 IFF provides an opportunity to incorporate other updates to Link 16 capabilities into the Raptor. This major thrust also captures F-22 program activities related to integrating the advanced Talon SPITBALL Link 16 antenna onto the F-22. Includes mission support requirements for the F-22 Program Office including, but not limited to: travel, computer costs, cost estimating data, strategic analysis and support, systems engineering process management and other miscellaneous contract support. The F-22 Link 16 and Mode 5 IFF product lines are conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a cadence approach as capabilities mature. ***FY 2021 Plans:*** FY21 plans can be found under BPAC 674788 F-22 Tactical Mandates. ***FY 2022 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue software development for additional Link 16 and Mode 5 IFF Transpond capabilities for fielding with subsequent releases. Mode 5 IFF Interrogate capabilities will continue development and system lab test of hardware and software. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Planned FY22 execution in communication systems in BPAC 674785 is $131.792M.			
Accomplishments/Planned Programs Subtotals	334.748	513.216	647.224

C. 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
• APAF 05 Line Item F02200: *F-22A Squadrons, PE 0207138F**	219.447	522.595	467.702	-	467.702	-	-	-	-	-	-
• APAF 05 F2232B: *Increment 3.2b*	20.213	5.889	-	-	-	-	-	-	-	-	-
• RDTE 07 PE 0207138F: *F-22 Tactical Mandates*	202.484	150.609	-	-	-	-	-	-	-	-	-

Remarks

NOTES:

*F-22A Squadrons, APAF/PE 0207138F, includes funding for F-22A Squadrons BPs 11 (Aircraft Modifications), 13 (Post-Production Support), 16 (Initial Spares), and 19 (Depot Activation) only.

F-22 Increment 3.2B, APAF/PE 0207138F includes funding for associated Increment 3.2B BPs 11 (Aircraft Modifications) and 16 (Initial Spares) only.

F-22 Tactical Mandates, RDT&E/PE 0207138F, includes funding for F-22A Tactical Mandates modernization and development BPAC 674788. Communication Systems major thrust will be captured under BPAC 674785 beginning in FY22 as a result of the BPAC consolidation.

D. Acquisition Strategy

In conjunction with the Raptor Enhancement Development & Integration II (REDI II) Indefinite Delivery/Indefinite Quantity (ID/IQ) ordering contract, the new Advanced Raptor Enhancement and Sustainment (ARES) ID/IQ will begin to be utilized in FY22 as well. The ARES contract is a follow-on to the REDI II contract. Both ID/IQ contracts maximize flexibility to start, stop, accelerate and decelerate projects as required and ARES provides maximum flexibility to manage various modernization projects. The REDI II and ARES contracts allow for the issuance of orders for efforts associated with the planning, analysis, design, development, qualification, test and documentation of F-22 weapon system performance enhancements, life-cycle improvements, Operational Flight Program (OFP) upgrades, and associated efforts essential to accomplishing the F-22 mission.

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 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

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
Update 6	SS/ Various	Lockheed Martin : Fort Worth, TX	0.000	5.616	Dec 2019	-		-		-		-	-	-	-
Infrastructure	Various	Various : Various	0.000	167.611	Nov 2019	184.101	Oct 2020	198.912	Oct 2021	-		198.912	-	-	-
Advanced Technology Development	Various	Various : Various	0.000	79.876	Nov 2019	57.130	Nov 2020	28.080	Nov 2021	-		28.080	-	-	-
Sensor Systems	SS/ Various	Lockheed Martin : Fort Worth, TX	0.000	75.685	Dec 2019	260.921	Feb 2021	262.972	Nov 2021	-		262.972	-	-	-
Navigation Systems	SS/ Various	Lockheed Martin : Fort Worth, TX	0.000	5.224	Nov 2019	9.000	Oct 2020	25.540	Nov 2021	-		25.540	-	-	-
Communication Systems	SS/ Various	Lockheed Martin : Fort Worth, TX	0.000	-		-		131.720	Nov 2021	-		131.720	-	-	-
		Subtotal	0.000	334.012		511.152		647.224		-		647.224	-	-	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
Direct Cite Civilian Pay	Various	Not specified. : TBD	0.000	0.736	Oct 2019	2.064	Oct 2020	-		-		-	-	-	-
		Subtotal	0.000	0.736		2.064		-		-		-	-	-	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	0.000	334.748		513.216		647.224		-		647.224	-	-	N/A

Remarks

FY21 and prior execution under Communication Systems is captured in BPAC 674788 F-22 Tactical Mandates exhibits.

