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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 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603790F / NATO Research and Development
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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	-	2.221	4.955	3.647	0.000	3.647	4.141	4.215	4.290	4.368	0.000	27.837
64NATO: <i>Nato Coop R&amp;D</i>	-	2.221	4.955	3.647	0.000	3.647	4.141	4.215	4.290	4.368	0.000	27.837
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

**Note**

In FY 2016, PE 0603791F, International Space Cooperative Research & Development, Project 645035, International Space Coop R&D, efforts were transferred to PE 0603790F, NATO Research and Development, Project 64NATO, NATO Coop R&D, in order to consolidate international cooperative research and development activities.

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

These funds will be used to initiate air, space, and cyber international cooperative research, and development (ICR&D) agreements with North Atlantic Treaty Organization (NATO) member states, major non-NATO allies and friendly foreign countries. Each of the selected activities and projects are required to have a concluded international agreement (IA), prior to funds being released, that implements the provisions of Title 10 U.S. Code, Section 2350a. This legislation (Title 10 U.S. Code, Section 2350) authorizes funds to significantly improve U.S. and allied conventional defense capabilities by leveraging the best defense technologies, eliminating costly duplication of R&D efforts, accelerating the availability of defense systems, and promoting US and allied interoperability or commonality. These funds will not be used for government civilian salaries, permanent construction, or spent overseas. This program element funds the implementation of Air Force ICR&D agreements in (1) Basic Research (2) Applied Research (3) Advanced Technology Development (4) Advanced Component Development and Prototypes (5) System Development and Demonstration and (6) RDT&E Management Support.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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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	2.305	4.955	4.701	0.000	4.701
Current President's Budget	2.221	4.955	3.647	0.000	3.647
Total Adjustments	-0.084	0.000	-1.054	0.000	-1.054
• 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	0.000	0.000			
• Other Adjustments	-0.084	0.000	-1.054	0.000	-1.054
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>		
<b>Title:</b> International Cooperative Research and Development	2.221	4.955	3.647		
<b>Description:</b> Supports bi- and multi-lateral international agreements that meet USAF RDT&E objectives and goals. Each of the cooperative projects that receive funding must meet one or more of the following requirements: enhance warfighter capabilities and coalition interoperability; accelerate the availability of defense systems; strengthen and reinforce strategic partnerships; gain access to the best defense technologies, capabilities and techniques; build relationships and influence with allies; and/or eliminate duplication of R&D efforts.					
<b>FY 2020 Plans:</b> FY20 cooperative projects involve RDT&E efforts in Autonomy, human performance, information systems, aerospace systems, munitions, materials and manufacturing, sensors, space situational awareness, missile warning, military satellite communications, global positioning systems, responsive space capabilities, cyber network defense and information assurance, and space vehicles. These projects include but are not limited to: Autonomous Fighter Risk Reduction; 5th Generation Ground Collision System Avoidance; Hypersonic ceramic composite; Protected Tactical Enterprise; Military Optical Communications and Optical Space Data Relay (MOSCOM)Support; NEMISIS-UAS surveillance; Deep Strike Weapon Systems THRESHER 1 and 2; Biological inspired technologies integrated on UAS platforms; Cyber Space-Building Trusted Networks and Resilient Systems, Space Situational Awareness; Impact Damage and Fire Effects; Spectral-aided tagging, tracking, and locating (SATTL); Autonomous Situational Awareness Technology; and Protected Tactical Field System Demo (PTFSD). These projects involved interoperability in cooperative R&D ventures with these Allies, Major Non-NATO Allies and Strategic Partners: Australia, France, Germany, Republic of Korea, Japan, Norway, United Kingdom, Canada, Spain, Singapore, and Sweden.					

