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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2021 Air Force **Date:** February 2020

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 7: Operational Systems Development</i>	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / <i>F-22A Squadrons</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	563.635	546.298	665.038	0.000	665.038	597.965	556.771	637.390	614.470	Continuing	Continuing
674785: <i>F-22</i>	0.000	304.668	470.138	514.429	0.000	514.429	431.443	428.583	560.566	594.821	Continuing	Continuing
674788: <i>F-22 Tactical Mandates</i>	0.000	258.967	76.160	150.609	0.000	150.609	166.522	128.188	76.824	19.649	Continuing	Continuing

**Note**  
 Project Infrastructure, combined the following major thrusts Operational Software Development, Reliability and Maintainability Program, F-22 Small Projects, Combined Test Force from BPAC 674785 and Laboratory Test and Operations, Lab and Combined Test Force from BPAC 674788.

Project Communication Systems, combined the following major thrusts Link 16, Mode 5 Identification Friend or Foe and Systems Engineering/Program Management Support from BPAC 674788.

**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 40+ years. 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.

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 F-22 weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

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.

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<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
Previous President's Budget	584.743	496.298	666.253	0.000	666.253
Current President's Budget	563.635	546.298	665.038	0.000	665.038
Total Adjustments	-21.108	50.000	-1.215	0.000	-1.215
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	50.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-21.108	0.000			
• Other Adjustments	0.000	0.000	-1.215	0.000	-1.215

**Change Summary Explanation**

FY19 SBIR reduction of \$21.108M

FY20 Congressional transfer of \$50M from APAF Line 28 to RDT&E Line 182 for F-22A Modernization

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Air Force										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 3600 / 7					<b>R-1 Program Element (Number/Name)</b> PE 0207138F / F-22A Squadrons				<b>Project (Number/Name)</b> 674785 / F-22			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
674785: F-22	0.000	304.668	470.138	514.429	0.000	514.429	431.443	428.583	560.566	594.821	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

Project Infrastructure, combined the following major thrusts Operational Software Development, Reliability and Maintainability Program, F-22 Small Projects, Combined Test Force from BPAC 674785 and Laboratory Test and Operations, Lab and Combined Test Force from BPAC 674788.

**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 40+ years. 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.

FY20 planned execution in sensor systems in BPAC 674785 will be \$69M to include the \$50M Congressional Add for F-22 Modernization. FY20 planned execution in communication systems in BPAC 674788 will be \$186M.

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<b>Title:</b> Update 6	11.949	4.000	0.000
<b>Description:</b> 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 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.			
<b>FY 2020 Plans:</b>			

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<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / F-22A Squadrons	<b>Project (Number/Name)</b> 674785 / F-22
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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
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<p>U6 Interoperability will complete system test and formal integrated flight test followed by completion of a sufficiency of test review. U6 Interoperability will then complete a fielding decision review and begin fleet release.</p>			
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**FY 2021 Plans:**  
U6 development program ends in FY20.

**FY 2020 to FY 2021 Increase/Decrease Statement:**  
Development ends in FY20.

<b>Title:</b> Infrastructure	144.841	188.128	193.963
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**Description:** This major thrust was formerly comprised of: Operational Software Development, Reliability and Maintainability Program (RAMP), F-22 Small Projects, Combined Test Force (CTF), Laboratory Test and Operations (LTO), and the Lab and Combined Test Force thrust from BPAC 674788.

Labs and Combined Test Force 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 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 Combined Test Force (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.

F-22 Small Projects provides technology studies and demonstrations to include, but not limited to, Low Observable (LO) signature management, threat modeling support, Developmental Test (DT) weapon assets, Pilot Training (PT), dynamic Synthetic Aperture Radar (SAR), cyber security, flight test engine refurbishment, support equipment development, Government Furnished Equipment (GFE), and Electronic Warfare (EW) system enhancements to counter evolving threats.

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. RAMP includes modifications to address corrosion, reduce maintenance hours, increase safety, and provide urgent response requirements to the F-22 CTF.

