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 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604504N *I Air Control*							
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	242.796	60.323	44.923	38.863	-	38.863	30.058	31.769	31.143	31.769	Continuing	Continuing
0718: *MATCALS*	13.840	7.080	6.648	3.222	-	3.222	2.667	2.708	2.760	2.814	Continuing	Continuing
0993: *Carrier ATC*	157.500	31.290	15.522	13.668	-	13.668	10.013	10.384	8.770	8.948	Continuing	Continuing
1657: *ATC Improvement*	4.239	0.417	0.416	0.424	-	0.424	0.435	0.443	0.451	0.461	Continuing	Continuing
3372: *ATC Systems*	67.217	21.536	22.337	21.549	-	21.549	16.943	18.234	19.162	19.546	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element provides for the development, integration, and testing of Automated Air Traffic Control (ATC) hardware and software required to provide improved flight safety and more reliable all-weather ATC and landing system capabilities at Naval Air Stations (NASs) and Marine Corps Air Stations (MCASs) and Fleet Area Control and Surveillance Facilities (FACSFAC) worldwide. Programs are required to upgrade or replace aging ATC and landing system equipment on aircraft, aircraft carriers, amphibious ships, NASs, MCASs and Navy/Marine Corps tactical/expeditionary airfields and remote landing sites. These upgrades include addressing broadened CyberSecurity requirements to remain compliant with software CyberSecurity directives and Information Assurance mandates. Virtual Warfare Center (VWC) supports the Marine Air Ground Task Force (MAGTF) Integrated Air and Missile Defense (IAMD) development.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under SYSTEM DEVELOPMENT AND DEMONSTRATION because it includes those projects that have passed Milestone B approval and are conducting engineering and manufacturing development tasks aimed at meeting validated requirement prior to full-rate production decision.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	61.498	44.923	36.844	-	36.844
Current President's Budget	60.323	44.923	38.863	-	38.863
Total Adjustments	-1.175	0.000	2.019	-	2.019
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.175	0.000			
• Program Adjustments	0.000	0.000	1.948	-	1.948
• Rate/Misc Adjustments	0.000	0.000	0.071	-	0.071

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 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604504N *I Air Control*

Change Summary Explanation

Schedule:

(Proj 3372) - Due to the complexity of the AN/SPN-46 Block IV components, the schedule has been updated to reflect the continuation of the program into FY 2022; The updated schedule also reflects the start of the AN/SPN-35 Block II in FY 2021.

Financial:

(Proj 0993) - The FY 2021 increase of $1.948 million is due to increased cyber resiliency efforts for the Carrier ATC program (AN/TPX-42).

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 0718 / *MATCALS*	

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
0718: *MATCALS*	13.840	7.080	6.648	3.222	-	3.222	2.667	2.708	2.760	2.814	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Marine Air Traffic Control and Landing Systems (MATCALS) program provides for continued development, integration, and testing of hardware and software to meet requirements for all-weather operations and improved flight safety of Air Traffic Control (ATC) and Landing Systems at Marine Corps expeditionary airfields. An Acquisition Decision Memorandum from Jan 2005 approved the use of the U.S. Army AN/TPN-31 Air Traffic Navigation, Integration, and Coordination System (ATNAVICS) to fulfill the Air Surveillance and Precision Approach Radar and Control System (ASPARCS) requirement for Jul 2006. The ATNAVICS will replace the legacy ATC Precision Approach Radar (PAR), Airport Surveillance Radar (ASR), and Command and Control Subsystem with a High Mobility Multipurpose Wheeled Vehicle based PAR, ASR and Command and Control Subsystem. The Marine Resource Oversight Committee Decision Memorandum 11-2005 of Dec 2004 outlines the evolutionary improvements required by Headquarters Marine Corps. This program works with the Marine ATC Working Group identifying the requirements to implement the preplanned program improvement (P3I) and evolutionary product improvements as required for Ground/Air Task Oriented Radar System (G/ATOR), ATNAVICS, Expeditionary ATC Towers, and Navigational Aids that support Marine Air Traffic Control Detachments.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: ASPARCS Improvements	1.089	0.587	0.590	0.000	0.590
Articles:	-	-	-	-	-
Description: Investigate and resolve obsolescence issues. Perform studies and analyses to implement P3I and other evolutionary improvements. Develop criteria for existing ASPARCS software to achieve Defense Information Infrastructure-Common Operating Environment Level 5 compliance, Information Assurance, Radar Range Extension and Mapping functionality, and enhanced simulation and training into the existing ASPARCS software. Perform Mode 5/S integration, operational functionality study and analyses with AN/TPN-31(V)7 ATNAVICS System.					
FY 2020 Plans: Continue ATNAVICS ECP's that will reduce system hardware footprint, improve reliability and meet the requirement for multiple touchdown points.					
FY 2021 Base Plans: Develop ECP's to minimize obsolescence issues within the Precision Approach Radar and develop capability to meet the multiple touchdown point capability requirement.					
FY 2021 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0718 / *MATCALS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: FY20 to FY21 increase is due to inflation.					
Title: Ground/Air Task Oriented Radar System (G/ATOR)	4.470	3.533	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: G/ATOR is multi-role, ground-based, expeditionary radar that replaces five legacy radar systems for the Marine Air Ground Task Force. It satisfies the Marine Air Command and Control System and the Ground Counter Fire/ Counter Battery capabilities. The G/ATOR replaces the AN/TPS-63 and complements the AN/TPS-59 long range radar and will provide mobile, multi-functional, three-dimensional surveillance of air breathing targets, detection of cruise missiles and Unmanned Aerial Systems, and the cueing of air defense weapons. The G/ATOR contributes to the extension of Sea Shield/Sea Strike by surveillance and detection of enemy air threats not seen by Navy sensors in the littorals by participating in a cooperative engagement network of sensors and shooters; G/ATOR enables Integrated Fire Control (IFC) and provides engage/fire on remote capability. G/ATOR surveillance coverage with IFC will provide unprecedented reach, volume and precision in the execution of Operational Maneuver From The Sea allowing Naval forces to project and sustain power deep inland. G/ATOR will add Mode 5/S capability, Federal Aviation Administration flight certification requirements, and the ability to integrate with AN/TPN-31(V) ATNAVICS for Precision Approach Radar. This increment of G/ATOR replaces the Marine Corps' AN/TPS-73 radar and the Airport Surveillance Radar portion of the ATNAVICS also known as Air Surveillance and Precision Approach Radar Control System.					
FY 2020 Plans: Continue developing the TEMP that supports the Mode 5/S integration into G/ATOR, includes the JOTA event required by the Marine Corps and a plan for obtaining DoD AIMS certification for the G/ATOR platform. Continue system testing of the G/ATOR Mode 5/S integration for FAA and DoD AIMS certification and use by all G/ATOR blocks.					
FY 2021 Base Plans: N/A					
FY 2021 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0718 / *MATCALS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY20 to FY21 decrease due to G/ATOR mode 5 development effort ending in FY20.					
Title: Virtual Warfare Center Support	1.521	2.528	2.632	0.000	2.632
Articles:	-	-	-	-	-
Description: Virtual Warfare Center (VWC) Support - This project supports fully interactive operator in the loop simulations in support of the Virtual Warfare Center (VWC) in order to quantify USMC Integrated Air and Missile Defense (IAMD) family of systems performance and how it impacts effectiveness in the IAMD mission area. ***FY 2020 Plans:*** Continue to support integration and development of Designs of Experiment related to marine Air Ground Task Force IAMD capabilities. Provide event technical support for additional analysis events. Conduct and document analysis results for USMC stakeholders. ***FY 2021 Base Plans:*** Continue to support integration and development of Designs of Experiment related to marine Air Ground Task Force IAMD capabilities. Provide event technical support for additional analysis events. Conduct and document analysis results for USMC stakeholders. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The FY 2020 to FY 2021 increase is due to inflation.					
Accomplishments/Planned Programs Subtotals	7.080	6.648	3.222	0.000	3.222

