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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy **Date:** May 2021

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 7: Operational Systems Development</i>					R-1 Program Element (Number/Name) PE 0305204N / <i>Tactical Unmanned Aer Vehicles</i>							
COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	278.151	9.451	7.108	9.837	-	9.837	-	-	-	-	-	-
2478: <i>Tactical Control System</i>	278.151	9.451	7.108	9.837	-	9.837	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This program element provides funding for the software development capabilities associated with Mission modules of the Tactical Unmanned Aerial Vehicle. This project is a Joint Military Intelligence Program.

The Tactical Control System (TCS), a component of the MQ-8 System, provides software for the joint tactical MQ-8 Fire Scout System. TCS integrated into the MQ-8 Mission Control System (MCS) provides the warfighters with the capability for day/night aerial Intelligence, Surveillance and Reconnaissance (ISR), target acquisition, voice, data and command and control communications/relay, and mine detection and localization. Additionally, TCS provides a multi-level, scalable, and flexible operator control of the air vehicles and payloads as well as direct receipt and dissemination of unmanned aerial vehicle sensor data.

B. Program Change Summary (\$ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.451	7.108	11.015	-	11.015
Current President's Budget	9.451	7.108	9.837	-	9.837
Total Adjustments	0.000	0.000	-1.178	-	-1.178
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	-1.084	-	-1.084
• Rate/Misc Adjustments	0.000	0.000	-0.094	-	-0.094

Change Summary Explanation

Schedule: TCS schedule deliveries updated to reflect changes in MQ-8 Fire Scout schedule milestones. Version 10 is scheduled to complete 3Q FY2022. This aligns with MQ-8 Radar and Link-16 development and integration efforts and supports subsequent TCS deliveries. Beginning with TCS Version 11 the program is migrating to an 18 month delivery schedule for major builds.

The FY 2022 funding request was reduced by \$1.084M million to account for the availability of prior year execution balances and \$0.094 million for working capital fund rate adjustments.

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Technical: N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy **Date:** May 2021

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0305204N / <i>Tactical Unmanned Aer Vehicles</i>	Project (Number/Name) 2478 / <i>Tactical Control System</i>
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
2478: <i>Tactical Control System</i>	278.151	9.451	7.108	9.837	-	9.837	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Tactical Control System (TCS) program supports the MQ-8 Fire Scout System and is a standards-based system, which provides interoperability and commonality for Command and Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) interfaces of Unmanned Aircraft Systems (UAS). TCS software, operating on Mission Control System (MCS) (also referred to as a Ground Control Station) hardware, utilizes North Atlantic Treaty Organization (NATO) Standardization Agreements (STANAG)-4586 architecture to communicate across a Tactical Common Data Link.

TCS provides a full range of scalable UAS capabilities from passive receipt of air vehicle and payload data to full air vehicle and payload command and control. TCS offers the warfighter a common core operating environment to simultaneously receive, process, and disseminate data from different UAS types for intelligence, reconnaissance, surveillance, and combat assessment.

This program supports enhancements and updates to TCS in order to continue to meet supported air vehicle enhancements, incorporation of new technologies that will be used to enhance overall system performance, incorporate new payloads and payload capabilities (such as Link-16 and Passive Targeting), incorporate multi-vehicle control, incorporate NATO STANAG-4586 and Command, Control, Communications, Computers and Intelligence enhancements, and alignment with OSD direction for UAS control segments.

TCS software is incorporated into the MQ-8 Fire Scout System and fields in conjunction with MQ-8. TCS software addresses MQ-8 requirements validated by the Joint Requirements Oversight Council in the MQ-8 Capability Production Document (Nov 2016) and multiple Joint Emergent Operational Need/Urgent Operational Needs statements. TCS is supported by an Operational Requirements Document (Feb 2000).