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<p>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.</p> <p><b><i>FY 2020 Plans:</i></b> Labs and CTF will continue planning and execution of F-22 Raptor software and hardware in support of Link 16, Mode 5 IFF, Sensor Systems, and OFP releases within the Labs to hand off to the CTF for testing. Additionally, Labs plans to update critical systems to include technology refresh and laboratory improvements (to include virtual components) required to support new aircraft configurations and capabilities.</p> <p>F-22 Small Projects will continue 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, PT, dynamic SAR, Flutter Excitation System (FES), GFE, and EW enhancements.</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 will continue 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>FY20 total includes \$17.893M for SBIR/STTR transfer that has not been implemented. FY20 and out also include costs for Lab/CTF test execution whereas FY19 did not. Lab/CTF test execution costs are anticipated to be \$20.8M in FY20.</p> <p><b><i>FY 2021 Plans:</i></b> Laboratory Test and Operations (LTO) plans to incorporate support of F-22 In a Box/Joint Simulated Environment (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.</p> <p>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, PT, dynamic SAR, GFE, and EW enhancements.</p>			

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<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / F-22A Squadrons	<b>Project (Number/Name)</b> 674785 / F-22		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<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>FY21 total includes \$24M for estimated SBIR/STTR transfer.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> \$5.84M increase from FY21 to FY20 due to CTF.</p>				
<p><b>Title:</b> Advanced Technology Development (ATD)</p> <p><b>Description:</b> 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><b>FY 2020 Plans:</b> Continue technology maturation and risk reduction projects in support of various classified F-22 development efforts. ATD also provides continued technology maturation and acquisition planning for the F-22 Sensor Systems program.</p> <p><b>FY 2021 Plans:</b> Continue technology maturation and risk reduction projects in support of various classified F-22 development efforts. ATD also provides continued technology maturation and acquisition planning for the F-22 Sensor Systems program.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> \$45.400M decrease from FY20 to FY21 due to completion of technology demo.</p>		111.612	93.600	48.200
<p><b>Title:</b> Sensor Systems</p> <p><b>Description:</b> This major thrust was formerly known as Sensor Enhancements. As part of the F-22 Capability Pipeline, implemented through Section 804 Middle Tier Acquisition (MTA) authority, Sensor Systems improves sensor capabilities to maintain air dominance and preserve first look, first shot, and first kill capability. The F-22 Sensor Systems 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>		29.182	179.686	248.823

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<p><b>FY 2020 Plans:</b> Continue software and hardware development for future fleet release and begin purchase of developmental test assets. FY20 also includes a \$50M Congressional Add for F-22 Modernization. FY20 planned execution in sensor systems in BPAC 674785 will be \$69M which includes the \$50M Congressional Add for F-22 Modernization. FY20 planned execution in communication systems in BPAC 674788 will be \$186M.</p> <p><b>FY 2021 Plans:</b> Continue software and hardware development for future fleet release. Purchase of developmental test assets.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> \$69.14M increase from FY20 to FY21 due to continued purchase of DT/OT assets, supplier support for DT/OT planning, environment standup, lab/system/airframe integration, and logistics development</p>			
<p><b>Title:</b> Navigation Systems</p> <p><b>Description:</b> 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, to include in Global Positioning System (GPS) degraded environments. As part of the F-22 Capability Pipeline, implemented through Section 804 Middle Tier Acquisition (MTA) authority, this effort will include the integration of Embedded GPS/Inertial Navigation System (INS) Modernization (EGI-M) onto the F-22 for M-Code, replacement of the legacy GPS antenna with a robust Controlled Radiation Pattern Antenna (CRPA), as well as other capabilities, to prevent exploitation of the weapon system by adversaries and 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 cadence approach as capabilities mature.</p> <p><b>FY 2020 Plans:</b> Complete risk reduction activities for F-22 GPS CRPA and transition to development. FY20 activities will include system level testing of the CRPA in F-22 system labs. Design Group A kits for CRPA and EGI-M.</p> <p><b>FY 2021 Plans:</b> Continue to work development activities for F-22 GPS CRPA. FY21 activities will include continuing system level testing of the CRPA and begin to utilize EGI-M production representative units in F-22 system labs and tests. Continue designing Group A kits for CRPA and EGI-M and begin the transition to purchasing Group A kits for test.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> \$18.72M increase from FY20 to FY21 due to software development, hardware integration and CRPA test asset procurement.</p>	7.084	4.724	23.443
<b>Accomplishments/Planned Programs Subtotals</b>	304.668	470.138	514.429

