Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy											Date: February 2020	
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 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	269.622	8.529	9.451	7.108	-	7.108	11.015	10.493	9.640	9.834	Continuing	Continuing
2478: *Tactical Control System*	269.622	8.529	9.451	7.108	-	7.108	11.015	10.493	9.640	9.834	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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	8.529	9.451	9.484	-	9.484
Current President's Budget	8.529	9.451	7.108	-	7.108
Total Adjustments	0.000	0.000	-2.376	-	-2.376
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	-2.381	-	-2.381
• Rate/Misc Adjustments	0.000	0.000	0.005	-	0.005

Change Summary Explanation

The FY 2021 funding request was reduced by $2.200 million to account for the availability of prior year execution balances.

Schedule: TCS schedule deliveries updated to reflect changes in MQ-8 Fire Scout schedule milestones. TCS Release Version 9 will complete 3Q FY2020 and Version 10 will commence 3Q FY2020. This will align with MQ-8 Radar development and integration efforts to support subsequent TCS deliveries.

Technical: N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
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 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
2478: *Tactical Control System*	269.622	8.529	9.451	7.108	-	7.108	11.015	10.493	9.640	9.834	Continuing	Continuing
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 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: TCS Development and Integration	7.742	8.660	6.127	0.000	6.127
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FY 2020 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 2021 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. Continue TCS version 10 integration of CCS and MUX requirements. Continue risk reduction and experimentation effort for Marine Air Ground Task Force Unmanned Aircraft System Expeditionary (MUX). ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The FY 2021 funding request was reduced to account for rate adjustments and the availability of prior year execution balances					
Title: Technical and Engineering Services	0.787	0.791	0.981	0.000	0.981
Articles:	-	-	-	-	-
FY 2020 Plans: Continue government engineering support, contractor support, program support, and travel for the TCS program. ***FY 2021 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Government engineering support, contractor support, program support, and travel as well as transition to Common Control System (CCS) program. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY2020 to FY2021 supports government engineering efforts associated with the TCS transition to CCS.					
Accomplishments/Planned Programs Subtotals	8.529	9.451	7.108	0.000	7.108

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 will be used to conduct risk reduction and experimentation for the MUX program and will continue to migrate to the Navy's Common Control System (CCS) program as the CCS product line matures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
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 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Software Development	SS/CPIF	Raytheon : Falls Church,VA	52.306	7.742	Dec 2018	8.660	Dec 2019	5.193	Dec 2020	-		5.193	40.244	114.145	114.145
Prior Year Cost no longer Funded in the FYDP	Various	Various : Various	195.505	0.000		0.000		0.000		-		0.000	0.000	195.505	195.505
Software Development	TBD	Various : Various	0.000	0.000		0.000		0.934	Nov 2020	-		0.934	9.376	10.310	10.310
		Subtotal	247.811	7.742		8.660		6.127		-		6.127	49.620	319.960	N/A

Remarks

Remarks: Software Development will consist of development/enhancement of software products to support payload integration and system improvements. Products developed under this line will be integrated into subsequent TCS version releases. Decrease from FY20 to FY21 due to the extension of software development efforts funded and planned during FY20 which extend into FY21, build 10. Extension of FY20 initiates CCS integration efforts in build 10.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test and Evaluation	WR	Various : Various	1.372	0.027	Nov 2018	0.028	Nov 2019	0.028	Nov 2020	-		0.028	Continuing	Continuing	Continuing
		Subtotal	1.372	0.027		0.028		0.028		-		0.028	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	Various	Various : Various	4.228	0.268	Nov 2018	0.258	Nov 2019	0.258	Nov 2020	-		0.258	Continuing	Continuing	Continuing
Government Engineering Support	WR	Various : Various	10.690	0.268	Nov 2018	0.274	Nov 2019	0.462	Nov 2020	-		0.462	Continuing	Continuing	Continuing
Program Management Support	Various	Various : Various	5.105	0.199	Nov 2018	0.205	Nov 2019	0.208	Nov 2020	-		0.208	Continuing	Continuing	Continuing
Travel	WR	NAVAIR : Patuxent River, MD	0.416	0.025	Nov 2018	0.026	Nov 2019	0.025	Nov 2020	-		0.025	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			20.439	0.760		0.763		0.953		-		0.953	Continuing	Continuing	N/A

Remarks

Remarks:
Increase in Government Engineering to support TCS migration to Common Control System (CCS).

