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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy **Date:** February 2018

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0304240M I (U) <i>Advanced Tactical Unmanned Aircraft System</i>
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COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	7.979	25.291	-	25.291	26.770	26.066	24.125	61.741	Continuing	Continuing
3135: <i>USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV</i>	0.000	0.000	4.978	20.438	-	20.438	26.768	26.066	24.125	61.741	Continuing	Continuing
3427: <i>KMAX Experimentation and Support</i>	0.000	0.000	3.001	4.853	-	4.853	0.002	0.000	0.000	0.000	0.000	7.856

A. Mission Description and Budget Item Justification

This program element provides for development and capability requirements for Advanced Tactical Unmanned Aerial Vehicles in support of expeditionary efforts. Projects are Joint Military Intelligence Programs.

Project 3135 - This project provides for the early trade studies, analysis, experimentation, and concept refinement for the Marine Air Ground Task Force (MAGTF) Unmanned Aircraft System (UAS) Expeditionary (MUX) with Vertical/Short Take-Off and Vertical Landing (V/STOVL) capability. These MUX efforts will include maturing key technologies and rapid prototyping to inform a future MUX program of record. Objective capabilities will include strike and cargo resupply. Provides USMC with MUX operational capability in FY26.

Project 3427 - This project provides for experimentation and support of the CQ-24A Cargo UAS (commonly referred to as KMAX). CQ-24A will be used to specifically inform the unmanned cargo resupply requirements of future programs of record, to include MUX. Experimentation includes payloads/sensor integration, control station integration, Concept of Operations (CONOPS) and Tactics, Techniques, and Procedures (TTP) development. These experimentation efforts inform program capability documents and support other military exercises, and advance technologies needed for the future MUX POR.

Cost estimate for Cost to Complete and Total Cost for both project units are being developed and will be promulgated in a future budget request.

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B. Program Change Summary (\$ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	0.000	7.979	10.385	-	10.385
Current President's Budget	0.000	7.979	25.291	-	25.291
Total Adjustments	0.000	0.000	14.906	-	14.906
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Rate/Misc Adjustments	0.000	0.000	14.906	-	14.906

Change Summary Explanation

Schedule:

Project 3135 - Updated to reflect MUX experimentation requirements.

Project 3427 - Not applicable

Technical: Not applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0304240M / (U)Advanced Tactical Unmanned Aircraft System				Project (Number/Name) 3135 / USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
3135: USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV	0.000	0.000	4.978	20.438	-	20.438	26.768	26.066	24.125	61.741	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding provides for the early trade studies, analysis, experimentation, key technology maturation, rapid prototyping, and concept refinement for the Marine Air Ground Task Force (MAGTF) Unmanned Aircraft System (UAS) Expeditionary (MUX) with Vertical/Short Take-Off and Vertical Landing (V/STOVL) capability. The MUX UAV supports Expeditionary Force 21 Operating Concepts and the 2017 Marine Aviation Plan (AvPlan) requires an advanced, multi-mission ship-based Group 5 UAS in support of Marine Expeditionary Force/Marine Expeditionary Brigade-sized MAGTF to address future capability gaps. The future MUX UAV system will provide a weaponized, payload flexible, shipboard capable/expeditionary system that is runway independent for all weather, long range/persistence, operations from the sea in a contested environment. This next generation UAV capability will have far greater range, endurance, altitude, and payload capability than the current conventional VTOL technology can provide from air capable ships. The MUX system Initial Capabilities Document (ICD) was approved in Oct 2016. The Material Development Decision and Analysis of Alternatives (AOA) is planned to start in FY18. Rapid prototyping strategies are also being pursued by the USMC to meet an early operational need date.

This effort will continue to inform program scope, phasing, and cost for development of the MUX capability. Funding in FY19 will also be used to reduce overall MUX program cost by leveraging other technology demonstrator developmental programs; such as the US Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC) Joint Multi-Role Technology Demonstrator (JMR-TD) and Defense Advanced Research Project Agency (DARPA) TERN which both end in FY18, allowing for continued technical maturation effort, rapid prototyping, and smooth transition to a MUX POR.

