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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force										Date: February 2019		
Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)					R-1 Program Element (Number/Name) PE 0603790F I NATO Research and Development							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	3.710	2.305	4.955	0.000	4.955	4.701	4.147	4.222	4.298	0.000	28.338
64NATO: Nato Coop R&D	-	3.710	2.305	4.955	0.000	4.955	4.701	4.147	4.222	4.298	0.000	28.338
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.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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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3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)		PE 0603790F I NATO Research and Development			
B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.851	2.305	4.955	0.000	4.955
Current President's Budget	3.710	2.305	4.955	0.000	4.955
Total Adjustments	-0.141	0.000	0.000	0.000	0.000
• 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	-0.141	0.000	0.000	0.000	0.000
C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: International Cooperative Research and Development	3.710	2.305	4.955	0.000	4.955
Description: 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.					
FY 2019 Plans: FY19 cooperative projects involve RDT&E efforts in 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; two Classified Projects in Cyber; Physiological Assessment for Warfighter Performance Prediction; Sensors & PID Enhanced by Directed Energy; Real-time Decentralized Task Allocation for Heterogeneous Swarming UAV; Weapon Effects with respect to Military Operations in Urban Terrain; Coated CMCs for Hypersonics; Materials for Long Pulse Laser Protection; Counter Agile Radar Application; Collaborative Space Domain Awareness (SDA) Data Collection and Fusion; Airborne Data Exchange; Cooperative Research on Anti-swarm Fuze-sensor Technology; Adaptive Automation to Support Team Decision Making in Complex Environments;Solid Propellant Rotating Detonation Engine Demonstrator; Autonomous Fighter Risk Reduction Program; Infusion Processing					

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and Fatigue; Analyses of Polymer Matrix Composites considering Environmental Effects; Cognitive Biomarker Sensor Development; Advanced Fuel-Spray Diagnostics for Propulsion Systems; Improved Durable Engines for UAVs; Bio-Inspired Technologies for Unmanned Autonomous Systems; Improved Elements for Next Gen RF-Directed Energy Weapons, Lasers and Detectors for UAS Systems; Measures for Evaluation of Air Vehicle Systems; RF Directed Energy Weapon Target Surrogates; Time Critical Targeting in Urban Environments; WarHead Improvements using Technology for Enhanced Functionality and Increased Survivability against Hard Targets; Protected Tactical Field Demonstration; and Protected Tactical Enterprise Service.  <b>FY 2020 Base 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 (SATT); 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  <b>FY 2020 OCO Plans:</b> N/A  <b>FY 2019 to FY 2020 Increase/Decrease Statement:</b> The NATO Coop R&D Program experienced an eighty percent increase in project applications for funding. The increase in project applications coupled with budget constraints limited the number of selected projects, no project received the full funding they requested allowing additional projects to be selected. Some projects with vital non-traditional strategic partners were not selected because of the limited budget. The NATO Coop R&D Program's projected budget is insufficient to sustain the programs' continued popularity, thereby inhibiting growth						

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<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		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>			<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020 Base</b>
into key strategic areas. This program plays a vital role by mitigating critical funding capability gaps and is also a key determinant is accelerating the fielding of innovating technologies to the Warfighter.					
<b>Accomplishments/Planned Programs Subtotals</b>			3.710	2.305	4.955
<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 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.					
<b>F. Performance Metrics</b> Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.					

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2020 Air Force</b>													<b>Date:</b> February 2019		
<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				
<b>Support (\$ in Millions)</b>				<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
NATO Coop R&D (International Research Projects)	Various	Various : NV	-	2.674	Feb 2018	1.125	Feb 2019	3.468	Feb 2020	0.000		3.468	Continuing	Continuing	-
<b>Subtotal</b>			-	2.674		1.125		3.468		0.000		3.468	Continuing	Continuing	N/A
<b>Test and Evaluation (\$ in Millions)</b>				<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
NATO Coop R&D (International Research Projects)	Various	Various : NV	-	1.036	Feb 2018	1.180	Feb 2019	1.487	Feb 2020	0.000		1.487	Continuing	Continuing	-
<b>Subtotal</b>			-	1.036		1.180		1.487		0.000		1.487	Continuing	Continuing	N/A
			<b>Prior Years</b>	<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>			-	3.710		2.305		4.955		0.000		4.955	Continuing	Continuing	N/A
<b>Remarks</b>															

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<b>Exhibit R-4, RDT&amp;E Schedule Profile:</b> PB 2020 Air Force			<b>Date:</b> February 2019		
<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 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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>																												
FY20 ICR&D Projects - Call Letter																												
FY20 ICR&D Projects - nomination package development																												
FY20 ICR&D Projects - Review panel																												
FY20 ICR&D Projects - Coordination of review panel results																												
FY20 ICR&D Approved Project Letter to the MAJCOMs																												
FY20 ICR&D Projects - Agreement development, negotiations, and signature																												
FY20 ICR&D Projects - RDTE cooperative project work																												

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2020 Air Force			<b>Date:</b> February 2019
<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><i>NATO Coop R&amp;D</i></b>				
FY20 ICR&D Projects - Call Letter	2	2019	3	2019
FY20 ICR&D Projects - nomination package development	2	2019	3	2019
FY20 ICR&D Projects - Review panel	3	2019	3	2019
FY20 ICR&D Projects - Coordination of review panel results	4	2019	4	2019
FY20 ICR&D Approved Project Letter to the MAJCOMs	4	2019	4	2019
FY20 ICR&D Projects - Agreement development, negotiations, and signature	1	2019	2	2020
FY20 ICR&D Projects - RDTE cooperative project work	1	2019	2	2020