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Air Force		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / F-22A Squadrons	<b>Project (Number/Name)</b> 674785 / F-22

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

Line Item	FY 2019	FY 2020	FY 2021	FY 2021	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Cost To	
			Base	OCO	Total					Complete	Total Cost
• APAF 05 Line Item F02200: <i>F-22A Squadrons, PE 0207138F*</i>	304.668	250.674	552.914	-	552.914	618.872	686.872	690.362	745.871	Continuing	Continuing
• APAF 05 Line Item F2232B: <i>F-22 Increment 3.2B, PE 0207138F***</i>	2.007	20.213	5.889	-	5.889	-	-	-	-	0.000	28.109
• RDTE 07 PE 0207138F: <i>F-22 Tactical Mandates</i>	258.967	76.160	150.609	-	150.609	166.522	128.188	76.824	19.649	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.

\*\*\*F-22 Tactical Mandates, RDT&E/PE 0207138F, includes funding for F-22A Tactical Mandates modernization and development BPAC 674788.

**D. Acquisition Strategy**

The Raptor Enhancement Development & Integration II (REDI II) contract is an Indefinite Delivery/Indefinite Quantity (ID/IQ) ordering contract that maximizes flexibility to start, stop, accelerate and decelerate projects as required. The (REDI) II contract is a follow-on to the initial REDI contract. REDI II provides maximum flexibility to manage various modernization projects. The REDI II contract allows 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 (OFFP) upgrades, and associated efforts essential to accomplishing the F-22 mission.



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**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / <i>F-22A Squadrons</i>	<b>Project (Number/Name)</b> 674785 / <i>F-22</i>
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FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
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

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
<b><i>F-22 Squadrons</i></b>																												
Update 6 Interoperability Flight Test																												
Update 6 Interoperability Deployment Decision Review																												
Update 6 Interoperability Full Deployment (Fleet Release)																												
Advanced Technology Development Demonstrations																												
Advanced Technology Development Studies & Analysis																												
Navigation Systems Development, Integration, and Test																												

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Air Force **Date:** February 2020

<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / <i>F-22A Squadrons</i>	<b>Project (Number/Name)</b> 674785 / <i>F-22</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>F-22 Squadrons</i></b>				
Update 6 Interoperability Flight Test	1	2019	2	2020
Update 6 Interoperability Deployment Decision Review	2	2020	2	2020
Update 6 Interoperability Full Deployment (Fleet Release)	3	2020	3	2020
Advanced Technology Development Demonstrations	1	2019	4	2025
Advanced Technology Development Studies & Analysis	1	2019	4	2025
Navigation Systems Development, Integration, and Test	1	2019	4	2024

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Air Force										<b>Date:</b> February 2020		
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<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
674788: F-22 Tactical Mandates	0.000	258.967	76.160	150.609	0.000	150.609	166.522	128.188	76.824	19.649	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

Project Communication Systems, combined the following major thrusts Link 16, Mode 5 Identification Friend or Foe and Systems Engineering/Program Management Support from BPAC 674788.

**A. Mission Description and Budget Item Justification**

This Budget Program Activity Code 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.

FY20 planned execution in sensor systems in BPAC 674785 will be \$69M to include the \$50M Congressional Add for F-22 Modernization. FY20 planned execution in communication systems in BPAC 674788 will be \$186M.