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

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: MUX Studies, Analysis, Experimentation and Concept Refinement	0.000	3.650	18.274	0.000	18.274
Articles:	-	-	-	-	-
FY 2018 Plans: Provides funding for Government and industry teams for pre-Milestone A activities including industry inquiries, aircraft trade studies, concept refinement, requirements/payload analysis for meeting mission requirements to inform the MUX POR. Supports development of the MUX Concept of Operations and draft Capability Development Document (CDD). Provides funding for experimentation with advanced concept demonstrator UAVs such as USMC CQ-24A Cargo UAS and DARPA/ONR developed Tern Medium Altitude Long Endurance (MALE) UAS, along with other tactical UAV/payload/control station demonstrator efforts to help inform performance requirements, initial Key Performance Parameters (KPP), CONOPS, concepts, tactics, doctrine,					

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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3135 / USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<p>and the future MUX program of record. Provides funding for engineering architecture assessments (aircraft and payloads) to establish specific areas the government will function as the systems integrator. This will inform a future POR in order to reduce life cycle costs.</p> <p>FY 2019 Base Plans: Provides funding for Government and industry teams for acquisition activities including industry inquiries, aircraft trade studies, concept refinement, requirements/payload analysis, and rapid prototyping efforts related to the MUX POR. Supports continued development of the MUX Concept of Operations and draft CDD. Provides funding for experimentation with advanced concept demonstrator UAVs such as USMC CQ-24A Cargo UAS, DARPA/ONR developed Tern UAS, and US Army AMRDEC JMR-TD aircraft projects, along with other tactical UAV/payload/control station demonstrator efforts, to help inform tactical unmanned system performance requirements, initial KPP, CONOPS, concepts, tactics, doctrine, the future MUX program of record, and support rapid prototyping efforts. Provides funding for engineering architecture assessments (aircraft and payloads) to establish specific areas where the government will function as the systems integrator.</p> <p>FY 2019 OCO Plans: N/A</p> <p>FY 2018 to FY 2019 Increase/Decrease Statement: Increase from \$3.650M to \$18.274M results from additional industry capability RFIs and trade studies to support a future program of record.</p>					
<p>Title: Technical and Engineering Services</p> <p align="right">Articles:</p> <p>FY 2018 Plans: Initiate and provide Government Engineering support, Contractor support, Program support and travel for execution of MUX studies, experimentation, and concept refinement and for pre-MS A related acquisition activities to support the future MUX program of record.</p> <p>FY 2019 Base Plans: Provide Government Engineering support, Contractor support, Program support and travel for execution of</p>	0.000 -	1.328 -	2.164 -	0.000 -	2.164 -

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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3135 / USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
MUX studies, experimentation, rapid prototyping, and concept refinement and for pre-MS A related acquisition activities to support the future MUX program of record. FY 2019 OCO Plans: N/A FY 2018 to FY 2019 Increase/Decrease Statement: Increase of \$1.328M to \$2.164M results from increased support for government engineering and industry developmental oversight.					
Accomplishments/Planned Programs Subtotals	0.000	4.978	20.438	0.000	20.438

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

N/A

Remarks

D. Acquisition Strategy

A Material Development Decision is anticipated in FY18. The MUX program will leverage technology of unmanned tactical aviation programs, including DARPA/ONR concept demonstrator UAV S&T programs, US Army AMRDEC JMR-TD aircraft projects, OEM internally funded UAV prototypes when available, existing tactical unmanned technologies, and promising new industry design concepts that result from industry trade studies. The government will develop and award study contracts as required to support program activities and analysis efforts. Assessment of available technology from existing S&T efforts and review of industry inquiries / study contracts will be used to determine the optimum MUX strategy to meet the Initial Operational Capability needs, as well as, a potentially Early Operational Capability which may be met through available rapid prototyping processes. The MUX POR intends to have the Government functioning as the system integrator for the development and sustainment of the program to reduce life cycle costs.