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 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

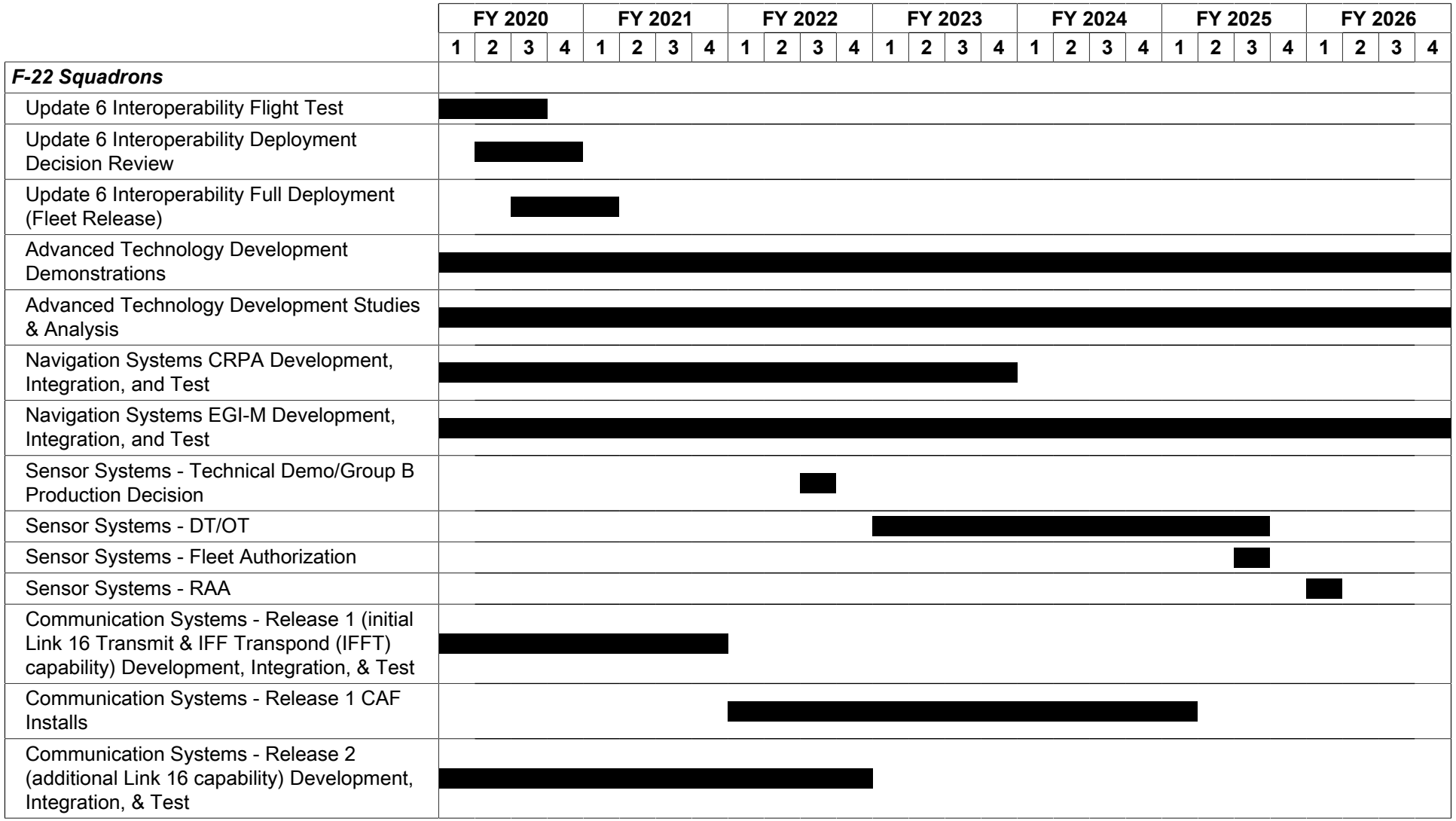

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

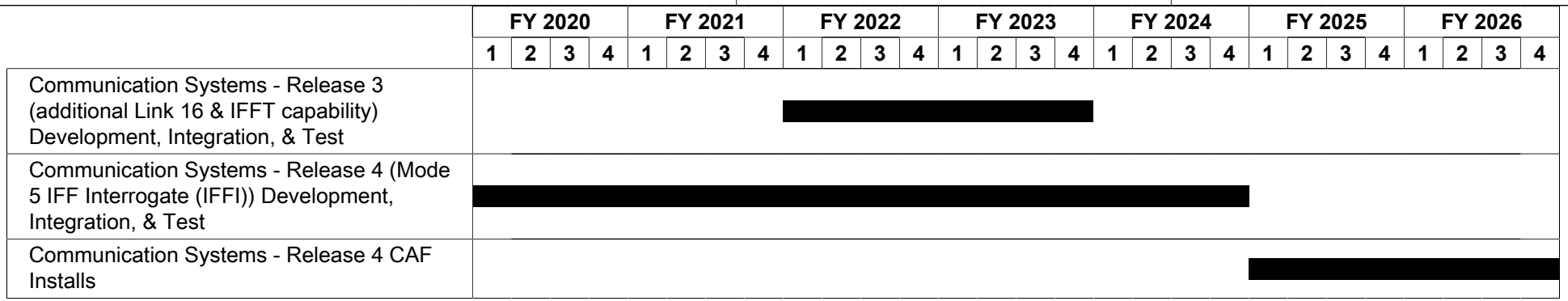

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674785 / *F-22*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
F-22 Squadrons				
Update 6 Interoperability Flight Test	1	2020	3	2020
Update 6 Interoperability Deployment Decision Review	2	2020	4	2020
Update 6 Interoperability Full Deployment (Fleet Release)	3	2020	1	2021
Advanced Technology Development Demonstrations	1	2020	4	2026
Advanced Technology Development Studies & Analysis	1	2020	4	2026
Navigation Systems CRPA Development, Integration, and Test	1	2020	4	2023
Navigation Systems EGI-M Development, Integration, and Test	1	2020	4	2026
Sensor Systems - Technical Demo/Group B Production Decision	3	2022	3	2022
Sensor Systems - DT/OT	1	2023	3	2025
Sensor Systems - Fleet Authorization	3	2025	3	2025
Sensor Systems - RAA	1	2026	1	2026
Communication Systems - Release 1 (initial Link 16 Transmit & IFF Transpond (IFFT) capability) Development, Integration, & Test	1	2020	4	2021
Communication Systems - Release 1 CAF Installs	1	2022	1	2025
Communication Systems - Release 2 (additional Link 16 capability) Development, Integration, & Test	1	2020	4	2022
Communication Systems - Release 3 (additional Link 16 & IFFT capability) Development, Integration, & Test	1	2022	4	2023
Communication Systems - Release 4 (Mode 5 IFF Interrogate (IFFI)) Development, Integration, & Test	1	2020	4	2024
Communication Systems - Release 4 CAF Installs	1	2025	4	2026

Note

FY21 and prior execution under Communication Systems is captured in BPAC 674788 F-22 Tactical Mandates exhibits.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / *F-22A Squadrons*	Project (Number/Name) 674788 / *F-22 Tactical Mandates*	