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• RDTEN/0204460M: *G/ATOR*	43.184	28.891	22.205	-	22.205	13.659	13.536	12.533	12.785	Continuing	Continuing
• OPN/2820: *Ashore ATC Equipment/MATCALS*	5.421	4.201	9.506	-	9.506	10.604	9.146	8.162	8.035	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0718 / *MATCALS*

D. Acquisition Strategy

An Acquisition Decision Memorandum was signed in Jan 2005 approving the procurement of the Army AN/TPN-31 ATNAVICS to fulfill the Air Surveillance and Precision Approach Radar and Control System requirement for July 2006. The MROC Decision Memorandum 11-2005 of December 2004 outlined the evolutionary improvements required by Headquarters Marine Corps. This program has joined with the Army to implement Pre-Planned Product Improvements and evolutionary product improvements.

G/ATOR will add Mode 5/S capability, FAA flight certification requirements, and the ability to integrate with AN/TPN-31 ATNAVICS for Precision Approach Radar.

The Marine Air Traffic Control (ATC) Working Group identified requirements to address obsolescence issues with ATC Expeditionary Towers. These requirements were validated by APX-8 and a Decision Analysis Study was conducted by NAVAIR 4.10. Funding will address development of expeditionary ATC Tower capability improvements via the Engineering Change Proposal process.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 0718 / *MATCALS*	

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 HDW Develop - ASPARCS Mode 5/S	WR	NAWCAD : Patuxent River, MD	1.589	0.500	Dec 2018	0.587	Dec 2019	0.590	Dec 2020	-		0.590	0.000	3.266	-
Primary HDW Develop - ASPARCS	WR	SPAWARSYSCEN : San Diego, CA	0.510	0.000		0.000		0.000		-		0.000	0.000	0.510	-
Primary HDW Develop - ASPARCS	C/CPFF	TRANDES : San Diego, CA	1.783	0.000		0.000		0.000		-		0.000	0.000	1.783	1.783
		Subtotal	3.882	0.500		0.587		0.590		-		0.590	0.000	5.559	N/A

Support ($ 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
Software Development - G/ ATOR	WR	NSWC : Dahlgren, VA	0.619	1.000	Feb 2019	0.956	Mar 2020	0.000		-		0.000	0.000	2.575	-
Software Development - ASPARCS	WR	NAWCAD : Patuxent River, MD	3.983	0.589	Mar 2019	0.000		0.000		-		0.000	0.000	4.572	-
Software Development - Mode 5/S Dev - G/ATOR	SS/CPIF	Telephonics : Huntington Station, NY	2.584	3.270	Oct 2018	2.377	Nov 2019	0.000		-		0.000	0.000	8.231	Continuing
Engineering Support - VWC	TBD	NSMA : TBD	1.320	0.942	Oct 2018	1.047	Jan 2020	1.157	Dec 2020	-		1.157	Continuing	Continuing	Continuing
Software Development - VWC	C/BA	TBD : TBD	0.580	0.419	Jan 2019	1.321	Jan 2020	1.315	Dec 2020	-		1.315	Continuing	Continuing	Continuing
		Subtotal	9.086	6.220		5.701		2.472		-		2.472	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
Program Management Support	WR	NAWCAD : Patuxent River, MD	0.622	0.160	Jan 2019	0.160	Jan 2020	0.160	Jan 2021	-		0.160	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 0718 / *MATCALS*	

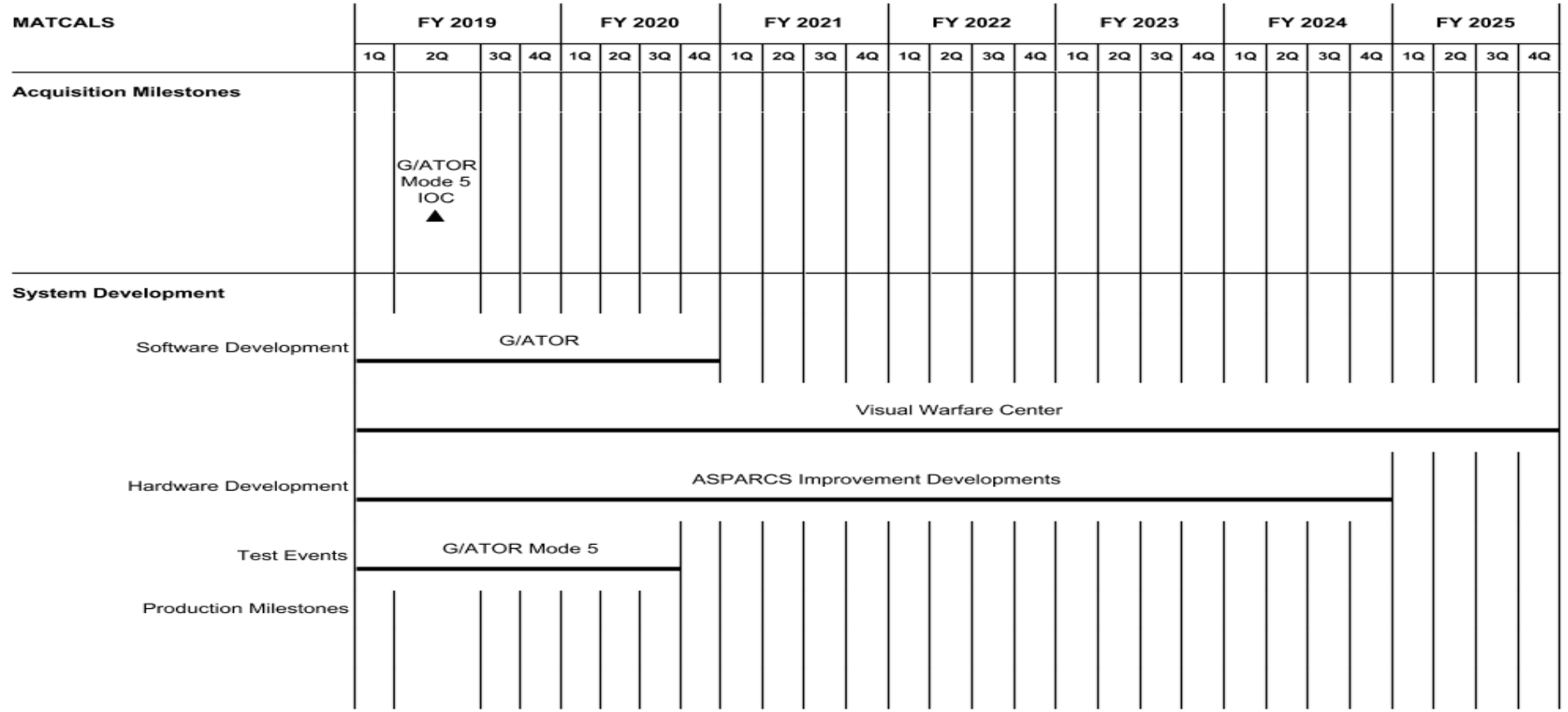
Management Services ($ in Millions)