E. Performance Metrics

Performance metrics include successful completion of Trade Studies; successful development of a CONOPS and draft CDD, identification of material solutions for concept refinement, and analysis of architectures.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy **Date:** February 2018

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3135 / USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV
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Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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			
MUX Studies and Experimentation	Various	TBD : TBD	0.000	0.000		1.500	Jan 2018	15.599	Nov 2018	-		15.599	Continuing	Continuing	Continuing
Requirements Analysis and Engineering Assessments	WR	Various : Various	0.000	0.000		2.150	Jan 2018	2.675	Nov 2018	-		2.675	Continuing	Continuing	Continuing
Subtotal			0.000	0.000		3.650		18.274		-		18.274	Continuing	Continuing	N/A

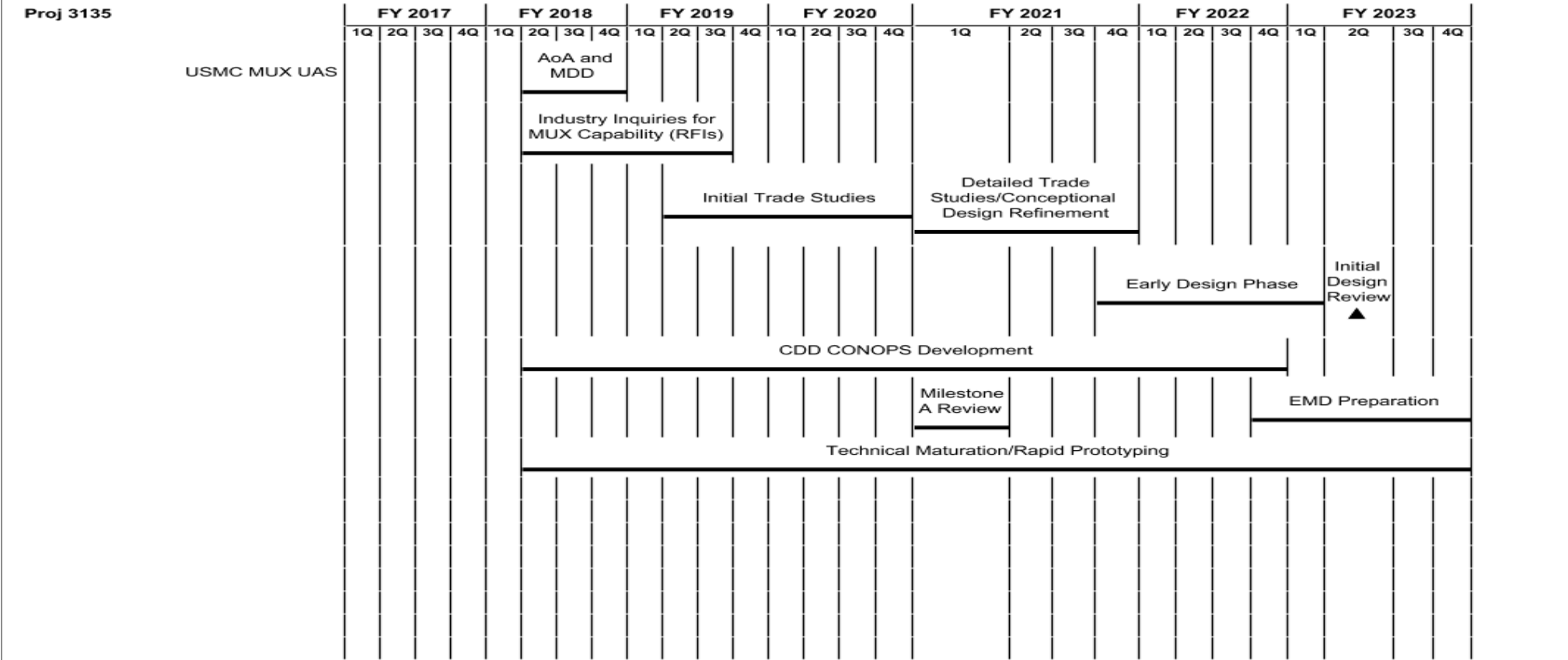
Management Services (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Engineering Support	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.635	Jan 2018	1.034	Nov 2018	-		1.034	0.000	1.669	-
Program Management Support	Various	Various : Various	0.000	0.000		0.600	Jan 2018	1.050	Nov 2018	-		1.050	0.000	1.650	-
Travel	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.093	Jan 2018	0.080	Nov 2018	-		0.080	0.000	0.173	-
Subtotal			0.000	0.000		1.328		2.164		-		2.164	0.000	3.492	N/A

			Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.000	0.000	4.978	20.438	-	20.438	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3135 / USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV



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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240M / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3135 / USMC MUX Medium Altitude - Long Endurance (MALE) Group 5 UAV

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3135				
USMC MUX UAS: Analysis of Alternatives and Material Development Decision (AoA & MDD)	2	2018	4	2018
USMC MUX UAS: Acquisition Milestone: Industry Inquiries for MUX Capability (RFIs)	2	2018	3	2019
USMC MUX UAS: Acquisition Milestone: Initial Trade Studies	2	2019	4	2020
USMC MUX UAS: Acquisition Milestone: Detailed Trade Studies/Conceptual Design Refinement	1	2021	4	2021
USMC MUX UAS: Acquisition Milestone: Early Design Phase	4	2021	1	2023
USMC MUX UAS: Acquisition Milestone: Initial Design Review	2	2023	2	2023
USMC MUX UAS: Acquisition Milestone: CDD CONOPS Development	2	2018	4	2022
USMC MUX UAS: Acquisition Milestone: Engineering Manufacturing & Development	4	2022	4	2023
USMC MUX UAS: Acquisition Milestone: Milestone A Review	1	2021	1	2021
USMC MUX UAS: Acquisition Milestone: Technical Maturation,UAV Experimentation, Rapid Prototyping	2	2018	4	2023

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Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0304240M / (U)Advanced Tactical Unmanned Aircraft System					Project (Number/Name) 3427 / KMAX Experimentation and Support		
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
3427: KMAX Experimentation and Support	0.000	0.000	3.001	4.853	-	4.853	0.002	0.000	0.000	0.000	0.000	7.856
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding provides for experimentation for unmanned cargo operations and includes complementary Intelligence, Surveillance, and Reconnaissance (ISR), payloads, advanced sensors, autonomy; efforts to refine requirements and concept of operations (CONOPS); and support of future unmanned programs of record, such as Marine Air Ground Task Force (MAGTF) Unmanned Aircraft System (UAS) Expeditionary (MUX).

The CQ-24A Cargo UAS is a unique, unmanned, sling-load capable aircraft that has had demand signals including moving cargo in permissive environments (e.g. food, fuel, medicine), combatting forest fires in the United States (specifically at night) when manned aircraft don't fly due to safety restrictions, and flying to locations that present dangerous or deadly conditions to humans (such as biological threats or radiation hazards).

The program's 2 Marine Corps CQ-24A were successfully utilized in Afghanistan to support urgent operational needs in that theater of operations. The 2 CQ-24A aircraft and ground control system require contractor services to operate. Utilization of existing CQ-24A systems is an efficient risk reduction method.

