Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305204N *I Tactical Unmanned Aer Vehicles*

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	261.852	7.770	8.529	9.451	-	9.451	9.484	9.660	9.441	9.630	Continuing	Continuing
2478: *Tactical Control System*	261.852	7.770	8.529	9.451	-	9.451	9.484	9.660	9.441	9.630	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element provides funding for development and capability requirements for Tactical Unmanned Aerial Vehicles. 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, provides the warfighters with the capability for day/night aerial Intelligence, Surveillance and Reconnaissance, 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	7.770	8.529	9.471	-	9.471
Current President's Budget	7.770	8.529	9.451	-	9.451
Total Adjustments	0.000	0.000	-0.020	-	-0.020
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Rate/Misc Adjustments	0.000	0.000	-0.020	-	-0.020

Change Summary Explanation

Increase in funding from FY 2019 to FY 2020 supports TCS Version 10 Common software development and transition.

Schedule: TCS schedule and software improvements coincide with MQ-8 Fire Scout schedule milestones.

Technical: None

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0305204N / *Tactical Unmanned Aer Vehicles*	Project (Number/Name) 2478 / *Tactical Control System*	

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
2478: *Tactical Control System*	261.852	7.770	8.529	9.451	-	9.451	9.484	9.660	9.441	9.630	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 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 (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 advanced sensors and weapons), 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. The FY20 funding supports Common Control System (CCS) integration into TCS and test with the MQ-8C radar program.

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 CCS migration.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: TCS Development and Integration	7.038	7.742	8.660	0.000	8.660
Articles:	-	-	-	-	-
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continued TCS integration and test with MQ-8 development. Continued new TCS capabilities to support requirements for MQ-8 land-based efforts plus support for air capable ships (to include Littoral Combat Ship (LCS), Frigates (FFG(X)), and Expeditionary Support Bases (ESB). Continued TCS STANAG 4586 compliance. Continued TCS C4ISR interface integration and testing for MQ-8 systems. Continued hardware and operating system independence initiatives. Continue Radar and payload integration (to include Minotaur) and test, MQ-8C integration, and continue preparations for CCS integration and demonstrations. Completed TCS Version 8 Common GCS transition and initiated TCS Version 9 preparations, including integration of CCS Vehicle Management. ***FY 2020 Base Plans:*** Continue TCS integration and test with MQ-8 development. Continue new TCS capabilities to support requirements for MQ-8 land-based efforts plus support for air capable ships (to include Littoral Combat Ship (LCS), Frigates (FFG(X)), and Expeditionary Support Bases (ESB). Continue TCS STANAG 4586 compliance. Continue TCS C4ISR interface integration and testing for MQ-8 systems. Continue hardware and operating system independence initiatives. Continue Radar and payload integration (to include Minotaur) and test, MQ-8C integration, and continue preparations for Common Control System (CCS) integration and demonstrations. Complete TCS Version 9 and initiate TCS Version 10. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase from FY 2019 to FY 2020 to support TCS Version 10 software development and transition to include Minotaur and CCS integration.					
Title: Technical and Engineering Services	0.732	0.787	0.791	0.000	0.791
Articles:	-	-	-	-	-
FY 2019 Plans: Continue government engineering support, contractor support, program support, and travel for the TCS program. ***FY 2020 Base Plans:*** Continue government engineering support, contractor support, program support, and travel for the TCS program. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No significant change from FY 2019 to FY 2020					
Accomplishments/Planned Programs Subtotals	7.770	8.529	9.451	0.000	9.451

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. TCS integrates the Navy's Common Control System (CCS)software and will eventually migrate to the CCS hardware solution.