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
Program Management Support	WR	G/ATOR : PEO Land Systems	0.250	0.200	Jan 2019	0.200	Jan 2020	0.000		-		0.000	0.000	0.650	-
		Subtotal	0.872	0.360		0.360		0.160		-		0.160	Continuing	Continuing	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	13.840	7.080		6.648		3.222		-		3.222	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0718 / *MATCALS*



2021DON - 0604504N - 0718

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0718 / *MATCALS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MATCALS				
Acquisition Milestones: G/ATOR Mode 5 IOC	2	2019	2	2019
System Development: Software Development: G/ATOR	1	2019	4	2020
System Development: Software Development: Visual Warfare Center	1	2019	4	2025
System Development: Hardware Development: ASPARCS improvements	1	2019	4	2024
System Development: Test Events: G/ATOR Mode 5	1	2019	3	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 0993 / *Carrier ATC*	

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
0993: *Carrier ATC*	157.500	31.290	15.522	13.668	-	13.668	10.013	10.384	8.770	8.948	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Shipboard Air Traffic Control systems, interfacing with versions of the AN/TPX-42A(V) Direct Altitude and Identity Readout (DAIR), allow shipboard Air Traffic Controllers to identify, marshal, and direct aircraft within a 50 Nautical Mile (NM) radius of the ship. In recent years, the top 25 percent of the AN/SPN-43C frequency band has been reallocated to the Fixed Wireless Access Community prohibiting Air Traffic Control (ATC) Air Search Radar (ASR) operation within 50NM of the coast. Because the Navy requires an air traffic control surveillance radar, this project unit will include engineering efforts to identify requirements and develop the AN/SPN-50(V)1 as an AN/SPN-43C replacement system. In addition, bridging Engineering Change Proposals (ECP) will be required to sustain the AN/SPN-43C capability until the AN/SPN-50(V)1 is completely fielded. Finally, the AN/TPX-42A(V) DAIR continues to undergo several phased upgrades that have resulted in a number of field changes/technology refresh/insertion efforts. System improvements include replacing militarized front-end equipment in the track processor with open architecture Commercial Off the Shelf technology, converting the operational program software to more commonly used and flexible "C" language, providing the "hooks" for potential interface with Mode 5 Identification Friend or Foe, and integrating a flat panel monitor into the controller work station. The ATC System Shipboard, AN/SYY-1(V) interfaces to emerging sensors as well as those currently in service to improve reliability to the fleet. The embedded training capability of the AN/TPX-42A(V) will carry on to the AN/SYY-1(V). This effort includes addressing broadened CyberSecurity requirements to remain compliant with software CyberSecurity directives and Information Assurance mandates.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: AN/SPN-50	25.085	9.561	5.373	0.000	5.373
Articles:	-	-	-	-	-
Description: This project funds the development of the AN/SPN-43C replacement program (AN/SPN-50), which was previously funded under AN/SPN-43C and is being broken out for administrative reasons. This system enables Air Traffic Controllers to assure the safe and expeditious movement of air traffic. This capability is an enabler in maintaining launch/recovery cycle times/sortie rates.					
FY 2020 Plans: Land-based testing will continue. Manufacturing maturity will be evaluated and a Production Readiness Review will be conducted. Documentation will continue to be updated leading up to the execution of a Milestone C in FY 2020.					
FY 2021 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0993 / *Carrier ATC*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Follow-on testing to Support ITC1 and Operational Test Readiness Review (OTRR). Conduct M Demo and Logistics Demo. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY2020 to FY2021 decrease due to the development effort ramping down.					
Title: AN/SPN-43C ***Articles:*** ***Description:*** Funds development of sustainment Engineering Change Proposals (ECP) for the AN/SPN-43C. The sustainment effort will ensure the capabilities provided by the AN/SPN-43C remain available to CVN, LHA and LHD type ships until the replacement system is fielded. ***FY 2020 Plans:*** Continued sustainment ECPs for AN/SPN-43C. ***FY 2021 Base Plans:*** Continued sustainment ECPs for AN/SPN-43C. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2020 to FY2021 increase is due to inflation.	2.256 -	2.301 -	2.347 -	0.000 -	2.347 -
Title: AN/TPX-42 ***Articles:*** ***Description:*** This project funds the ongoing modernization of the AN/TPX-42 system through engineering changes and technology refresh, to include CyberSecurity requirements and compliance. Specific engineering changes are: Development of an Air Traffic Control (ATC) Multi-Function Console (MFC) which will reduce operational costs, improve reliability, and provide common hardware for all ATC workstations. Additionally, MFC will provide interfaces for emerging/planned sensors. ***FY 2020 Plans:***	3.949 -	3.660 -	5.948 -	0.000 -	5.948 -

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0993 / *Carrier ATC*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Continue Multifunction Console (MFC)/AN/SYY-1 ECP inclusive of interface development for AN/SPN-50(V) and Enterprise Air Surveillance Radar (EASR). Note: AN/SYY-1 will be the Tech Solution for Multifunction Console ECP. Commence land based testing for AN/TPX-42 interference with EASR and AN/SPN-50. ***FY 2021 Base Plans:*** Continue sustainment ECPs for AN/TPX-42. Continue developing shipboard enclave environment, reduce cyber vulnerabilities of aviation land and launch systems and improve the ability to continue manned and unmanned aircraft flight operations in a cyber-contested battlespace. Continue land based testing for AN/TPX-42 interface with Enterprise Air Surveillance Radar (EASR and AN/SPN-50). ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The FY 2020 to FY 2021 increase due to increased development efforts for AN/TPX-42 cyber resiliency requirements.					
Accomplishments/Planned Programs Subtotals	31.290	15.522	13.668	0.000	13.668

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• OPN/2830: *Afloat ATC*	8.593	24.349	40.100	-	40.100	44.057	62.969	64.235	65.519	Continuing	Continuing
Equipment: SATC / AN/SPN-50(V)1											

Remarks

D. Acquisition Strategy

AN/TPX-42 Voice/Video recorder replacement, Joint Precision Approach and Landing System Interface, Shipboard trainer, and Air Traffic Control (ATC) Console are all in progress ECPs, with improvements being incorporated into the production of AN/SYY-1(V) upgrade kits.

AN/SPN-50 replacement program is an ACAT IVT program. All other projects are non-ACAT upgrades to existing systems. An evolutionary acquisition approach is being used to introduce these technology advancements that either satisfy user requirements, such as all weather operation, or address supportability and cost of ownership problems.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0993 / *Carrier ATC*

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 HDW Develop-TPX-42	WR	NAWCAD : PAX River, MD	5.966	0.563	Dec 2018	0.574	Dec 2019	1.436	Dec 2020	-		1.436	Continuing	Continuing	Continuing
Primary HDW Develop - SPN-43	WR	NAWCAD : PAX River, MD	4.673	0.475	Dec 2018	0.484	Dec 2019	0.526	Dec 2020	-		0.526	Continuing	Continuing	Continuing
Primary HDW Develop - SPN-50(V)1 Pre-CDR Configuration EDM	C/CPIF	SAAB : Syracuse NY	11.317	0.000		0.000		0.000		-		0.000	0.000	11.317	11.317
Primary HDW Develop - SPN-50(V)1 Post-CDR Configuration EDM	C/CPIF	SAAB : Syracuse NY	4.374	1.009	Dec 2018	0.095	Dec 2019	0.059	Dec 2020	-		0.059	0.077	5.614	5.614
Primary HDW EMD - SPN-50(V)1	C/CPIF	SAAB : Syracuse NY	25.517	13.860	Jan 2019	2.785	Dec 2019	0.785	Dec 2020	-		0.785	0.560	43.507	44.507
Prior year Prod Dev no longer funded in the FYDP	Various	Various : TBD	17.998	0.000		0.000		0.000		-		0.000	0.000	17.998	-
		Subtotal	69.845	15.907		3.938		2.806		-		2.806	Continuing	Continuing	N/A

Remarks

AN/TPX-42 and AN/SPN-43 HDW development increases in FY21 due to increased cyber resiliency development efforts.
Prior year totals has been updated to reflect actuals from previous years.