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	269.622	8.529		9.451		7.108		-		7.108	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

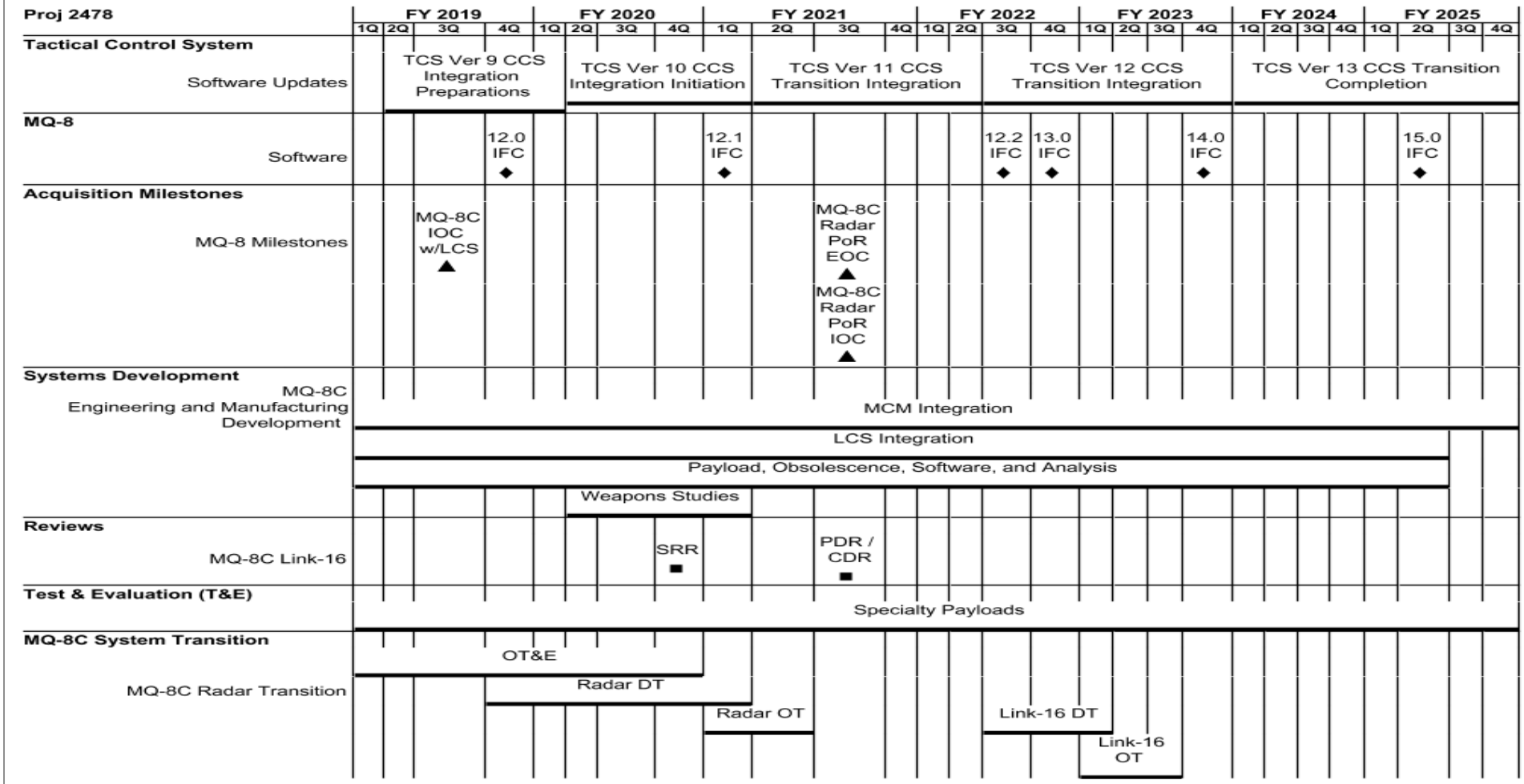

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

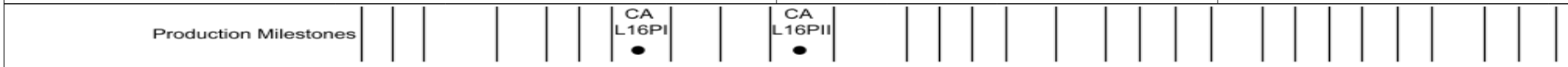

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2478				
Tactical Control System: Software Updates: TCS Ver 9 CCS Integration Preparations	2	2019	1	2020
Tactical Control System: Software Updates: TCS Ver 10 CCS Integration Initiation	2	2020	1	2021
Tactical Control System: Software Updates: TCS Ver 11 CCS Transition Integration	2	2021	2	2022
Tactical Control System: Software Updates: TCS Ver 12 CCS Transition Integration	3	2022	4	2023
Tactical Control System: Software Updates: TCS Ver 13 CCS Transition Completion	1	2024	4	2025
MQ-8: Software: 12.0 IFC	4	2019	4	2019
MQ-8: Software: 12.1 ICF	1	2021	1	2021
MQ-8: Software: 12.2 IFC	3	2022	3	2022
MQ-8: Software: 13.0 IFC	4	2022	4	2022
MQ-8: Software: 14.0 IFC	4	2023	4	2023
MQ-8: Software: 15.0 IFC	2	2025	2	2025
Acquisition Milestones: MQ-8 Milestones: MQ-8 Initial Operational Capability (IOC) MQ-8C Littoral Combat Ship (LCS)	3	2019	3	2019
Acquisition Milestones: MQ-8 Milestones: MQ-8C Radar PoR EOC	3	2021	3	2021
Acquisition Milestones: MQ-8 Milestones: MQ-8C Radar PoR IOC	3	2021	3	2021
