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 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603860N *I JNT Precision Approach & Ldg Sys*							
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	1,232.955	99.123	51.341	33.612	-	33.612	25.284	15.451	11.246	11.472	Continuing	Continuing
2329: *JPALS*	1,232.955	99.123	51.341	33.612	-	33.612	25.284	15.451	11.246	11.472	Continuing	Continuing
Program MDAP/MAIS Code: **Project MDAP/MAIS Code(s):** 238												

A. Mission Description and Budget Item Justification

A. Mission Description and Budget Item Justification

The Joint Precision Approach and Landing System (JPALS) is the primary precision approach and landing system for CVN and LHA/D ships to support aircraft without SPN-46 Automatic Carrier Landing Systems (ACLS) capability including F-35B, F-35C, MQ-25A and future platforms. JPALS ship systems are required to provide CVN and LHA/D ships a primary precision approach capability during night and instrument flight conditions, including coupled approach capability to a hover transition point for LHA/D ships, and coupled approach to the deck (auto-land) capability aboard CVN ships. JPALS also provides the over-the-air inertial alignment capability for CVN and LHA/D ships to support aircraft platforms without Link-4A capability, including F-35, MQ-25A and future platforms. JPALS efforts include addressing broadened CyberSecurity requirements to remain compliant with software CyberSecurity directives and Information Assurance mandates.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under ADVANCED COMPONENT DEVELOPMENT AND PROTOTYPES because it includes all efforts necessary to evaluate integrated technologies, representative models or prototype systems in high fidelity and realistic operating environments.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	101.566	51.341	32.871	-	32.871
Current President's Budget	99.123	51.341	33.612	-	33.612
Total Adjustments	-2.443	0.000	0.741	-	0.741
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.443	0.000			
• Program Adjustments	0.000	0.000	0.539	-	0.539
• Rate/Misc Adjustments	0.000	0.000	0.202	-	0.202

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 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603860N *I JNT Precision Approach & Ldg Sys*

Change Summary Explanation

Technical: N/A

Schedule: N/A

Financial: FY 2021 increase of $741K is for CyberSecurity requirements.

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 0603860N / *JNT Precision Approach & Ldg Sys*	Project (Number/Name) 2329 / *JPALS*	

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
2329: *JPALS*	1,232.955	99.123	51.341	33.612	-	33.612	25.284	15.451	11.246	11.472	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 238

A. Mission Description and Budget Item Justification

This budget reflects the Department of Defense certified Component Cost Position of the restructured Joint Precision Approach and Landing System (JPALS) program that funds the developmental, testing, and integration activities to implement and field JPALS ship systems that deliver the primary precision approach, landing, on-deck inertial alignment, surveillance, and auto-land capability for current and future low observable manned and unmanned platforms onboard all CVN and LHA/D ships. JPALS provides for development, integration, installation, and test of JPALS on CVN and LHA/D ships in accordance with the Joint Requirements Oversight Council (JROC) March 2016 approved JPALS Capability Development Document (CDD). JPALS Engineering Development Model (EDM) articles have been delivered to support JPALS EMD activities.

JPALS EDMs have been installed at shore based test facilities and (temporarily) on CVN and LHA/D ships to support F-35B/C developmental and operational testing and MQ-25A concept refinement, system requirements identification, allocation, surrogate risk reduction, and test. Two JPALS EDMs were procured in FY 2017 to support testing and F-35 shipboard operational deployments. JPALS will continue to invest in software development in direct support of precision approach and auto-land capabilities for the F-35B/C, MQ-25A, and future air platforms. JPALS effort includes addressing broadened CyberSecurity requirements to remain compliant with software CyberSecurity directives and Information Assurance mandates. Remaining costs are associated with the completion of the test and support to fielded EDM units.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: JPALS Ship Systems and Test	93.537	45.540	27.702	0.000	27.702
Articles:	-	-	-	-	-
Description: JPALS provides for development, integration, installation, and test of Sea-Based JPALS on CVN and LHA/D ships.					
FY 2020 Plans: Begin Operational Test (OT). Continue to support F-35 operational deployments. Conduct Interactive Electronic Technical Manuals (IETM) Validation and Verification, complete Maintenance Demonstration.					
FY 2021 Base Plans:					