Support ($ 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
Software Development-TPX-42	WR	NAWCAD : PAX River, MD	22.505	2.300	Dec 2018	2.071	Dec 2019	2.740	Dec 2020	-		2.740	Continuing	Continuing	Continuing
Integrated Logistics Support- TPX-42	WR	NAWCAD : PAX River, MD	2.079	0.120	Dec 2018	0.122	Dec 2019	0.588	Dec 2020	-		0.588	Continuing	Continuing	Continuing
Integrated Logistics Support-SPN-43	WR	NAWCAD : PAX River, MD	1.131	0.120	Dec 2018	0.122	Dec 2019	0.123	Dec 2020	-		0.123	Continuing	Continuing	Continuing
Integrated Logistics Support-SPN-50(V)1	WR	NAWCAD : PAX River, MD	1.136	0.563	Dec 2018	0.364	Dec 2019	0.193	Dec 2020	-		0.193	Continuing	Continuing	Continuing
Studies & Analysis-SPN-50(V)1	WR	NAWCAD : PAX River, MD	3.856	0.585	Dec 2018	0.065	Dec 2019	0.085	Dec 2020	-		0.085	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 0993 / *Carrier ATC*	

Support ($ 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
Software Development - SPN-50(V)1	WR	NAWCAD : PAX River, MD	9.640	1.595	Dec 2018	0.080	Dec 2019	0.212	Dec 2020	-		0.212	Continuing	Continuing	Continuing
Studies & Analysis-SPN-43	WR	NAWCAD : PAX River, MD	2.049	0.020	Dec 2018	0.021	Dec 2019	0.022	Dec 2020	-		0.022	Continuing	Continuing	Continuing
Studies & Analysis-TPX-42	WR	NAWCAD : PAX River, MD	1.421	0.100	Dec 2018	0.102	Dec 2019	0.250	Dec 2020	-		0.250	Continuing	Continuing	Continuing
Systems Engineering-SPN-50(V)1	WR	NAWCAD : PAX River, MD	14.086	3.667	Dec 2018	2.340	Dec 2019	0.517	Dec 2020	-		0.517	0.208	20.818	-
Prior Year Support no longer funded in the FYDP	Various	Various : Various	13.393	0.000		0.000		0.000		-		0.000	0.000	13.393	-
Studies & Analysis SPN-50(V)1	WR	Variou : VA	0.402	0.000		0.000		0.000		-		0.000	0.000	0.402	-
		Subtotal	71.698	9.070		5.287		4.730		-		4.730	Continuing	Continuing	N/A

Remarks

AN/TPX-42 software development increases in FY21 due to increased cyber resiliency development efforts.

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
Developmental Test & Evaluation- TPX-42	WR	NAWCAD : PAX River, MD	4.045	0.712	Dec 2018	0.726	Dec 2019	0.785	Dec 2020	-		0.785	Continuing	Continuing	Continuing
Development Test & Evaluation - SPN-43	WR	NAWCAD : PAX River, MD	3.532	1.516	Dec 2018	1.520	Dec 2019	1.550	Dec 2020	-		1.550	Continuing	Continuing	Continuing
Operational Test & Evaluation-SPN-50(V)1	WR	OPTEVOR : Norfolk, VA	0.409	0.268	Dec 2018	0.296	Dec 2019	2.272	Dec 2020	-		2.272	2.336	5.581	-
Prior year T&E no longer funded in the FYDP	Various	Various : Various	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
Development Test & Evaluation SPN-50	WR	NAWCAD : PAX River	3.684	2.413	Dec 2018	2.664	Dec 2019	0.000		-		0.000	0.000	8.761	-
		Subtotal	11.670	4.909		5.206		4.607		-		4.607	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 0993 / *Carrier ATC*	

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
Program Management Support	C/CPFF	American Electronics, Inc. : California, MD	2.363	0.425	Dec 2018	0.337	Dec 2019	0.575	Dec 2020	-		0.575	Continuing	Continuing	Continuing
Program Management Support	WR	NAWCAD : PAX River, MD	1.563	0.700	Dec 2018	0.535	Dec 2019	0.675	Dec 2020	-		0.675	Continuing	Continuing	Continuing
Travel	WR	NAVAIRHQ : PAX River, MD	0.361	0.279	Dec 2018	0.219	Dec 2019	0.275	Dec 2020	-		0.275	Continuing	Continuing	Continuing
		Subtotal	4.287	1.404		1.091		1.525		-		1.525	Continuing	Continuing	N/A

Remarks

Program Management support increased to support improving cyber resiliency within the Aviation Land and Launch Enclave (ALLE).

	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	157.500	31.290		15.522		13.668		-		13.668	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0993 / *Carrier ATC*

