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Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0207138F / <i>F-22A Squadrons</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	0.000	642.138	647.296	559.709	0.000	559.709	566.247	541.382	543.214	528.745	Continuing	Continuing
674785: <i>F-22</i>	0.000	485.953	647.224	559.709	0.000	559.709	566.247	541.382	543.214	528.745	Continuing	Continuing
674788: <i>F-22 Tactical Mandates</i>	0.000	156.185	0.072	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The F-22 Raptor 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 F-22 provides air superiority to the Joint Force, access in the highly contested operational environment, as well as homeland and cruise missile defense into the 2040s. To remain effective in its mission, 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.

Determined attempts to deny US air superiority from peer threats within the Indo-Pacific region have increased the need for investments and activities to 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 these efforts and necessary for increasing joint force lethality and maintaining a credible deterrent in theater.

This paragraph is a tribute to all of the people that have poured their heart and soul into designing, building, flying, funding, modernizing, and sustaining the F-22 Raptor throughout its years of service. It has steadily flown missions and broken records, known and unknown around the world since it began flying 25 years ago. It is the sheepdog, the watcher in the night that keeps our adversaries at bay, and it wouldn't be possible without the entire team pushing the very limit of possibility every single day.

Technology development and Modernization for the F-22 Raptor 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 an annual delivery cadence for capabilities as they mature.

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.

The total cost of the F-22 Rapid Prototyping Middle Tier of Acquisition effort is \$1,716.9M, including RDT&E and procurement of prototype units. F-22 Rapid Prototyping is fully funded across the Future Years Defense Program.

The total cost of the F-22 Rapid Fielding Middle Tier of Acquisition effort is \$371.9M, including RDT&E and procurement of prototype units. F-22 Rapid Fielding is fully funded across the Future Years Defense Program.

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This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605827F, 0605828F, 0605829F, 0605831F, 0605832F, 0605833F, 0605898F, 0606398F. In FY21 2.493M was expended for civilian pay expenses in this program element, and in FY22 6.114M 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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	663.825	647.296	0.000	0.000	0.000
Current President's Budget	642.138	647.296	559.709	0.000	559.709
Total Adjustments	-21.687	0.000	559.709	0.000	559.709
• Congressional General Reductions	0.000	0.000			
• 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	0.000	0.000			
• SBIR/STTR Transfer	-21.687	0.000			
• Other Adjustments	0.000	0.000	559.709	0.000	559.709

Change Summary Explanation

FY21 SBIR/STTR reduction of \$21.687M.

The FY 2022 President's Budget submittal did not reflect FY23 through FY26 funding. Therefore, an explanation of the change between the two budget positions for FY23 cannot be made in a relevant manner.

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force										Date: April 2022		
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
674785: F-22	0.000	485.953	647.224	559.709	0.000	559.709	566.247	541.382	543.214	528.745	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The F-22 Raptor 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 F-22 provides air superiority to the Joint Force, access in the highly contested operational environment, as well as homeland and cruise missile defense into the 2040s. To remain effective in its mission, 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.

Determined attempts to deny US air superiority from peer threats within the Indo-Pacific region have increased the need for investments and activities to 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 these efforts and necessary for increasing joint force lethality and maintaining a credible deterrent in theater.

This paragraph is a tribute to all of the people that have poured their heart and soul into designing, building, flying, funding, modernizing, and sustaining the F-22 Baby Raptor throughout its years of service. It has steadily flown missions and broken records, known and unknown around the world since it began flying 25 years ago. It is the sheepdog, the watcher in the night that keeps our adversaries at bay, and it wouldn't be possible without the entire team pushing the very limit of possibility every single day.

Technology development and Modernization for the F-22 Raptor 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 an annual delivery cadence for capabilities as they mature.

Actual and planned execution within Communication Systems and Sensor Systems for FY21 and FY22 will differ from totals shown in each Major Thrust due to balancing program funding at the BPAC level. The Sensor System Major Thrust executed \$266.9M of FY21 funds in BPAC 674785; Communication Systems executed \$159.3M of FY21 funds in BPAC 674788. All funding for Communication Systems in FY22 and beyond will be executed in BPAC 674785.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605827F, 0605828F, 0605829F, 0605831F, 0605832F, 0605833F, 0605898F, 0606398F. In FY21 \$2.493M was expended for civilian pay expenses in this program element, and in FY22 \$6.114M is forecasted for civilian pay expenses in this program element.