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
674788: *F-22 Tactical Mandates*	0.000	202.484	150.609	0.072	0.000	0.072	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Budget Program Activity Code (BPAC) is being consolidated into BPAC 674785 F-22A Squadrons starting in FY22. This facilitates budget execution by aligning all F-22 modernization efforts under the same BPAC and eliminates references to F-22 Tactical Mandates beyond FY21. The following remains for reference to current year and prior year budget activity.

This BPAC focuses on delivering Link 16 and Mode 5 Identification Friend or Foe (IFF) capabilities to the F-22 Raptor.

Link 16 will deliver Link 16 Transmit and enhance existing receive capabilities. Link 16 capabilities will be enabled by Open System Architecture (OSA) and enables 5th generation F-22 fighter aircraft to transmit tactical information through datalink to the 5th generation F-35 (a.k.a. 5th-to-5th), as well as to 4th generation aircraft (a.k.a. 5th-to-4th). Transmitting tactical data to other aircraft types via datalink is a top Air Force priority. With Link 16 Transmit, the F-22's superior 5th Generation sensor suite will critically support the situational awareness of all participants in the operational environment. Mode 5 IFF will deliver IFF Transpond and Interrogate capabilities. Mode 5 IFF is a Joint Requirements Oversight Council-mandated Blue Force identification capability that improves Raptor survivability and reduces fratricide risk DoD-wide. Mode 5 IFF brings significantly enhanced combat identification in both quality and security. All capabilities will be fielded on the F-22 Block 30/35 combat coded F-22 fleet.