AN/TPX-42 / AN/SPN-43 Schedule

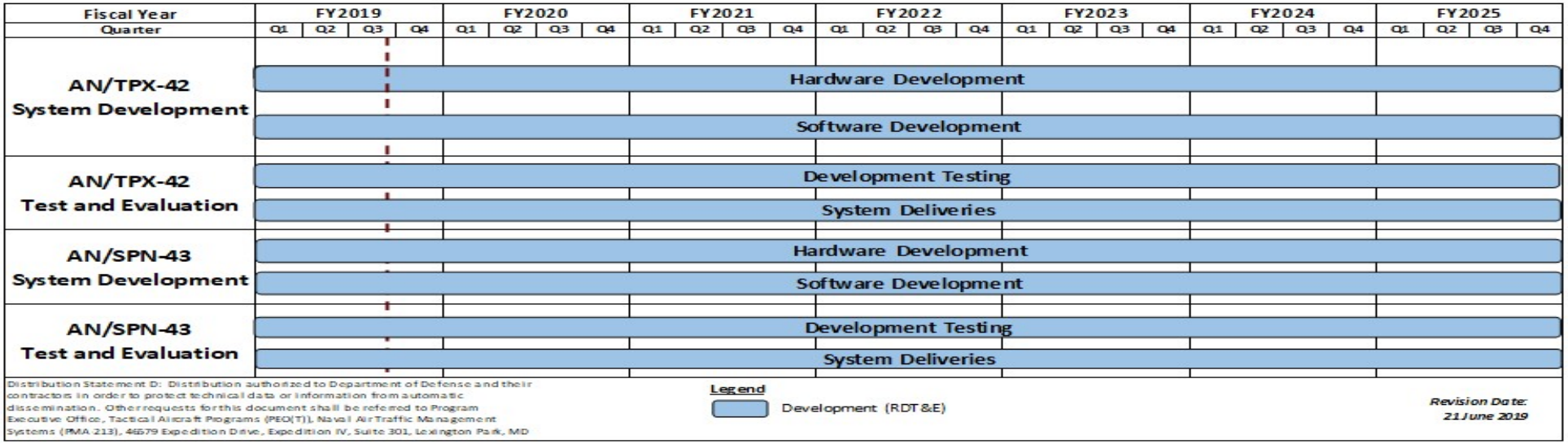
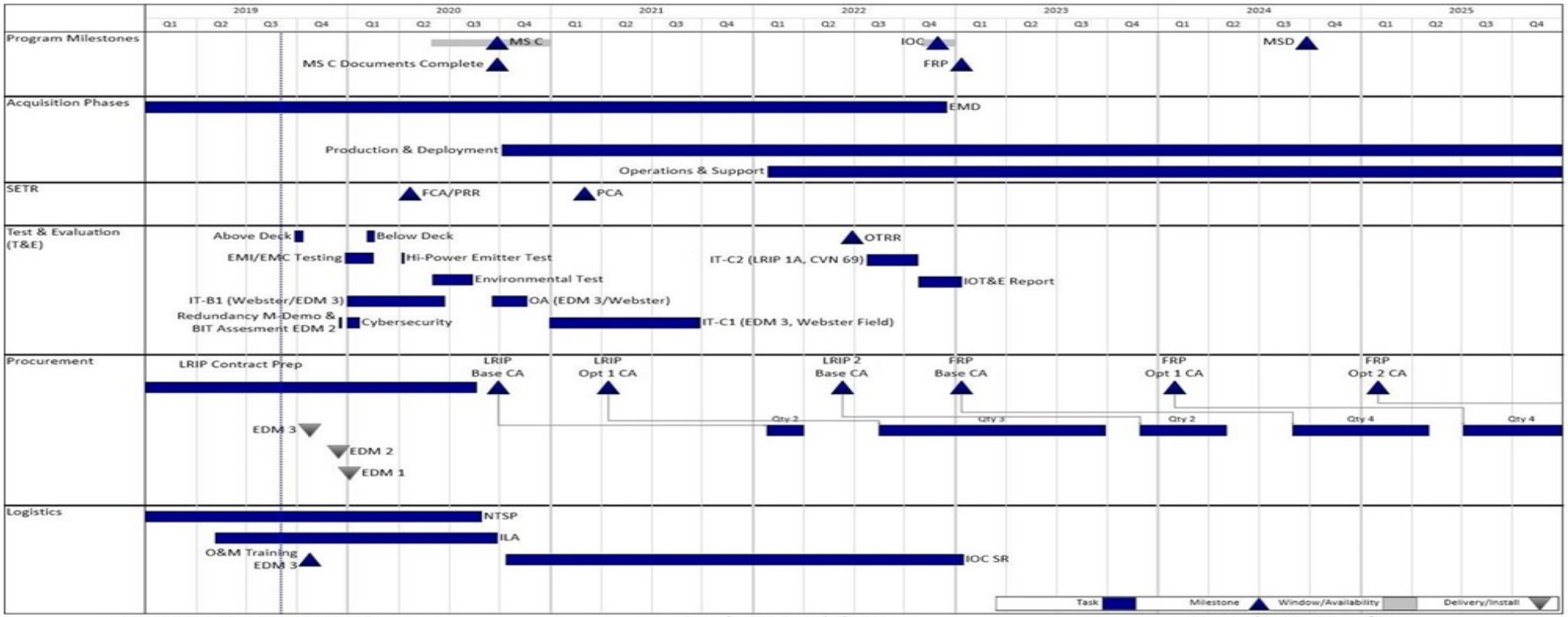


Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0993 / *Carrier ATC*

SPN-50 Program Schedule



SPN-50 IGS MASTER 07082019.mpp Snapshot Date: 7/8/2019 Created in OnePager® Pro

Bring 'em Back Alive

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 0993 / *Carrier ATC*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Carrier ATC				
Acquisition Milestones: Milestones: AN/SPN-50(V)1 Milestone C	3	2020	3	2020
System Development: Hardware Development: AN/SPN-43C	1	2019	4	2025
System Development: Hardware Development: AN/TPX-42A(V)	1	2019	4	2025
System Development: Software Development: AN/SPN-43C	1	2019	4	2025
System Development: Software Development: AN/TPX-42A(V)	1	2019	4	2025
System Development: Reviews: Functional Configuration Audit/Production Readiness Review (AN/SPN-50(V)1)	2	2020	2	2020
System Development: Reviews: Physical Configuration Audit (AN/SPN-50(V)1)	1	2021	1	2021
Test and Evaluation: Developmental Testing/Operational Testing (AN/SPN-50(V)1)	3	2019	1	2021
Test and Evaluation: Developmental Testing (AN/TPX-42A(V))	1	2019	4	2025
Test and Evaluation: Developmental Testing (AN/SPN-43C)	1	2019	4	2025
Deliveries: Post-CDR Configuration Prototype Delivery (AN/SPN-50(V)1)	4	2019	4	2019
Deliveries: System Deliveries (TPX-42A(V))	1	2019	4	2025
Deliveries: System Deliveries (AN/SPN-43C)	1	2019	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 1657 / *ATC Improvement*	

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
1657: *ATC Improvement*	4.239	0.417	0.416	0.424	-	0.424	0.435	0.443	0.451	0.461	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program provides for engineering development, integration, adaptation, and testing of new and/or modernized Air Traffic Control (ATC) systems, air navigational aids, landing systems, and ATC communication systems for Naval and Marine Corps Air Stations (NAS/MCAS), Fleet ATC Systems, and remote tower improvements.. These systems are critical to Naval Aviation and provide for safe, efficient air operations. Additionally, the Federal Aviation Administration (FAA) is affecting major modernization of the National Airspace System (NAS). The Navy must maintain compatibility with FAA-developed ATC systems in order to ensure seamless interoperability within the NAS. NAS modernization initiatives in Project 1657 include the Visual Information Display System (VIDS) and follow-on Pre-Planned Product Improvements, with additional RDT&E efforts required for modified commercial-off-the-shelf ATC systems and equipment for modernization and recapitalization of these systems at our NAS, MCAS & Fleet Area Control & Surveillance Facilities (FACSFACs) worldwide.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: NAS MOD VIDS	0.208	0.207	0.211	0.000	0.211
Articles:	-	-	-	-	-
Description: Continue engineering development of pre-planned product improvements for the VIDS and initiate efforts to incorporate VIDS into the FACSFACs. Research display alternatives for Navy ATC systems, and evaluate alternatives for future communication and radar systems.					
FY 2020 Plans: Continue engineering development of Pre-Planned Product Improvement for VIDS to incorporate multiple weather source inputs. Continue Standard Terminal Automation System (STARS) and VIDS engineering development for technology insertion. Continue engineering efforts to maintain interoperability with the FAA's next generation air traffic control system.					
FY 2021 Base Plans: Continue engineering development of Pre-Planned Product Improvement for VIDS to incorporate multiple weather source inputs. Continue STARS and VIDS engineering development for technology insertion. To include VIDS cyber integration efforts and continue engineering efforts to maintain interoperability with the FAA's next generation air traffic control system.					
FY 2021 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 1657 / *ATC Improvement*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY20 to FY21 increase is due to inflation.					
Title: Fleet ATC Systems	0.209	0.209	0.213	0.000	0.213
Articles:	-	-	-	-	-
Description: Research efforts to determine the best technical approach to integrate various data link and communication system upgrades into Navy/Marine Corps ATC Systems including, but not limited to, the Digital Airport Surveillance Radar (DASR) and the DoD Advanced Automation Systems (DAAS) into the Fleet Area Control and Surveillance Facilities. Evaluate alternative for future processor/display, sensor and communication systems. ***FY 2020 Plans:*** Continue engineering efforts to maintain interoperability with the FAA's next generation air traffic control system. Continue evaluation of future processor/display, sensor and communication systems. ***FY 2021 Base Plans:*** Continue engineering efforts to maintain interoperability with the FAA's next generation air traffic control system. Continue evaluation of future processor/display, sensor and communication systems. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY20 to FY21 increase is due to inflation.					
Accomplishments/Planned Programs Subtotals	0.417	0.416	0.424	0.000	0.424