E. Performance Metrics

Successfully complete Navy payloads integration (to include, but not limited to: Coastal Battlefield Reconnaissance and Analysis (COBRA) and radar) in accordance with the MQ-8 Program of Record. Support MQ-8C Endurance Upgrade, Radar, and future capabilities. Successfully complete Littoral Combat Ship Integration. Complete Developmental and Operational Test.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Software Development 2	SS/CPIF	Raytheon : Falls Church,VA	45.272	7.034	Dec 2017	7.742	Dec 2018	8.660	Dec 2019	-		8.660	57.947	126.655	126.655
Prior Year Cost no longer Funded in the FYDP	C/CPAF	Raytheon : Falls Church,VA	195.332	0.000		0.000		0.000		-		0.000	0.000	195.332	195.332
Primary Software Development 2	SS/CPIF	NGC : San Diego, CA	0.173	0.000		0.000		0.000		-		0.000	0.000	0.173	0.173
		Subtotal	240.777	7.034		7.742		8.660		-		8.660	57.947	322.160	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test and Evaluation	WR	Various : Various	1.346	0.026	Nov 2017	0.027	Nov 2018	0.028	Nov 2019	-		0.028	Continuing	Continuing	Continuing
		Subtotal	1.346	0.026		0.027		0.028		-		0.028	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	Various	Various : Various	3.983	0.245	Nov 2017	0.268	Nov 2018	0.258	Nov 2019	-		0.258	Continuing	Continuing	Continuing
Government Engineering Support	WR	Various : Various	10.407	0.283	Nov 2017	0.268	Nov 2018	0.274	Nov 2019	-		0.274	Continuing	Continuing	Continuing
Program Management Support	Various	Various : Various	4.947	0.158	Nov 2017	0.199	Nov 2018	0.205	Nov 2019	-		0.205	Continuing	Continuing	Continuing
Travel	WR	NAVAIR : Patuxent River, MD	0.392	0.024	Nov 2017	0.025	Nov 2018	0.026	Nov 2019	-		0.026	Continuing	Continuing	Continuing
		Subtotal	19.729	0.710		0.760		0.763		-		0.763	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy			Date: March 2019
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	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	261.852	7.770		8.529		9.451		-		9.451	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