The F-22's Link 16 and Mode 5 IFF developments are conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a scheduled cadence for capabilities as they mature.

Actual and planned execution within Communication Systems and Sensor Systems for FY20 and FY21 will differ from totals shown in each Major Thrust due to balancing program funding at the BPAC level.

The Sensor Systems Major Thrust is executing $82.4M of FY20 funds in BPAC 674785, to include a $50.0M Congressional Add; Communication Systems is executing $236.3M of FY20 funds in BPAC 674788. Sensor Systems is executing $258.4M of FY21 funds in BPAC 674785, while Communication Systems is executing $153.1M of FY21 funds BPAC 674788.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Communication Systems	202.484	150.609	0.072
Description: As part of the F-22 Rapid Prototyping Middle Tier Acquisition (MTA) program, previously known as the Capability Pipeline, Link 16 and Mode 5 IFF consists of software and hardware development necessary to field both the Link 16 Transmit			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674788 / *F-22 Tactical Mandates*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
capability, and tactical Mode 5 IFF Transpond and Interrogate on the F-22. Link 16 Transmit will be accomplished via an Open System Architecture (OSA) integrated with F-22 legacy avionics. The OSA implementation will provide a pathway to more competitive and open F-22 modernization. Mode 5 IFF provides an opportunity to incorporate other updates to Link 16 capabilities into the Raptor. This major thrust also captures F-22 program activities related to integrating the advanced Talon SPITBALL Link 16 antenna onto the F-22. Includes mission support requirements for the F-22 Program Office including, but not limited to: travel, computer costs, cost estimating data, strategic analysis and support, systems engineering process management and other miscellaneous contract support. The F-22 Link 16 and Mode 5 IFF product lines are conducted using a rapid acquisition construct leveraging commercial best practices such as agile and lean. This allows the F-22 Raptor enterprise to develop, test, and field software/hardware from multiple programs (product lines) using a cadence approach as capabilities mature. ***FY 2021 Plans:*** Initial Link 16 transmit and Mode 5 IFF Transpond capabilities will complete Developmental Test (DT) and Operational Test (OT) in preparation for release to the F-22 combat fleet. Continue software development for additional Link 16 and Mode 5 IFF Transpond capabilities for fielding with subsequent releases. Mode 5 IFF Interrogate capabilities will continue development and system lab test of hardware and software. Pre-EMD work on TALON SPITBALL completed in FY20. TALON SPITBALL activities from the Air Force Tactical Exploitation of National Capabilities (TENCAP) office will transition EMD to F-22 Program Office. Planning for TALON SPITBALL EMD activities to continue development and integration activities for the F-22 Raptor. ***FY 2022 Plans:*** This BPAC is being consolidated into BPAC 674785 F-22 Squadrons. FY22 plans for Communication Systems can be found in the F-22 Squadrons R-2A exhibit. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Planned FY22 execution in Communication Systems is $131.792M and is documented in the F-22 Squadrons R-2A exhibit.			
Accomplishments/Planned Programs Subtotals	202.484	150.609	0.072

C. 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
• RDTE 07 PE 0207138F: *F-22A Squadrons**	334.748	488.055	647.296	-	647.296	-	-	-	-	-	-
• APAF 05 Line Item F02200: *F-22A Squadrons, PE 0207138F***	219.447	522.595	467.702	-	467.702	-	-	-	-	-	-
• APAF 05 Line Item F2232B: *F-22A Increment 3.2B, PE 0207138F****	20.213	5.889	-	-	-	-	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674788 / *F-22 Tactical Mandates*

C. 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

Remarks

NOTES:

*F-22 Squadrons, RDT&E/PE 0207138F, includes funding for F-22A Squadrons modernization and development BPAC 674785. Communication Systems major thrust will be captured under BPAC 674785 in FY22 as a result of the BPAC consolidation.

**F-22A Squadrons, APAF/PE 0207138F, includes funding for F-22A Squadrons BPs 11 (Aircraft Modifications), 13 (Post-Production Support), 16 (Initial Spares), and 19 (Depot Activation) only.

***F-22 Squadrons, APAF/PE 0207138F/F2232B, includes funding for F-22 Increment 3.2B BPs 11 (Aircraft Modifications) and 16 (Initial Spares) only.