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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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Title: Infrastructure</p> <p>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.</p> <p>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 test and certification support, maintenance, staffing, with 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, CA, is the hub for developmental test efforts for the entire F-22 enterprise. It 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. F-22 Infrastructure efforts include the technical refresh of the entire F-22 development and test infrastructure, to include the F-22 CTF and all development labs.</p> <p>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, weapons, Pilot Training (PT), Pilot Vehicle Interface (PVI), countermeasures, helmet, 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.</p> <p>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.</p> <p>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</p>	168.327	214.124	218.296	0.000	218.296

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
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(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 utilize 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 2022 Plans:
Provide support to the System Integration Labs (SILs) for faster testing and assessment of F-22 enhancements. 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. Update critical systems to include technology refresh and laboratory improvements 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, Common Range Integrated Instrumentation System (CRIIS) development integration, 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.

FY 2023 Base 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

FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>hand off to the CTF for testing. Continue to update critical systems to include technology refresh and laboratory optimization improvements.</p> <p>Small projects continues technology planning studies and demonstrations for DT weapon assets, threat modeling support, test support, test aircraft modifications, CRIIS integration, cyber security, engine enhancements, crypto, dynamic SAR, GFE, PT, EW enhancements, and adds QRIP development, and Fox Tablet integration.</p> <p>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.</p> <p>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.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase of \$4.172M from FY22 to FY23 supports the improvement of throughput and performance of F-22 labs, reduces risk to flight test, and accelerates delivery of the capability pipeline.</p>					
<p>Title: Advanced Technology Development (ATD)</p> <p>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.</p> <p>The F-22 program attempts to maximize efficiency by utilizing technology transfer both to the Next Generation Air Dominance (NGAD) portfolio, and from the NGAD portfolio 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.</p> <p>FY 2022 Plans:</p>	38.648	59.627	61.080	0.000	61.080

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>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.</p> <p>FY 2023 Base Plans: Continue technology maturation and risk reduction projects in support of various F-22 development efforts. Additionally, continue to mature the Low Drag Pylon and Tank capabilities as part of its risk reduction activities.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase of \$1.453M from FY22 to FY23 reflects the continuation of advanced technology development projects for the F-22 Raptor.</p>					
<p>Title: Sensor Systems</p> <p>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 superiority and preserve first look, first shot, and first kill capability. This includes developing and maturing advanced Infrared Search & Track (IRST) sensor capabilities to provide the F-22 with an asymmetric sensing advantage against potential adversaries while continuing to deliver on its unmatched maneuverability.</p> <p>The F-22 Sensor System programs utilize 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.</p> <p>FY 2022 Plans: Continue Sensor Enhancements software and hardware development for future fleet release. Continue 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.</p> <p>FY 2023 Base Plans: Continue Sensor Enhancements software and hardware development for future fleet release. Complete purchase and begin receipt of initial test assets, continue development environment standup, lab/system/</p>	269.978	238.704	160.200	0.000	160.200

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
airframe integration, and logistics planning. Continue technology maturation and risk reduction efforts for multiple development activities. FY 2023 OCO Plans: N/A FY 2022 to FY 2023 Increase/Decrease Statement: Decrease of \$78.504M from FY22 to FY23 attributable to the completion of test asset purchases.					
Title: Navigation Systems 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) (in compliance with M-Code Mandate Public Law 111-383), replacement of the legacy GPS antenna with a robust Controlled Reception Pattern Antenna (CRPA), as well as other capabilities, working together to prevent exploitation of the weapon system by adversaries and to provide an anti-jam, anti-spoof 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 2022 Plans: Continue with CRPA hardware & system software development, providing test units to labs to begin platform integration. Integrate additional software for backwards compatibility of EGI-M and CRPA with legacy systems. Begin Developmental and Operational testing of Legacy Support Software. Continue refinement of EGI-M hardware and development of software products necessary for future integration to the platform. FY 2023 Base Plans: Complete integration of CRPA hardware and software into platform, then begin Developmental and Operational testing. Receive EGI-M Engineering Development Modules (EDM) to begin integration into platform and testing in F-22 System Labs. FY 2023 OCO Plans:	9.000	24.212	18.603	0.000	18.603