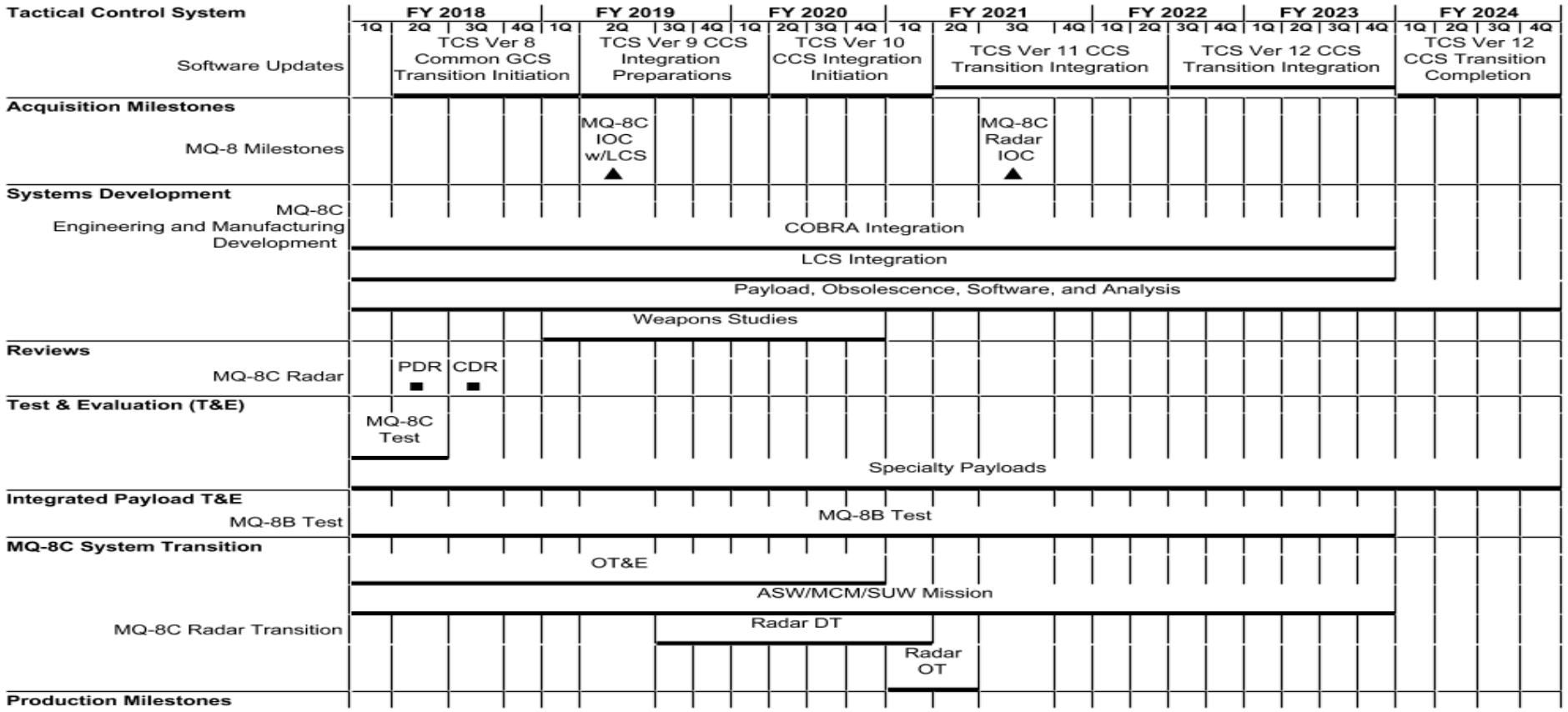

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Tactical Control System				
Software Updates: TCS Ver 8 Common GCS Transition Initiation	2	2018	1	2019
Software Updates: TCS Ver 9 CCS Integration Preparations	2	2019	1	2020
Software Updates: TCS Ver 10 CCS Integration Initiation	2	2020	1	2021
Software Updates: TCS Ver 11 CCS Transition Integration	2	2021	2	2022
Software Updates: TCS Ver 12 CCS Transition Integration	3	2022	4	2023
Software Updates: TCS Ver 13 CCS Transition Completion	1	2024	4	2024
Acquisition Milestones: MQ-8 Milestones: MQ-8 Initial Operational Capability (IOC) MQ-8C Littoral Combat Ship (LCS)	2	2019	2	2019
Acquisition Milestones: MQ-8 Milestones: MQ-8C Radar IOC	3	2021	3	2021
Systems Development: Engineering and Manufacturing Development: Coastal Battlefield Reconnaissance and Analysis Integration (COBRA), BLK 1/2/3	1	2018	4	2023
Systems Development: Engineering and Manufacturing Development: Littoral Combat Ship (LCS) Integration	1	2018	4	2023
Systems Development: Engineering and Manufacturing Development: Payload, Obsolescence, Software, and Analysis	1	2018	4	2024
Systems Development: Engineering and Manufacturing Development: Weapons Studies	1	2019	4	2020
Reviews: MQ-8C Radar: Preliminary Design Review (PDR)	2	2018	2	2018
Reviews: MQ-8C Radar: Critical Design Review (CDR)	3	2018	3	2018
Test & Evaluation (T&E): MQ-8C Development Test	1	2018	2	2018
Test & Evaluation (T&E): Specialty Payloads	1	2018	4	2024
Integrated Payload T&E: MQ-8B Test: MQ-8B/C Test: Littoral Combat Ship (LCS) Integration	1	2018	4	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy		Date: March 2019
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MQ-8C System Transition: Operational Test and Evaluation (OT&E)	1	2018	4	2020
MQ-8C System Transition: ASW/MCM/SUW Mission	1	2018	4	2023
MQ-8C System Transition: MQ-8C Radar Transition: Radar Developmental Test (DT)	3	2019	1	2021
MQ-8C System Transition: MQ-8C Radar Transition: Radar Operational Test (OT)	1	2021	2	2021