D. Acquisition Strategy

In conjunction with the Raptor Enhancement Development & Integration II (REDI II) Indefinite Delivery/Indefinite Quantity (ID/IQ) ordering contract, the new Advanced Raptor Enhancement and Sustainment (ARES) ID/IQ will begin to be utilized in FY22 as well. The ARES contract is a follow-on to the REDI II contract. Both ID/IQ contracts maximize flexibility to start, stop, accelerate and decelerate projects as required and ARES provides maximum flexibility to manage various modernization projects. The REDI II and ARES contracts allow for the issuance of orders for efforts associated with the planning, analysis, design, development, qualification, test and documentation of F-22 weapon system performance enhancements, life-cycle improvements, Operational Flight Program (OFP) upgrades, and associated efforts essential to accomplishing the F-22 mission.

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 0207138F / *F-22A Squadrons*	Project (Number/Name) 674788 / *F-22 Tactical Mandates*	

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
Communication Systems	SS/ Various	Lockheed Martin : Ft Worth, TX	0.000	202.484	Oct 2019	150.609	Oct 2020	0.072	Nov 2021	-		0.072	-	-	-
		Subtotal	0.000	202.484		150.609		0.072		-		0.072	-	-	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	0.000	202.484		150.609		0.072		-		0.072	-	-	N/A

Remarks

FY22 Communication System execution is captured in BPAC 674785 F-22 Squadrons in FY22.

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 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674788 / *F-22 Tactical Mandates*

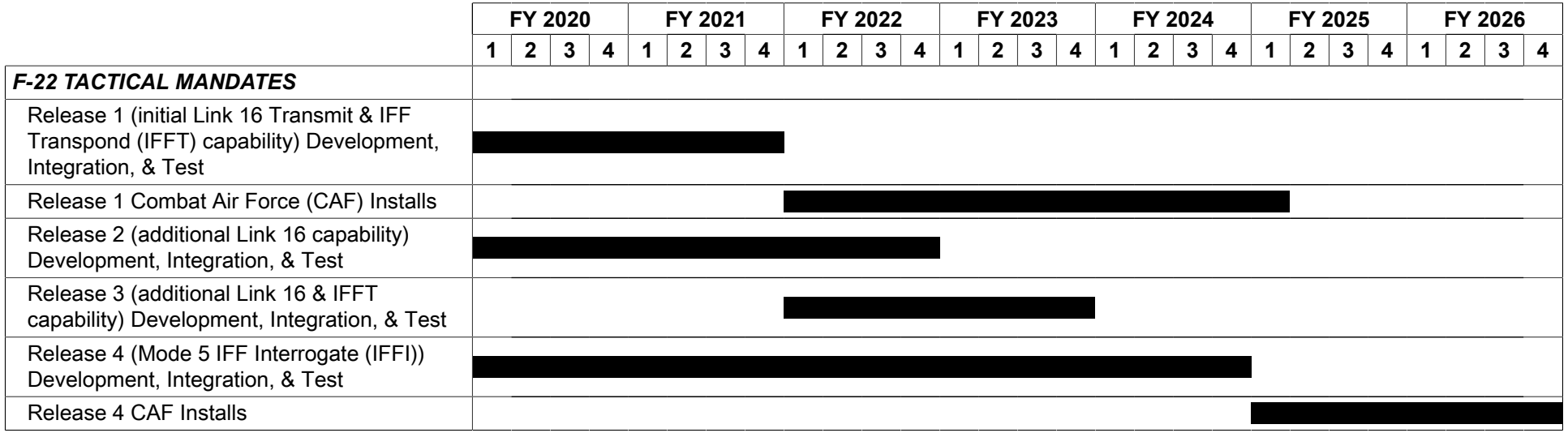

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 0207138F / *F-22A Squadrons*	**Project (Number/Name)** 674788 / *F-22 Tactical Mandates*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
F-22 TACTICAL MANDATES				
Release 1 (initial Link 16 Transmit & IFF Transpond (IFFT) capability) Development, Integration, & Test	1	2020	4	2021
Release 1 Combat Air Force (CAF) Installs	1	2022	1	2025
Release 2 (additional Link 16 capability) Development, Integration, & Test	1	2020	4	2022
Release 3 (additional Link 16 & IFFT capability) Development, Integration, & Test	1	2022	4	2023
Release 4 (Mode 5 IFF Interrogate (IFFI)) Development, Integration, & Test	1	2020	4	2024
Release 4 CAF Installs	1	2025	4	2026

Note

FY22 execution under Communication Systems is captured in BPAC 674785 F-22 Squadrons exhibits.