TCS maximizes the use of contractor and government off-the-shelf hardware and software whenever possible and incorporates software/hardware enhancements where appropriate to maintain growth potential and minimize hardware and operating system dependence. TCS software is interoperable and is compliant with the OSD Command and Control, Communications, Intelligence Joint Technical Architecture, Distributed Common Ground System standards, Global Command and Control System, and NATO standards. TCS hardware and software upgrades support the Navy's Common Control System (CCS) migration and as such can be used to support future UAS MCS requirements.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: TCS Development and Integration	8.660	6.127	8.748	0.000	8.748
Articles:	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Continue government engineering support, contractor support, program support, and travel as needed to support program objectives. FY 2022 OCO Plans: N/A FY 2021 to FY 2022 Increase/Decrease Statement: Increase due to additional government engineering support, contractor support, program support, and travel to support program objectives.					
Accomplishments/Planned Programs Subtotals	9.451	7.108	9.837	0.000	9.837

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

N/A

Remarks

D. Acquisition Strategy

The TCS program is government owned, non-proprietary software that currently supports the MQ-8 Fire Scout System. The TCS program continues to focus on Navy requirements and standards-based architecture/software to support interoperability. The government-owned TCS software development toolkit is available to all UAS developers and manufacturers that allows a low-cost integration into the open architecture non-proprietary TCS system.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy **Date:** May 2021

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0305204N / <i>Tactical Unmanned Aer Vehi</i> <i>cles</i>	Project (Number/Name) 2478 / <i>Tactical Control System</i>
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Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Primary Software Development	SS/CPIF	Raytheon : Falls Church, VA	60.048	8.660	Dec 2019	5.198	Dec 2020	7.935	Dec 2021	-		7.935	-	-	-
Prior Year Cost no longer Funded in the FYDP	Various	Various : Various	195.505	0.000		0.000		0.000		-		0.000	-	-	-
Software Development	TBD	Various : Various	0.000	0.000		0.934	Nov 2020	0.813	Nov 2021	-		0.813	-	-	-
Subtotal			255.553	8.660		6.132		8.748		-		8.748	-	-	N/A

Remarks
Increase in FY 2022 supports a more significant Development/Enhancement of software products to support Radar payload integration and system improvements associated with version 10, which also includes significant Link-16 and other future payload requirements.

Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Development Test and Evaluation	WR	Various : Various	1.399	0.028	Nov 2019	0.028	Nov 2020	0.032	Nov 2021	-		0.032	-	-	-
Subtotal			1.399	0.028		0.028		0.032		-		0.032	-	-	N/A

Remarks
Increase in Test and Evaluation to support integration of additional capability (e.g. Link-16).

Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Contractor Engineering Support	Various	Various : Various	4.496	0.258	Nov 2019	0.258	Nov 2020	0.236	Nov 2021	-		0.236	-	-	-
Government Engineering Support	WR	Various : Various	10.958	0.274	Nov 2019	0.457	Nov 2020	0.583	Nov 2021	-		0.583	-	-	-
Program Management Support	Various	Various : Various	5.304	0.205	Nov 2019	0.208	Nov 2020	0.212	Nov 2021	-		0.212	-	-	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy **Date:** May 2021

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Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Travel	WR	NAVAIR : Patuxent River, MD	0.441	0.026	Nov 2019	0.025	Nov 2020	0.026	Nov 2021	-		0.026	-	-	-
Subtotal			21.199	0.763		0.948		1.057		-		1.057	-	-	N/A

Remarks
Increase in Government Engineering to support integration of additional capability (e.g. Link-16).

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	278.151	9.451	7.108	9.837	-	9.837	-	-	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy **Date:** May 2021

Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0305204N / <i>Tactical Unmanned Aer Vehi</i> <i>cles</i>	Project (Number/Name) 2478 / <i>Tactical Control System</i>
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Proj 2478	FY 2020				FY 2021				FY 2022			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Tactical Control System	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">Software Updates</div> <div style="width: 25%;">TCS Ver 9</div> <div style="width: 25%;">TCS Ver 9.1</div> <div style="width: 25%;">TCS Ver 10</div> <div style="width: 25%;">TCS Ver 11</div> </div>											
MQ-8	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">Software</div> <div style="width: 25%;">12.0 IFC</div> <div style="width: 25%;">12.1 IFC</div> <div style="width: 25%;">12.2 IFC</div> <div style="width: 25%;">13.0 IFC</div> <div style="width: 25%;">14.0 IFC</div> </div>											
Acquisition Milestones	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">MQ-8 Milestones</div> <div style="width: 25%;"></div> <div style="width: 25%;"></div> <div style="width: 25%;">MQ-8C Radar PoR IOC</div> <div style="width: 25%;"></div> <div style="width: 25%;"></div> </div>											
Systems Development	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">MQ-8C Engineering and Manufacturing Development</div> <div style="width: 25%;">COBRA Integration</div> <div style="width: 25%;">LCS Integration</div> <div style="width: 25%;">Payload, Obsolescence, Software, and Analysis</div> </div>											
Reviews	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">MQ-8C Link-16</div> <div style="width: 25%;">SRR</div> <div style="width: 25%;">PDR / CDR</div> <div style="width: 25%;">SRR</div> </div>											
Test & Evaluation (T&E)	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">MQ-8C Electronic Warfare Passive Targeting (EW/PT)</div> <div style="width: 25%;">Specialty Payloads</div> </div>											
MQ-8C System Transition	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">OT&E</div> <div style="width: 25%;">Radar DT</div> <div style="width: 25%;">Radar OT</div> </div>											
Production Milestones	<div style="display: flex; justify-content: space-between;"> <div style="width: 25%;">CA L16PI</div> <div style="width: 25%;">CA L16PII</div> <div style="width: 25%;">MQ-8C EW/PT P1</div> </div>											

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 2478				
Tactical Control System: Software Updates: TCS Version 9	1	2020	3	2020
Tactical Control System: Software Updates: TCS Version 9.1	3	2020	2	2021
Tactical Control System: Software Updates: TCS Version 10	3	2020	3	2022
Tactical Control System: Software Updates: TCS Version 11	2	2022	4	2022
MQ-8: Software: 12.0 IFC	1	2020	1	2020
MQ-8: Software: 12.1 IFC	4	2020	4	2020
MQ-8: Software: 12.2 IFC	1	2021	1	2021
MQ-8: Software: 13.0 IFC	1	2022	1	2022
MQ-8: Software: 14.0 IFC	3	2022	3	2022
Acquisition Milestones: MQ-8 Milestones: MQ-8C Radar PoR IOC	3	2021	3	2021
Systems Development: Engineering and Manufacturing Development: Coastal Battlefield Reconnaissance and Analysis Intergration (COBRA), BLK 1/2/3	1	2020	4	2022
Systems Development: Engineering and Manufacturing Development: Littoral Combat Ship (LCS) Integration	1	2020	4	2022
Systems Development: Engineering and Manufacturing Development: Payload, Obsolescence, Software, and Analysis	1	2020	4	2022
Reviews: MQ-8C Link-16: Systems Readiness Review (SRR)	3	2021	3	2021
Reviews: MQ-8C Link-16: Program Design Review(PDR) / Critical Design Review (CDR)	1	2022	1	2022
Reviews: MQ-8C Electronic Warfare Passive Targeting (EW/PT): MQ-8C Electronic Warfare Passive Targeting (EW/PT) (SRR)	3	2022	3	2022
Test & Evaluation (T&E): Specialty Payloads	1	2020	4	2022

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy **Date:** May 2021

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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
MQ-8C System Transition: Operational Test and Evaluation (OT&E)	1	2020	4	2020
MQ-8C System Transition: MQ-8C Radar Transition: Radar Developmental Test (DT)	1	2020	1	2021
MQ-8C System Transition: MQ-8C Radar Transition: Radar Operational Test (OT)	3	2021	4	2021
MQ-8C System Transition: Production Milestones: Contract Award MQ-8C Link-16 Phase I	3	2020	3	2020
MQ-8C System Transition: Production Milestones: Contract Award MQ-8C Link-16 Phase II	1	2022	1	2022
MQ-8C System Transition: Production Milestones: Contract Award MQ-8C Electronic Warfare/Passive Targeting (EW/PT)	3	2022	3	2022