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 0603860N / *JNT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Close out Operational Test (OT), Initial Operational Test and Evaluation (IOT&E) Phase II. Continue to support F-35 operational deployments. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease of $17.838M from FY 2020 to FY 2021 is due to EMD phase ramping down.					
Title: Joint Strike Fighter (JSF) F-35B Marine Corp STOVL and F-35C Navy Carrier Variant Support	4.020	4.101	4.180	0.000	4.180
Articles:	-	-	-	-	-
Description: Provide technical development, shore based, and ship based support for F-35B and F-35C JPALS Integration and Developmental Test (DT) and Operational Test (OT) events. Provide JPALS system certification and documentation to certify shipboard all weather precision approach capability for F-35 operational test and deployments. ***FY 2020 Plans:*** Continue support of operational deployments of JPALS Ultra High Frequency Data Broadcast (UDB) capable F-35 aircraft including delivery, installation, and ship rider technical support of the JPALS Early Operational Capability (EOC) units onto ships. Continue planning of JPALS two-way, autoland, and M-code implementation into F-35 aircraft. Begin development of JPALS two-way and autoland implementation into F-35 aircraft. ***FY 2021 Base Plans:*** Continue support of operational deployments of JPALS UDB capable F-35 aircraft including delivery, installation, and ship rider technical support of the JPALS Early Operational Capability (EOC) units onto ships. Continue development of JPALS two-way and autoland implementation into F-35 aircraft. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase of $.079M from FY 2020 to FY 2021 is due to inflation.					
Title: MQ-25 Support	1.566	1.700	1.730	0.000	1.730
Articles:	-	-	-	-	-

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 0603860N / *JNT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: Provide technical support, lab support, requirements identification, allocation and test activities for MQ-25. Support MQ-25 concept refinement, requirements development, integration specifications, and risk reduction activities for JPALS integration. Support MQ-25 concept refinement and JPALS integration and developmental activities. ***FY 2020 Plans:*** Continue JPALS algorithm integration support and testing. Prepare JPALS system integration lab at Patuxent River for MQ-25 shore testing. ***FY 2021 Base Plans:*** Continue JPALS algorithm integration support and testing. Continue preparation of JPALS system integration lab at Patuxent River for MQ-25 shore testing. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase of $.030M from FY 2020 to FY 2021 is due to inflation.					
Accomplishments/Planned Programs Subtotals	99.123	51.341	33.612	0.000	33.612

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/2867: *JPALS*	38.094	85.445	100.751	-	100.751	51.640	9.999	4.135	4.232	0.631	294.927

Remarks

D. Acquisition Strategy

Technology Development phase was conducted jointly by NAVAIRSYSCOM (PMA-213), USAF Electronic Systems Command (Global Air) and multiple industry partners. This effort provided the concept of operations, performance specifications and technology readiness levels necessary to provide the foundation from which to launch the Increment 1 System Development and Demonstration (SDD) phase development. Joint Precision Approach and Landing System (JPALS) reached MS-B on 14 July 2008 and the SDD phase development contract was awarded on 17 July 2008. Tasking consisted of sea-based JPALS, related ship and airborne reference systems, end-to-end software algorithms, necessary ship installation hardware, test equipment, system simulation software, and other RDT&E deliverable products. The SDD contract was awarded after full and open competition. JPALS is being developed by the Navy with an open system architecture in order to facilitate the compatible integration of many different aircraft and avionics architectures. JPALS provides for development, integration, installation, and test of Sea-Based JPALS to meet Initial

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 0603860N / *JNT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

Operation Capability of CVN and LHA/D ships in accordance with the JPALS Capability Development Document (CDD). Additionally, this requirement provides critical enabling technology for Joint Strike Fighter (JSF) F-35B Marine Corps Short Take-Off and Vertical Landing (STOVL) and F-35C Navy Carrier Variant, ship-based MQ-25A, and future Navy and Marine Corps air platforms.

As a result of the DON Resource and Requirements Review Board approved PALC Roadmap, the JPALS production phase was deferred to include design improvements to provide manned and unmanned aircraft with autoland capabilities. The current Engineering and Manufacturing Development (EMD) contract was modified in FY14 to add detailed requirements and design trade studies to identify specific system design improvements. An extension for pre-Milestone B efforts was awarded in fourth quarter FY15.

A Development RFP Release Decision Point (DRRDP) Defense Acquisition Board (DAB) was completed and the RFP for JPALS EMD 16 was released on 24 November 2015. A Milestone B (MS B) DAB was completed 02 June 2016. The MS B Acquisition Decision Memorandum (ADM) was approved 27 June 2016, which granted entry into the EMD phase for the restructured JPALS program and officially completed all actions required to exit Nunn-McCurdy. JPALS now has an approved Acquisition Program Baseline (APB) and has been designated an Acquisition Category (ACAT) 1C program. Sole Source contract was awarded to Raytheon in fourth quarter FY16. Completed Milestone C in April 2019.

