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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0304240N / (U) <i>Advanced Tactical Unmanned Aircraft System</i>
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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	0.000	9.300	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.300
3429: <i>TERN UAS</i>	0.000	9.300	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.300

Note

FY 2019 funding does not reflect the enacted rescission amount of \$4.809 Million.

A. Mission Description and Budget Item Justification

The Navy identified capability gaps in the Navy's Distributed Maritime Operations (DMO) concept that could be addressed with a next generation, sea-based Medium Altitude Long Endurance (MALE) Unmanned Aerial Vehicle (UAV) operating from Surface Combatant Ships. This program element provided for the maturation, prototyping, and demonstration of advanced platform, payload, networking, and enabling technologies. Technologies that required further maturation included advanced Vertical Take-off and Landing air vehicles, advanced data networks that support distributed unmanned operations, and other technologies that enable maritime over the horizon targeting and early warning at safe stand-off distances. All results from these demonstrations are available to refine requirements for the next generation of maritime aviation Family of Systems (FOS), and may directly support capability gaps associated with the Future Surface Combatant (FSC).

This project provided for trade studies, analysis, and continued prototype development, testing, fleet experimentation, and concept refinement for next generation manned-unmanned aviation technologies to meet Navy Fleet and Combatant Commander (COCOM) classified warfighter gaps in a DMO construct. This project conducted requirements analysis and studies for allocation of requirements for manned/unmanned platforms needed for DMO and for operations on FSC. Candidate technologies were focused on developing new DMO platforms and the required sensors and communications relay payloads that are enabling technologies for DMO.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	9.300	0.000	0.000	-	0.000
Current President's Budget	9.300	0.000	0.000	-	0.000
Total Adjustments	0.000	0.000	0.000	0.000	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

Change Summary Explanation

Schedule: Not Applicable

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Technical: Not Applicable Cost: Not Applicable		

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy										Date: February 2020		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0304240N / (U)Advanced Tactical Unmanned Aircraft System				Project (Number/Name) 3429 / TERN UAS			
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
3429: TERN UAS	0.000	9.300	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.300
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program was established to develop technologies to allow for their evaluation in the Distributed Maritime Operations (DMO) construct to support requirements refinement for aviation support to current and future surface combatants to include the Future Surface Combatant (FSC) program. This program conducted studies and analysis of requirements to determine the most effective allocation of mission requirements to aviation platforms and between manned and unmanned platforms to enable future DMO and FSC operations. Areas of analysis included, but were not limited to, over-the horizon communications, targeting, distributed maneuvering, manned-unmanned platform mix, and optimized sensor payload configurations to satisfy DMO mission gaps. The program demonstrated organic shipboard platforms capable of providing persistent 24/7 Intelligence, Surveillance, and Reconnaissance (ISR), targeting, early warning, and anti-surface strike capabilities at long radius orbits. To achieve these goals, the program investigated new concepts for aircraft launch and recovery, logistics, and maintenance in maritime operating conditions. This effort assisted in funding mission utility technical assessment of a Medium-Altitude, Long-Endurance Unmanned Aerial Vehicle (MALE UAV) technology demonstrators intended for surface combatants.

This program conducted advancement and experimentation of the enabling sensor technologies required to operate in the DMO environment, such as demonstrating sense and avoid sensors and autonomy software in real world environments and advanced ice detection systems to avoid potential loss of aircraft when operating at extreme ranges. Additionally, the project supported prototype development and fleet experimentation of other mission payloads required for DMO gaps.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: MALE (TERN) UAV Technical Maturation and Experimentation	8.909	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: FY 2019 funding does not reflect the enacted rescission amount of \$4.809 Million.					
FY 2020 Plans: N/A					
FY 2021 Base Plans: N/A					
FY 2021 OCO Plans: N/A					
Title: Technical and Engineering Services	0.391	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
	<i>Articles:</i>	-	-	-	-
FY 2020 Plans: N/A					
FY 2021 Base Plans: N/A					
FY 2021 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	9.300	0.000	0.000	0.000	0.000

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

N/A

Remarks

D. Acquisition Strategy

The program conducted experimentation efforts leveraging DARPA/ONR contracts for Tern. SBIR contracts were utilized for safety and mission systems payloads that were originally awarded under small business contract actions.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240N / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3429 / TERN UAS
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
MALE (TERN) UAV Technical Maturation & Experimentation	C/CPIF	Northrop Grumman : San Diego, CA	0.000	8.909	Dec 2018	0.000		0.000		-		0.000	0.000	8.909	4.100
Subtotal			0.000	8.909		0.000		0.000		-		0.000	0.000	8.909	N/A

Remarks
FY 2019 funding does not reflect the enacted rescission amount of \$4.809 Million.

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	0.356	Jan 2019	0.000		0.000		-		0.000	0.000	0.356	-
Program Management Support	Various	SPAWAR : North Charleston, SC	0.000	0.035	May 2019	0.000		0.000		-		0.000	0.000	0.035	-
Subtotal			0.000	0.391		0.000		0.000		-		0.000	0.000	0.391	N/A

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	0.000	9.300	0.000	0.000	-	0.000	9.300	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240N / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3429 / TERN UAS
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Proj 3429	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
Technical and Engineering Services	Wargaming Studies Analysis of Alternatives																											
	Model Based Engineering Assessment																											
MALE (TERN) UAV Technical Maturation and Experimentation	Envelope Expansion, Flight Testing, & Demonstration																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0304240N / (U)Advanced Tactical Unmanned Aircraft System	Project (Number/Name) 3429 / TERN UAS

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3429				
Technical and Engineering Services: Wargaming, Studies, Analysis of Alternatives	1	2019	4	2019
Technical and Engineering Services: Model Base Engineering Assessments	1	2019	4	2019
MALE (TERN) UAV Technical Maturation and Experimentation: Envelope Expansion, Flight Testing, & Demonstration	1	2019	4	2019