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A					
FY 2022 to FY 2023 Increase/Decrease Statement: Decrease of \$5.609M from FY22 to FY23 reflects the continuance of the CRPA EMD contract.					
Title: Communication Systems	0.000	110.557	79.530	0.000	79.530
Description: As part of the F-22 Rapid Prototyping Middle Tier Acquisition (MTA) program, previously known as the Capability Pipeline, Communication Systems consists of software and hardware development, test, and certifications necessary to field systems and capabilities for combat with a joint force. Including Link 16 Transmit, tactical Mode 5 Identify Friend or Foe (IFF) Challenge and Reply, Second Generation Anti-Jam UHF Radio for NATO (SATURN), and updating Tactical Secure Voice Cryptographic Interoperability Specification (TSVCIS). Link 16 Transmit will be accomplished via an Open System Architecture (OSA) integrated with F-22 legacy avionics and enable tactical data sharing between both 5th generation and 4th generation aircraft. The OSA implementation will provide a pathway to more competitive and open F-22 modernization. Mode 5 IFF is a Joint Requirements Oversight Council-mandated Blue Force identification capability that improves Raptor survivability and reduces fratricide risk DoD-wide. This capability brings significantly enhanced combat identification in both quality and security. The SATURN radio will align F-22 UHF voice and data security requirements with several NATO allied Standardization Agreements and also with U.S. Procurement Specifications. This major thrust also covers F-22 program activities required to update Tactical Secure Voice Cryptographic Interoperability Specification (TSVCIS) 3.1 to version 3.1.1, a key component of Cryptographic Modernization Planning as directed by CJCSI-6510.02D and to align with guidance from the National Cryptographic Solution Management Office (NSCMO), August 2020. The Communication Systems major thrust utilizes 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 2022 Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Continue software development for additional Link 16 and Mode 5 IFF Reply capabilities for fielding with subsequent releases. Mode 5 IFF Challenge capabilities will continue development and system lab test of hardware and software.</p> <p>FY 2023 Base Plans: Continue software development for additional Link 16 and Mode 5 IFF Reply capabilities for fielding with subsequent releases. Continue development and system lab test of hardware and software for Mode 5 IFF Challenge capabilities. Complete delivery of Mode 5 IFF Challenge DT/OT hardware kits. Complete qualification activities of Mode 5 IFF Challenge power supplies and crypto modules. Begin development of SATURN radio hardware and software. Begin development of TSVICIS software updates.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Decrease of \$31.027M from FY22 to FY23 reflects the planned completion of hardware development for initial release of Mode 5 and Link 16 in FY23.</p>					
<p>Title: Low Drag Tanks and Pylons</p> <p>Description: The F-22 Low Drag Tank and Pylon (LDTP) capability is critical to maintaining Air Superiority in the joint fight and combating emerging threats. Due to the advancement of adversary technologies in detection and emergence of fighter, cargo, and refueling platforms increasing engagement ranges, it is critical to future mission execution and success to provide the Raptor with an increased range capability while maintaining own-ship survivability.</p> <p>The F-22 LDTPs are advanced technological designs providing increased persistence and range while maintaining lethality and survivability. The low drag tanks are intended to reduce drag, facilitate supersonic flight with external tanks and extend the range of the F-22. The pylons are equipped with smart rack pneumatic technology to accurately control ejection performance and smooth wind swept surface for minimum drag without store.</p> <p>LDTP risk reduction activities are captured under the Advanced Technology Development (ATD) major thrust. Documentation of the development and integration components as part of the Engineering, Manufacturing, and Development (EMD) program will be captured under the LDTP major thrust.</p> <p>FY 2022 Plans:</p>	0.000	0.000	22.000	0.000	22.000

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Continue technology maturation and perform risk reduction tasks to support software integration, flight testing, and fielding. These tasks are captured within the ATD major thrust for FY22. The primary focus of this effort will be to accomplish tasks to include, but not limited to; procurement of test assets, flight test program/matrix development, software and hardware integration.					
FY 2023 Base Plans: Continue technology maturation and risk reduction projects while transitioning to EMD, where operational testing will be accomplished in parallel with developmental testing efforts. Accomplish software and hardware development for future fleet release to support both old and new pylon/tank configurations.					
FY 2023 OCO Plans: N/A					
FY 2022 to FY 2023 Increase/Decrease Statement: Increase of \$22.000M from FY22 to FY23 reflects the transition from risk reduction activities captured under the ATD major thrust to the beginning of EMD in FY23.					
Accomplishments/Planned Programs Subtotals	485.953	647.224	559.709	0.000	559.709

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• APAF 05 Line Item F02200: F-22A Squadrons, PE 0207138F*	405.095	450.907	812.258	-	812.258	868.138	873.971	850.569	894.880	Continuing	Continuing
• APAF 05 F2232B: Increment 3.2b	1.289	-	-	-	-	-	-	-	-	0.000	1.289
• RDTE 07 PE 0207138F: F-22 Tactical Mandates	156.185	0.072	-	-	-	-	-	-	-	Continuing	Continuing

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.