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
N/A				
<p><b>FY 2021 Plans:</b>  FY21 cooperative projects involve RDT&amp;E efforts in Artificial Intelligence, directed energy, hypersonics, Autonomy, human performance, information systems, aerospace systems, munitions, materials and manufacturing, sensors, space situational awareness, missile warning, military satellite communications, global positioning systems, responsive space capabilities, cyber network defense and information assurance, and space vehicles. These projects include but are not limited to: Development of Emerging Additive Manufacturing Technologies (DAWN); Mission Planning for Photonic Systems; Micro-Satellite Military Utility (MSMU) Ground Station Interoperability; Improved Technology for High-temperature Alloys Necessary to Optimize Small Supersonic Systems (I-THANOS3); Himalayan Eagle; Ignition Optimization Using Pulsed Discharge; Selected Cyber Information Exchange; Next Generation EO IR Sensor Technology (NGIEST); Solid State High Power Microwave 'Cannon'; HPM Target Effects &amp; Weaponization; Deep Space Radar; Confined Quantum Sensors; Embedded Flow Control for Low Pressure Turbines (LPTs); Sensors &amp; PID (Positive threat Identification) Enhanced Model for Directed Energy; Hybrid Ultra-Wide/Narrow Band Directed Energy Weapon (DEW); Quantum Sensors for Ephemeris-Free Space Operations; Improved HPEM Elements for Next Generation RF-Directed Energy Weapons; and Intelligent Adaptive Collaborative Teaming Technologies (IACTT). These projects involved interoperability in cooperative R&amp;D ventures with these Allies, Major Non-NATO Allies and Strategic Partners: Australia, Estonia, Israel, Germany, Canada, United Kingdom, Italy, Netherlands, Norway, New Zealand, India, Republic of Korea, Japan, and Singapore.</p>				
N/A				
<p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b>  NATO Coop R&amp;D experienced a decrease between FY20 and FY21 of \$1.348 which will be the new baseline for future years.</p>				
<b>Accomplishments/Planned Programs Subtotals</b>		2.221	4.955	3.647
<b>D. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
<b>E. Acquisition Strategy</b>				
A principal goal of the NATO Cooperative R&D program is to effectively utilize the aggregate resources invested by the US and our allies in air, space, and cyber R&D. This program element provides the critical funding incentive needed to pursue air, space and cyber related International Cooperative Research Development and Acquisition (ICRD&A) agreements and helps to (a) leverage USAF and allied resources through cost sharing and economies of scale; (b) exploit the best US				

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<b>Appropriation/Budget Activity</b>	<b>R-1 Program Element (Number/Name)</b>
3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	PE 0603790F / <i>NATO Research and Development</i>

and allied technologies for equipping coalition forces; (c) demonstrate areas of commonality or interoperability with our allies; and (d) accelerate the availability of defense technology and systems. Candidate projects are reviewed against USAF goals, DoD objectives, and warfighter needs prior to being approved. An international agreement defining project objectives, responsibilities and costs is required prior to release of funds. To obtain these funds and ensure service commitment, projects are selected from existing or new RDT&E programs funded in the Future Years Defense Plan (FYDP). Project offices must show matching funds and contributions from associated program elements and equitable allied funding. As appropriate, funding responsibility for out-year requirements and follow-on efforts are transferred to the project office and associated program elements. Any new contracts are awarded after full and open competition.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)					Project (Number/Name)						
3600 / 4				PE 0603790F / NATO Research and Development					64NATO / Nato Coop R&D						
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Support	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
NATO Coop R&D (International Research Projects)	Various	Various : NV	-	1.111	Feb 2019	3.468	Feb 2020	2.055	Feb 2021	0.000		2.055	Continuing	Continuing	-
<b>Subtotal</b>			-	1.111		3.468		2.055		0.000		2.055	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
NATO Coop R&D (International Research Projects)	Various	Various : NV	-	1.110	Feb 2019	1.487	Feb 2020	1.592	Feb 2021	0.000		1.592	Continuing	Continuing	-
<b>Subtotal</b>			-	1.110		1.487		1.592		0.000		1.592	Continuing	Continuing	N/A
<b>Project Cost Totals</b>			-	2.221		4.955		3.647		0.000		3.647	Continuing	Continuing	N/A
<b>Remarks</b>															

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<b>Exhibit R-4, RDT&amp;E Schedule Profile:</b> PB 2021 Air Force		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603790F / NATO Research and Development	<b>Project (Number/Name)</b> 64NATO / Nato Coop R&D

	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>NATO Coop R&amp;D</b>																												
FY21 ICR&D Projects - Call Letter		■																										
FY21 ICR&D Projects - nomination package development		■																										
FY21 ICR&D Projects - Review panel			■																									
FY21 ICR&D Projects - Coordination of review panel results				■																								
FY21 ICR&D Approved Project Letter to the MAJCOMs				■																								
FY21 ICR&D Projects - Agreement development, negotiations, and signature					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
FY21 ICR&D Projects - RDTE cooperative project work					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Air Force		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0603790F / NATO Research and Development	<b>Project (Number/Name)</b> 64NATO / Nato Coop R&D

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>NATO Coop R&amp;D</b>				
FY21 ICR&D Projects - Call Letter	2	2019	3	2019
FY21 ICR&D Projects - nomination package development	2	2019	3	2019
FY21 ICR&D Projects - Review panel	3	2019	3	2019
FY21 ICR&D Projects - Coordination of review panel results	4	2019	4	2019
FY21 ICR&D Approved Project Letter to the MAJCOMs	4	2019	4	2019
FY21 ICR&D Projects - Agreement development, negotiations, and signature	1	2020	2	2021
FY21 ICR&D Projects - RDTE cooperative project work	1	2020	2	2021