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• OPN/2820: *Ashore ATC Equipment: NASMOD/Fleet ATC*	35.696	36.385	37.072	-	37.072	39.526	40.622	41.227	41.769	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 1657 / *ATC Improvement*

D. Acquisition Strategy

All projects are non-ACAT upgrades to existing systems. An evolutionary acquisition approach is being used to introduce technology advancements that either satisfy emergent requirements or address supportability and cost of ownership problems.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 1657 / *ATC Improvement*

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 HDW Develop - VIDS	WR	SPAWAR Systems Command : Charleston, SC	2.165	0.208	Dec 2018	0.207	Dec 2019	0.211	Dec 2020	-		0.211	Continuing	Continuing	Continuing
Primary HDW Develop - Fleet ATC	WR	SPAWAR Systems Center : Charleston, SC	1.138	0.209	Dec 2018	0.209	Dec 2019	0.213	Dec 2020	-		0.213	Continuing	Continuing	Continuing
		Subtotal	3.303	0.417		0.416		0.424		-		0.424	Continuing	Continuing	N/A

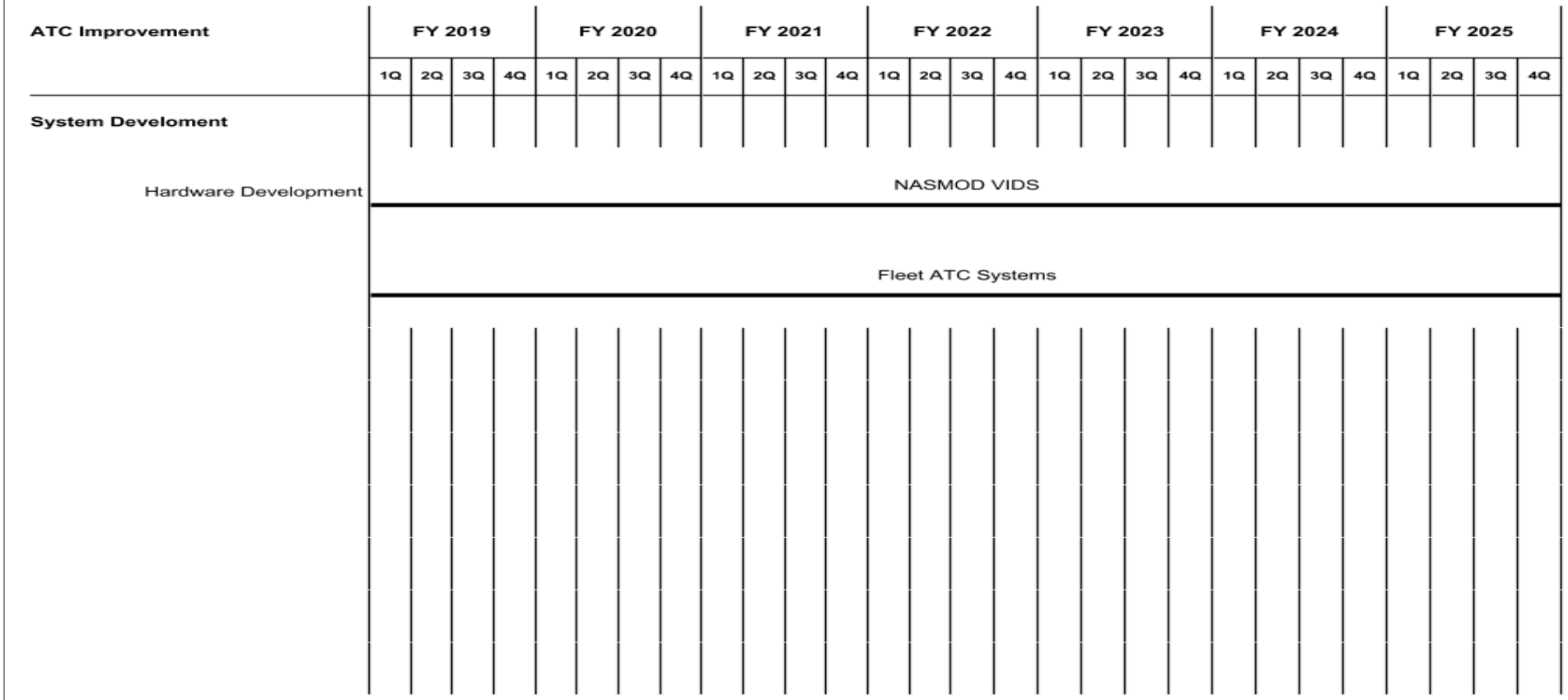
Support ($ in Millions)

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
Systems Engineering	WR	SPAWAR Systems Center : Charleston, SC	0.936	0.000		0.000		0.000		-		0.000	0.000	0.936	-
		Subtotal	0.936	0.000		0.000		0.000		-		0.000	0.000	0.936	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	4.239	0.417		0.416		0.424		-		0.424	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 1657 / *ATC Improvement*



2021DON - 0604504N - 1657

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 1657 / *ATC Improvement*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ATC Improvement				
System Develoment: Hardware Development: NASMOD VIDS	1	2019	4	2025
System Develoment: Hardware Development: Fleet ATC Systems	1	2019	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 3372 / *ATC Systems*	