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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u> <u>Base</u>	<u>FY 2023</u> <u>OCO</u>	<u>FY 2023</u> <u>Total</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
***F-22 Tactical Mandates, RDT&E/PE 0207138F, includes funding for F-22A Tactical Mandates modernization and development BPAC 674788. Communication Systems major thrust is 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 (OFF) upgrades, and associated efforts essential to accomplishing the F-22 mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / F-22A Squadrons	Project (Number/Name) 674785 / F-22
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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Infrastructure	Various	Various : Various	0.000	165.834	Oct 2020	208.010	Oct 2021	212.443	Oct 2022	-		212.443	Continuing	Continuing	-
Advanced Technology Development	Various	Various : Various	0.000	38.648	Nov 2020	59.627	Nov 2021	61.080	Nov 2022	-		61.080	Continuing	Continuing	-
Sensor Systems	SS/ Various	Lockheed Martin : Fort Worth, TX	0.000	269.978	Apr 2021	238.704	Feb 2022	160.200	Nov 2022	-		160.200	Continuing	Continuing	-
Navigation Systems	SS/ Various	Lockheed Martin : Fort Worth, TX	0.000	9.000	Oct 2020	24.212	Oct 2021	18.603	Nov 2022	-		18.603	Continuing	Continuing	-
Communication Systems	SS/ Various	Lockheed Martin : Fort Worth, TX	0.000	-		110.557	Oct 2021	79.530	Nov 2022	-		79.530	Continuing	Continuing	-
Low Drag Tanks and Pylons	SS/CPIF	Lockheed Martin : Fort Worth, TX	0.000	-		-		22.000	Mar 2023	-		22.000	Continuing	Continuing	-
Subtotal			0.000	483.460		641.110		553.856		-		553.856	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Direct Cite Civilian Pay	Various	Not specified : TBD	0.000	2.493	Oct 2020	6.114	Oct 2021	5.853	Oct 2022	-		5.853	0.000	14.460	-
Subtotal			0.000	2.493		6.114		5.853		-		5.853	0.000	14.460	N/A

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	485.953	647.224	559.709	-	559.709	Continuing	Continuing	N/A

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

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / F-22A Squadrons	Project (Number/Name) 674785 / F-22
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FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

F-22 Squadrons	
Advanced Technology Development Demonstrations	
Advanced Technology Development Studies & Analysis	
Navigation Systems CRPA Development, Integration, and Test	
Navigation Systems EGI-M Development, Integration, and Test	
Sensor Systems - Technical Demo/Group B Production Decision	
Sensor Systems - DT/OT	
Sensor Systems - Fleet Authorization	
Sensor Systems - RAA	
Communication Systems - Release 1 (initial Link 16 Transmit & IFF Reply capability) Development, Integration, & Test	
Communication Systems - Release 1 CAF Installs	
Communication Systems - Release 2 (additional Link 16 capability) Development, Integration, & Test	
Communication Systems - Release 3 (additional Link 16 & IFF Reply capability) Development, Integration, & Test	
Communication Systems - Release 4 (Mode 5 IFF Challenge) Development, Integration, & Test	

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / F-22A Squadrons	Project (Number/Name) 674785 / F-22
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	FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Communication Systems - Release 4 CAF Installs																																
Low Drag Tanks and Pylons - Milestone Decision Authority Technical Demonstration																																
Low Drag Tanks and Pylons - DT/OT																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / <i>F-22A Squadrons</i>	Project (Number/Name) 674785 / <i>F-22</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>F-22 Squadrons</i>				
Advanced Technology Development Demonstrations	1	2021	4	2027
Advanced Technology Development Studies & Analysis	1	2021	4	2027
Navigation Systems CRPA Development, Integration, and Test	1	2021	4	2024
Navigation Systems EGI-M Development, Integration, and Test	1	2021	4	2026
Sensor Systems - Technical Demo/Group B Production Decision	4	2022	4	2022
Sensor Systems - DT/OT	3	2023	3	2025
Sensor Systems - Fleet Authorization	4	2025	4	2025
Sensor Systems - RAA	1	2026	1	2026
Communication Systems - Release 1 (initial Link 16 Transmit & IFF Reply capability) Development, Integration, & Test	1	2021	4	2021
Communication Systems - Release 1 CAF Installs	1	2022	1	2025
Communication Systems - Release 2 (additional Link 16 capability) Development, Integration, & Test	1	2021	4	2022
Communication Systems - Release 3 (additional Link 16 & IFF Reply capability) Development, Integration, & Test	1	2022	4	2023
Communication Systems - Release 4 (Mode 5 IFF Challenge) Development, Integration, & Test	1	2021	4	2025
Communication Systems - Release 4 CAF Installs	1	2025	4	2027
Low Drag Tanks and Pylons - Milestone Decision Authority Technical Demonstration	4	2023	4	2023
Low Drag Tanks and Pylons - DT/OT	3	2023	4	2024

Note

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

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force										Date: April 2022		
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
674788: F-22 Tactical Mandates	0.000	156.185	0.072	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project has been consolidated into Budget Program Activity Code (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 is unchanged from the FY22PB and remains for reference to current year and prior year budget activity.