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

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<b>Title:</b> Communication Systems	258.967	76.160	150.609
<b>Description:</b> This major thrust was formerly comprised of Link 16, Mode 5 Identification Friend or Foe (IFF) and Systems Engineering/Program Management Support. As part of the F-22 Capability Pipeline, implemented through Section 804 Middle Tier Acquisition (MTA) authority, 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 also provides an opportunity to incorporate other			

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

<p>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 to include, but not be 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.</p> <p><b>FY 2020 Plans:</b> Initial Link 16 and Mode 5 IFF Transpond capabilities will begin Developmental Test (DT) and Operational Test (OT) in preparation for release to the F-22 combat fleet. Mode 5 IFF Interrogate capabilities will continue development and begin system lab test of hardware and software. Transition F-22 Talon SPITBALL activities from Air Force Tactical Exploitation of National Capabilities (TENCAP) office to F-22 Program Office to continue development and integration activities for the F-22 Raptor. FY20 planned execution in communication systems in BPAC 674788 will be \$186M. FY20 planned execution in sensor systems in BPAC 674785 will be \$69M to include the \$50M Congressional Add for F-22 Modernization.</p> <p><b>FY 2021 Plans:</b> 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. Continue transition F-22 Talon SPITBALL activities from Air Force Tactical Exploitation of National Capabilities (TENCAP) office to F-22 Program Office to continue development and integration activities for the F-22 Raptor.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> \$74.45M increase from FY20 to FY21 due to balancing between BPACs.</p>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<b>Accomplishments/Planned Programs Subtotals</b>	258.967	76.160	150.609

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE 07 PE 0207138F: <i>F-22A Squadrons*</i>	387.807	420.138	488.055	-	488.055	598.873	557.607	638.428	615.417	Continuing	Continuing
• APAF 05 Line Item F02200: <i>F-22A Squadrons, PE 0207138F**</i>	405.650	250.674	552.914	-	552.914	618.631	686.872	690.362	745.871	Continuing	Continuing
• APAF 05 Line Item F2232B: <i>F-22A</i> <i>Increment 3.2B, PE 0207138F****</i>	2.007	20.213	5.889	-	5.889	-	-	-	-	0.000	28.109

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Air Force	<b>Date:</b> February 2020
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<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / <i>F-22A Squadrons</i>	<b>Project (Number/Name)</b> 674788 / <i>F-22 Tactical Mandates</i>
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**C. Other Program Funding Summary (\$ in Millions)**

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</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.

\*\*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**

The Raptor Enhancement Development & Integration II (REDI) II contract is an Indefinite Delivery/Indefinite Quantity contract that maximizes flexibility to start, stop accelerate and reaccelerate projects as required. The REDI II contract is a follow-on to the initial REDI contract. REDI II provides maximum flexibility to manage various modernization projects. The REDI II contract allows 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.



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**Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force** **Date:** February 2020

<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0207138F / F-22A Squadrons	<b>Project (Number/Name)</b> 674788 / F-22 Tactical Mandates
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	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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

<b>F-22 TACTICAL MANDATES</b>																												
Link 16 Development , Integration & Test																												
Link 16 & IFF Transpond Developmental Test																												
Link 16 & IFF Transpond Production Decision																												
Link 16 & IFF Transpond Installs																												
Mode 5 IFF Development, Integration & Test																												
Mode 5 IFF Interrogate Developmental Test																												
Mode 5 IFF Interrogate Production Decision																												
Mode 5 IFF Interrogate Installs																												

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2021 Air Force **Date:** February 2020

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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>F-22 TACTICAL MANDATES</i></b>				
Link 16 Development , Integration & Test	1	2019	4	2021
Link 16 & IFF Transpond Developmental Test	2	2020	3	2021
Link 16 & IFF Transpond Production Decision	4	2019	4	2019
Link 16 & IFF Transpond Installs	1	2022	4	2024
Mode 5 IFF Development, Integration & Test	1	2019	1	2024
Mode 5 IFF Interrogate Developmental Test	4	2022	1	2024
Mode 5 IFF Interrogate Production Decision	2	2023	2	2023
Mode 5 IFF Interrogate Installs	2	2024	4	2025