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
3372: *ATC Systems*	67.217	21.536	22.337	21.549	-	21.549	16.943	18.234	19.162	19.546	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Landing System Upgrade Program (LSUP) is essential to maintain the United States Navy's capability to perform safe and expeditious aircraft landings aboard CVN and LHA/D vessels. The Navy's Precision Approach and Landing Capability requirements have necessitated Life Cycle Extension upgrades to legacy landing systems, AN/SPN-35, AN/SPN-41 and AN/SPN-46. The LSUP program will modernize technology that was developed and fielded over 30 years ago. It is estimated that without these upgrades, the Navy will lose its Automatic Carrier Landing System capability within 5 years. Cyber Security requirements have driven increased efforts to remain compliant with software CyberSecurity directives and Information Assurance mandates. Maintaining compliance is critical to retaining authorization to operate within the Fleet.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: AN/SPN-46 Blk IV Upgrade	6.271	10.200	6.190	0.000	6.190
Articles:	4	-	-	-	-
Description: The AN/SPN-46 Blk IV program targets aging and obsolete components within the carrier landing systems and replaces them with modernized and sustainable components. Blk IV consists of antenna pedestal upgrades, addresses transmitter obsolescence issues, and replacement of obsolete circuit cards, and Cybersecurity.					
FY 2020 Plans: Continue development of the Blk IV upgrade to include risk reduction shock testing of the AN/SPN-46 antenna assembly, additional 2500 CCA redesign to accommodate the WIN 10 SHB Operating System image, and rework needed for the Unit 19 Power Supply Engineering Development Models (EDMs). Integration efforts will continue with the new transmitter and circuit cards, as well as, integrating a reinforced antenna strut assembly and upgraded feedhorn spin motor. Conduct antenna shock risk reduction testing. Hold Technical Readiness Review (TRR) and initiate Pedestal/Transmitter testing.					
FY 2021 Base Plans: Continue qualification testing of the pedestal/transmitter configuration. Complete the principal unit (Pedestal EDMs) Electromagnetic Interference (EMI), environmental and shock testing. Installation of EDMs at the Landing Systems Test Facility (LSTF) to start the full system integration, in-system testing, and formal flight qualification testing.					
FY 2021 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 3372 / *ATC Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease of $4.010M from FY 2020 to FY 2021 is due to the AN/SPN-46 Blk IV power supply and circuit card development efforts concluding.					
Title: AN/SPN-35 Blk I Upgrade	10.220	7.360	4.100	0.000	4.100
Articles:	5	-	-	-	-
Description: This program provides for the development, upgrade, redesign, integration, and testing of the AN/SPN-35C Block I upgrade. AN/SPN-35C is the Precision Approach Radar aboard LHA/LHD class ships and is used for Mode III aircraft recovery which ensures the safe approach and landing of all LH-class embarked aircraft during adverse weather & night conditions. The AN/SPN-35C Block I upgrade will include engineering efforts to upgrade, redesign, replace, and support common failure items (Receiver, Radar Processing Controller (RPC), Main Input/output Processor (MIOP), Control-Indicators). Included in these efforts are changes to obsolete components and analog systems, ensuring the radar capability is available to the fleet and extending the service life of the AN/SPN-35C to 2040. ***FY 2020 Plans:*** Continue development of the AN/SPN-35 Blk I upgrade. Complete Test Readiness Review (TRR) and Integration Readiness Review (IRR). Delivery of EDMs to Software Integration Lab (SIL), to begin risk reduction integration testing, Electromagnetic Interference (EMI) qualification testing, Environmental and Shock testing. ***FY 2021 Base Plans:*** Complete flight testing. Complete development of the AN/SPN-35 Blk I upgrade. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease of $3.260M from FY 2020 to FY 2021 is due to the AN/SPN-35 Blk I upgrade completion.					
Title: AN/SPN-46 Blk V Upgrade (CCAs, RTOS, software, RAM pole, TS-3098)	5.045	4.777	7.262	0.000	7.262
Articles:	-	-	-	-	-
Description: The AN/SPN-46 Block V upgrade targets aging and obsolete hardware and software components within the carrier landing system and replaces them with modernized and supportable components. Blk V consists of a major AN/					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 3372 / *ATC Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
SPN-46 operational software upgrade along with a refresh of numerous Commercial Off The Shelf (COTS) equipment subassemblies. Planned upgrades are updates to the radar's obsolete radar processor circuit card assemblies (CCAs) with new generation CCAs, upgrading the radar's Real Time Operating System (RTOS) with a current and supportable RTOS, and optimizing and reconfiguring the radar's software into a logical, modular format. The radar's top two degraders, the Radar Alignment Mast (RAM) pole and the TS-3098 test set, will be modified with less complex, higher reliability designs.Hardware changes will include reducing reliability issues caused by outdated bus systems and IP based substructures and provide as overall system hardening to mitigate external interference issues. The software architecture redesign and optimization will increase modularity and operational efficiency as well as implement M-Code and resolve cyber security related issues inherent with the current system. ***FY 2020 Plans:*** Continue engineering designs to support Technical Interchange Meeting (TIM) level reviews for the radar CCAs and RTOS. Transition VxWorks Version 5.5 to Version 7.0. Tech refresh of the 2850 Radar processor circuit card assembly. ***FY 2021 Base Plans:*** Continue engineering design reviews and documentation updates for all updated components to support two additional TIM's. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase of $2.485M in FY 2020 to FY 2021 is due to the increased engineering efforts leading to software development for TIM #3.					
Title: AN/SPN-35 Blk II Upgrade	0.000	0.000	3.997	0.000	3.997
Articles:	-	-	-	-	-
Description: This program provides for the development, upgrade, redesign, integration, and testing of the AN/SPN-35C Block II upgrade. AN/SPN-35C is the Precision Approach Radar aboard LHA/LHD class ships and is used for Mode III aircraft recovery which ensures the safe approach and landing of all LH-class embarked aircraft during adverse weather & night conditions. The AN/SPN-35C Block II upgrade will include engineering					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 3372 / *ATC Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
efforts to develop an Active Electronically Steered Array (AESA) to replace the existing receiver-transmitter, pedestal, antenna group and incorporate digital stabilization. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Begin development of the Active Electronically Steered Array (AESA). ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase of $3.997M from FY 2020 to FY 2021 is due to the start of the AN/SPN-35 Blk II upgrade.					
Accomplishments/Planned Programs Subtotals	21.536	22.337	21.549	0.000	21.549

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• OPN/2830: *Afloat ATC Equipment/ACLS*	39.297	38.930	25.013	-	25.013	32.049	44.828	46.358	47.241	Continuing	Continuing

Remarks

D. Acquisition Strategy

Landing System Upgrade Program consists of lifecycle extension upgrades to the AN/SPN-35C Precision Approach Radar, AN/SPN-41B Instrument Control Landing Systems and AN/SPN-46 Automatic Carrier Landing Systems which support Air Traffic Control (ATC) operations on board CVN, LHA, and/or LHD-class ships. This effort includes numerous commercial off-the-shelf (COTS) component refresh updates which are urgently needed to sustain the operational viability of these Naval ATC systems supporting fleet air operations for at least the next 15 years until the next generation ATC system is fully implemented. This COTS refresh will include analysis and upgrade of key system components that are critical to overall system operation but have become increasingly difficult to maintain over the past few years. Recent adjustments in the direction and scope of Naval ATC systems have necessitated a re-evaluation of the long-term viability and sustainability of the current Fleet ATC equipment.

The Resources and Requirements Review Board approved the DON Precision Approach and Landing Capability (PALC) Roadmap per Decision Memorandum (DM) Ser: N8B/13U141053 dtd 03 July 2013. This PALC Roadmap re-scoped Joint Precision Approach and Landing System (JPALS) into a single increment and deferred JPALS capability from legacy fleet aircraft. As a result, a requirement to sustain current SPNs through 2030 has emerged. Per Enclosure 1 of the above DM, the

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 3372 / *ATC Systems*

Landing Systems Upgrade Program will be comprised of upgrades to the AN/SPN-46, AN/SPN-35C, and AN/SPN-41B. It is anticipated that each SPN upgrade will go through separate Systems Engineering Technical Review (SETR) processes.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 3372 / *ATC Systems*

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 Hardware Development - AN/SPN-46 Blk IV Upgrade	WR	NAWCAD : Patuxent River, MD	21.305	1.123	Nov 2018	5.364	Nov 2019	2.436	Nov 2020	-		2.436	Continuing	Continuing	Continuing
Ancillary Hardware Development - AN/SPN-46 Blk IV Upgrade	C/CPFF	Sierra Nevada Corp (SNC) : Reno, NV	22.923	2.934	Nov 2018	2.550	Nov 2019	2.257	Nov 2020	-		2.257	0.000	30.664	30.664
Primary Hardware Development - AN/SPN-35 Blk I Upgrade	WR	NAWCAD : Patuxent River, MD	7.262	3.455	Nov 2018	2.515	Nov 2019	1.796	Nov 2020	-		1.796	Continuing	Continuing	Continuing
Ancilliary Hardware Development - AN/SPN-35 Blk I Upgrade	WR	NAWCAD : Patuxent River, MD	4.355	4.796	Nov 2018	4.043	Nov 2019	1.539	Nov 2020	-		1.539	Continuing	Continuing	Continuing
Primary Hardware Development - AN/SPN - 46 Blk V Upgrade	C/CPFF	Sierra Nevada Corp (SNC) : Reno, NV	0.000	2.628	Nov 2018	1.583	Nov 2019	3.499	Nov 2020	-		3.499	5.453	13.163	13.163
Ancilliary Hardware Development - AN/SPN-46 Blk V Upgrade	WR	NAWCAD : Patuxent River, MD	0.000	1.249	Nov 2018	2.276	Nov 2019	2.584	Nov 2020	-		2.584	0.000	6.109	-
Primary Hardware Development - AN/SPN-35 Blk II Upgrade	TBD	NAWCAD : Patuxent River, MD	0.000	0.000		0.000		3.997	Nov 2020	-		3.997	0.000	3.997	-
		Subtotal	55.845	16.185		18.331		18.108		-		18.108	Continuing	Continuing	N/A

Remarks

Increase from FY 2020 to FY 2021 for AN/SPN-46 Blk V is due to engineering efforts required for TIMs in 1st quarter and 3rd quarter FY 2021.