Systems Development: Engineering and Manufacturing Development: Mine Counter Measures (MCM) Integration	1	2019	4	2025
Systems Development: Engineering and Manufacturing Development: Littoral Combat Ship (LCS) Integration	1	2019	2	2025
Systems Development: Engineering and Manufacturing Development: Payload, Obsolescence, Software, and Analysis	1	2019	2	2025

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0305204N / *Tactical Unmanned Aer Vehicles*	**Project (Number/Name)** 2478 / *Tactical Control System*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Systems Development: Engineering and Manufacturing Development: Weapons Studies	2	2020	1	2021
Reviews: MQ-8C Link-16: Systems Readiness Review (SRR)	4	2020	4	2020
Reviews: MQ-8C Link-16: Program Design Review(PDR) / Critical Design Review (CDR)	3	2021	3	2021
Test & Evaluation (T&E): Specialty Payloads	1	2019	4	2025
MQ-8C System Transition: Operational Test and Evaluation (OT&E)	1	2019	4	2020
MQ-8C System Transition: MQ-8C Radar Transition: Radar Developmental Test (DT)	4	2019	1	2021
MQ-8C System Transition: MQ-8C Radar Transition: Radar Operational Test (OT)	1	2021	2	2021
MQ-8C System Transition: MQ-8C Radar Transition: Link-16 Developmental Test (DT)	3	2022	1	2023
MQ-8C System Transition: MQ-8C Radar Transition: Link-16 Operational Test (OT)	1	2023	3	2023
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	2	2021	2	2021