This project 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 Challenge and Reply 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 development programs utilize 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 FY21 and FY22 will differ from totals shown in each Major Thrust due to balancing program funding at the BPAC level. The Sensor System Major Thrust executed \$266.9M of FY21 funds in BPAC 674785; Communication Systems executed \$159.3M of FY21 funds in BPAC 674788. All funding for Communication Systems in FY22 and FY23 will be executed in BPAC 674785.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Communication Systems	156.185	0.072	0.000	0.000	0.000
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 Challenge and Reply on the F-22. Link 16 Transmit will be accomplished via an Open System Architecture (OSA) integrated with F-22 legacy avionics.					

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>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 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 utilize 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.</p> <p>FY 2022 Plans: This project has been consolidated into BPAC 674785 F-22 Squadrons. FY22 plans for Communication Systems can be found in the F-22 Squadrons R-2A exhibit.</p> <p>FY 2023 Base Plans: This project has been consolidated into BPAC 674785 F-22 Squadrons. FY23 plans for Communication Systems can be found in the F-22 Squadrons R-2A exhibit.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: N/A</p>					
Accomplishments/Planned Programs Subtotals	156.185	0.072	0.000	0.000	0.000

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTE 07 PE 0207138F: <i>F-22A Squadrons*</i>	485.953	647.224	559.709	-	559.709	566.247	541.382	543.214	528.745	Continuing	Continuing
• APAF 05 Line Item F02200: <i>F-22A Squadrons, PE 0207138F**</i>	405.095	450.907	812.258	-	812.258	868.138	873.971	850.569	894.880	Continuing	Continuing
• APAF 05 Line Item F2232B: <i>F-22A Increment 3.2B, PE 0207138F****</i>	1.289	-	-	-	-	-	-	-	-	0.000	1.289

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force	Date: April 2022
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Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / F-22A Squadrons	Project (Number/Name) 674788 / F-22 Tactical Mandates
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u> <u>Base</u>	<u>FY 2023</u> <u>OCO</u>	<u>FY 2023</u> <u>Total</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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Remarks
NOTES:

*F-22 Squadrons, RDT&E/PE 0207138F, includes funding for F-22A Squadrons modernization and development BPAC 674785. Communication Systems major thrust is captured under BPAC 674785 beginning 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 (OFF) upgrades, and associated efforts essential to accomplishing the F-22 mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / F-22A Squadrons	Project (Number/Name) 674788 / F-22 Tactical Mandates
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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Communication Systems	SS/ Various	Lockheed Martin : Ft Worth, TX	0.000	156.185	Oct 2020	0.072	Nov 2021	0.000		-		0.000	Continuing	Continuing	-
Subtotal			0.000	156.185		0.072		0.000		-		0.000	Continuing	Continuing	N/A
Project Cost Totals			0.000	156.185		0.072		0.000		-		0.000	Continuing	Continuing	N/A

Remarks
Execution under Communication Systems is captured in BPAC 674785 F-22 Squadrons exhibits beginning in FY22.

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / F-22A Squadrons	Project (Number/Name) 674788 / F-22 Tactical Mandates
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FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

F-22 TACTICAL MANDATES	
Release 1 (initial Link 16 Transmit & IFF Reply capability) Development, Integration, & Test	
Release 1 Combat Air Force (CAF) Installs	
Release 2 (additional Link 16 capability) Development, Integration, & Test	
Release 3 (additional Link 16 & IFF Reply capability) Development, Integration, & Test	
Release 4 (Mode 5 IFF Challenge) Development, Integration, & Test	
Release 4 CAF Installs	

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0207138F / <i>F-22A Squadrons</i>	Project (Number/Name) 674788 / <i>F-22 Tactical Mandates</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>F-22 TACTICAL MANDATES</i>				
Release 1 (initial Link 16 Transmit & IFF Reply capability) Development, Integration, & Test	1	2021	4	2021
Release 1 Combat Air Force (CAF) Installs	1	2022	1	2025
Release 2 (additional Link 16 capability) Development, Integration, & Test	1	2021	4	2022
Release 3 (additional Link 16 & IFF Reply capability) Development, Integration, & Test	1	2022	4	2023
Release 4 (Mode 5 IFF Challenge) Development, Integration, & Test	1	2021	4	2025
Release 4 CAF Installs	1	2025	4	2027

Note

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