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

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: CQ-24A Cargo UAS Experimentation and Support Services	0.000	2.091	3.849	0.000	3.849
Articles:	-	-	-	-	-
FY 2018 Plans:					
Provides funding for government and industry teams to operate aircraft in support of tactics development and fleet experimentation and modify aircraft with payloads to support requirements refinement, to include future MUX requirements. Payloads may include sensors, weapons, and systems to support extended range operations. Provides funding for engineering architecture assessments (aircraft and payloads) to establish areas where the government will function as the systems integrator for a program of record, in order to reduce life cycle costs.					
FY 2019 Base Plans:					
Provides funding for government and industry teams to operate aircraft in support of tactics development and fleet experimentation and modify aircraft with payloads to support requirements refinement, to include future MUX requirements. Payloads may include sensors, weapons, autonomy, and systems to support unique cargo					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
requirements envisioned for MUX or other specialty mission areas that this unique CQ-24A DOD high-value asset can provide. FY 2019 OCO Plans: N/A FY 2018 to FY 2019 Increase/Decrease Statement: Increase from \$2.091M to \$3.849M results from additional tactics development and experimentation flight hours for the program.					
Title: Technical and Engineering Services FY 2018 Plans: Initiate and provide government engineering support, contractor support, program support and travel for execution of CQ-24A Cargo UAS experimentation and concept refinement for study products and acquisition activities to support future programs of record, to include MUX. FY 2019 Base Plans: Provide government engineering support, contractor support, program support and travel for execution of CQ-24A Cargo UAS experimentation and concept refinement for study products and acquisition activities to support future programs of record, to include MUX. FY 2019 OCO Plans: N/A FY 2018 to FY 2019 Increase/Decrease Statement: Increase from \$0.910M to \$1.004M results from engineering and technical requirements to support experimentation and developmental oversight.	0.000	0.910	1.004	0.000	1.004
Articles:	-	-	-	-	-
Accomplishments/Planned Programs Subtotals	0.000	3.001	4.853	0.000	4.853

C. Other Program Funding Summary (\$ in Millions) N/A Remarks

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D. Acquisition Strategy

The CQ-24A Cargo UAS experimentation and support activities will be contracted through a sole source contract with the aircraft prime vendor in order to support continued experimentation through FY19. It is envisioned that support will continue beyond FY19/20 to align with the MUX program of record concept refinement phase. Other U.S. Government agencies have expressed interest in using these CQ-24A Cargo UAS assets to fight forest fires (at night) in the Midwest. CQ-24A can be made available for experimentation of autonomous fire-fighting through other agency funding (if available).

E. Performance Metrics

Performance metrics include successful completion of technical demonstration with published reports and CONOPS updates, along with inputs to unmanned cargo re-supply requirements for capability documents and performance specifications.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy **Date:** February 2018

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Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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			
CQ-24A Cargo UAS Experimentation	C/CPFF	Lockheed Martin : MCAS Yuma, AZ	0.000	0.000		1.511	Jan 2018	3.239	Mar 2019	-		3.239	0.000	4.750	4.750
Requirements and Analysis, and Engineering Assessments	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.580	Jan 2018	0.610	Mar 2019	-		0.610	0.000	1.190	1.190
Subtotal			0.000	0.000		2.091		3.849		-		3.849	0.000	5.940	N/A

Management Services (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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			
Govt Engineering Support	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.410	Jan 2018	0.474	Nov 2018	-		0.474	0.000	0.884	-
Program Management Support	Various	Various : Various	0.000	0.000		0.445	Jan 2018	0.450	Nov 2018	-		0.450	0.000	0.895	-
Travel	WR	NAWCAD : Patuxent River, MD	0.000	0.000		0.055	Jan 2018	0.080	Nov 2018	-		0.080	0.000	0.135	-
Subtotal			0.000	0.000		0.910		1.004		-		1.004	0.000	1.914	N/A

Project Cost Totals	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
	0.000	0.000	3.001	4.853	-	4.853	0.000	7.854	N/A

Remarks

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Proj 3427	FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023											
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q								
Acquisition Milestones					Experimentation and concept refinement of USMC CONOPS, tactics, and doctrine																															

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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3427				
Acquisition Milestones: Experimentation and concept refinement of USMC CONOPS, tactics, and doctrine	1	2018	1	2020