Support ($ 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
Integrated Logistics Support (ILS)	WR	NAWCAD : Patuxent River, MD	2.212	1.300	Nov 2018	0.992	Nov 2019	1.012	Nov 2020	-		1.012	Continuing	Continuing	Continuing
Systems Engineering Support	WR	NAWCAD : Patuxent River, MD	3.604	1.995	Nov 2018	1.321	Nov 2019	0.770	Nov 2020	-		0.770	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 3372 / *ATC Systems*	

Support ($ 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	5.816	3.295		2.313		1.782		-		1.782	Continuing	Continuing	N/A

Remarks

Decrease in FY 2020 to FY 2021 Systems Engineering support is due to AN/SPN-46 Blk IV power supply/circuit cards efforts and AN/SPN-35 Blk I development efforts concluding.

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
AN/SPN-46 Blk IV Upgrade	WR	NAWCAD : Patuxent River, MD	2.804	0.139	Nov 2018	0.141	Nov 2019	0.162	Nov 2020	-		0.162	Continuing	Continuing	Continuing
AN/SPN-35 Blk I Upgrade	WR	NAWCAD : Patuxent River, MD	0.000	0.217	Nov 2018	0.465	Nov 2019	0.572	Nov 2020	-		0.572	Continuing	Continuing	Continuing
AN/SPN-46 Blk V Upgrade	WR	NAWCAD : Patuxent River, MD	0.000	0.123	Nov 2018	0.189	Nov 2019	0.192	Nov 2020	-		0.192	Continuing	Continuing	Continuing
		Subtotal	2.804	0.479		0.795		0.926		-		0.926	Continuing	Continuing	N/A

Remarks

FY 2019 AN/SPN-46 Blk IV actuals updated to reflect current testing schedule. Increase in FY 2020 to FY 2021 is due to AN/SPN-35 Blk I building up and completion of testing efforts in preparation for production decision.

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
Program Management (PM) Support	WR	NAWCAD : Patuxent River, MD	2.089	1.190	Nov 2018	0.629	Nov 2019	0.477	Nov 2020	-		0.477	Continuing	Continuing	Continuing
PM Suppt - MSS	C/CPAF	TBD : Patuxent River, MD	0.663	0.387	Nov 2018	0.269	Nov 2019	0.256	Nov 2020	-		0.256	Continuing	Continuing	Continuing
		Subtotal	2.752	1.577		0.898		0.733		-		0.733	Continuing	Continuing	N/A

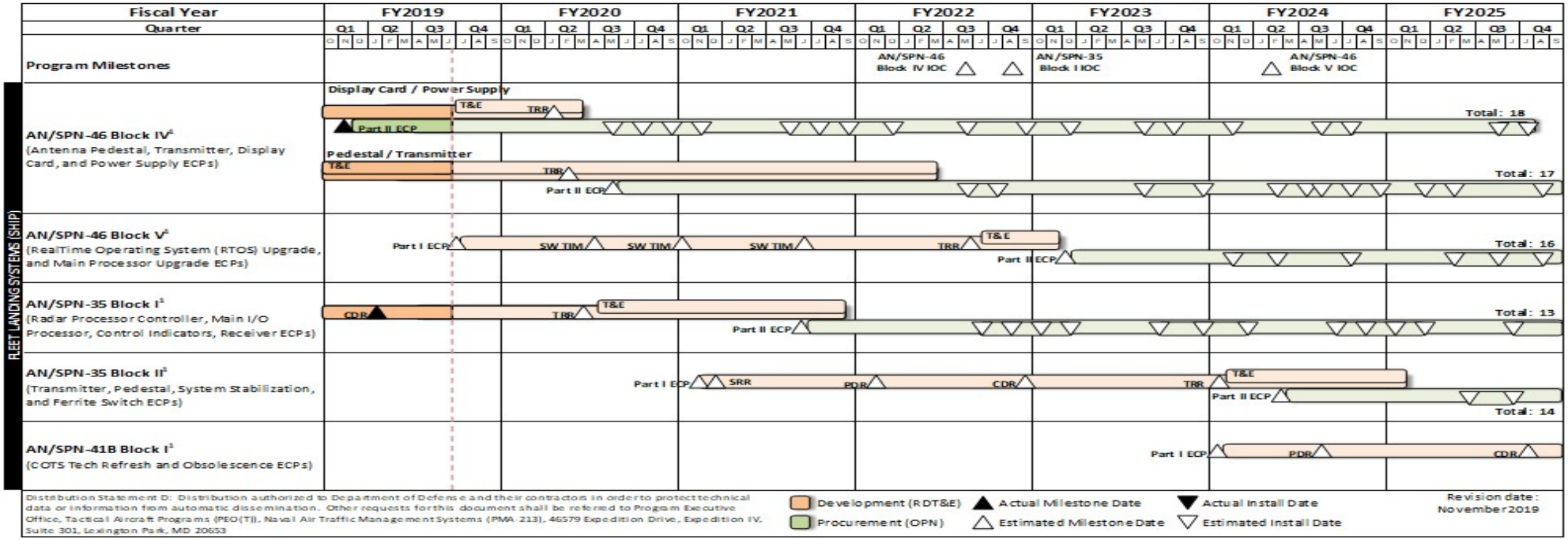
Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604504N / *Air Control*	Project (Number/Name) 3372 / *ATC Systems*	

	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	67.217	21.536		22.337		21.549		-		21.549	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 3372 / *ATC Systems*

Landing Systems (Afloat) Roadmap



POC: Jordan Yingling
UNCLASSIFIED-FOUO-Dist. D

Bring 'em Back Alive

1

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604504N / *Air Control*	**Project (Number/Name)** 3372 / *ATC Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3372				
Reviews: AN/SPN-35 Blk I Critical Design Review (CDR)	2	2019	2	2019
Reviews: AN/SPN-46 Blk V Technical Interchange Meeting (TIM) I	3	2020	3	2020
Reviews: AN/SPN-46 Blk V Technical Interchange Meeting (TIM) II	1	2021	1	2021
Reviews: AN/SPN-46 Blk V Technical Interchange Meeting (TIM) III	3	2021	3	2021
Reviews: AN/SPN-35 Blk II System Requirements Review (SRR)	1	2021	1	2021
Test and Evaluation: AN/SPN-46 Blk IV Test Readiness Review (TRR) Display Card/ Power Supply	2	2020	2	2020
Test and Evaluation: AN/SPN-46 Blk IV (TRR) Pedestal/Transmitter	3	2020	3	2020
Test and Evaluation: AN/SPN-35 Blk I (TRR)	2	2020	2	2020
Test and Evaluation: AN/SPN-46 Blk V (TRR)	3	2022	3	2022