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 0603860N / *JNT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

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
Ship Integration	WR	NAWCAD : Pax River, MD	67.872	9.995	Nov 2018	3.653	Nov 2019	1.575	Nov 2020	-		1.575	Continuing	Continuing	Continuing
Primary Hardware Development - EMD Phase I	C/CPIF	Raytheon : Fullerton, CA	410.181	0.000		0.000		0.000		-		0.000	0.000	410.181	410.181
Primary Hardware Development - New EMD Contract	C/CPIF	Raytheon : Fullerton, CA	128.883	60.860	Nov 2018	30.073	Nov 2019	21.021	Nov 2020	-		21.021	30.136	270.973	270.973
JPALS Modifications for ARC-210	C/CPFF	RCI : Cedar Rapids, IA	5.104	1.849	Nov 2018	1.650	Nov 2019	0.758	Nov 2020	-		0.758	0.758	10.119	10.119
Risk Reduction for Auto-land - FFRDC Support	FFRDC	JHU : Laurel, MD	0.493	0.000		0.000		0.000		-		0.000	0.000	0.493	-
Prior Year Prod Dev no longer funded in the FYDP	TBD	Various : Various	249.870	0.000		0.000		0.000		-		0.000	0.000	249.870	-
		Subtotal	862.403	72.704		35.376		23.354		-		23.354	Continuing	Continuing	N/A

Remarks

The Primary Hardware Development contract with Raytheon is a CPIF contract. FY 2020 funding re-aligned from Ship Integration to Systems Engineering Support due to reduced EDM ship integration activities and increased System Engineering efforts in FY 2020.

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 Support	WR	NAWCAD : Pax River, MD	192.203	16.375	Nov 2018	7.035	Nov 2019	5.605	Nov 2020	-		5.605	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	NAWCAD : Pax River, MD	30.542	2.682	Nov 2018	0.725	Nov 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Prior Year Support Costs non longer funded in FYDP	Various	Various : Various	21.514	0.000		0.000		0.000		-		0.000	0.000	21.514	-
		Subtotal	244.259	19.057		7.760		5.605		-		5.605	Continuing	Continuing	N/A

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 0603860N / *JNT Precision Approach & Ldg Sys*	Project (Number/Name) 2329 / *JPALS*	

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

Remarks

FY 2020 increased from FY 2020 President's Budget Request is due to management of EDM units, Software Integration Lab (SIL) efforts, and correction of deficiencies found during test.

Decrease in Systems Engineering support and Integrated Logistics support between FY 2020 and FY 2021 is due to EMD phase ramping down.

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	WR	NAWCAD : Pax River, MD	76.283	2.772	Nov 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	4.945	0.638	Nov 2018	0.726	Nov 2019	0.605	Nov 2020	-		0.605	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	NAWCAD : Pax River, MD	0.000	0.000		6.387	Nov 2019	2.994	Nov 2020	-		2.994	0.000	9.381	-
		Subtotal	81.228	3.410		7.113		3.599		-		3.599	Continuing	Continuing	N/A

Remarks

Decrease in Operational Test & Evaluation between FY 2020 and FY 2021 is due to completion of Initial Operational Test and Evaluation (IOT&E) Phase II, and Initial Operational Capability (IOC).

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 : Pax River, MD	25.752	3.050	Nov 2018	0.917	Nov 2019	0.899	Nov 2020	-		0.899	Continuing	Continuing	Continuing
PM Support-MSS	C/CPFF	Amelex : Pax River, MD	14.844	0.829	May 2019	0.133	Jan 2020	0.130	Jan 2021	-		0.130	1.069	17.005	17.005
PM Support-MSS	C/CPFF	Avian : Pax River, MD	1.592	0.000		0.000		0.000		-		0.000	0.000	1.592	1.592

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 0603860N / *JNT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

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
PM Support-MSS	C/CPFF	SAIC : Pax River, MD	2.487	0.000	Nov 2018	0.000		0.000		-		0.000	0.000	2.487	2.487
Travel	WR	NAVAIR : Pax River, MD	0.390	0.073	Nov 2018	0.042	Nov 2019	0.025	Nov 2020	-		0.025	Continuing	Continuing	Continuing
		Subtotal	45.065	3.952		1.092		1.054		-		1.054	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	1,232.955	99.123		51.341		33.612		-		33.612	Continuing	Continuing	N/A

Remarks

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 0603860N / *JNT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

JPALS Program Schedule

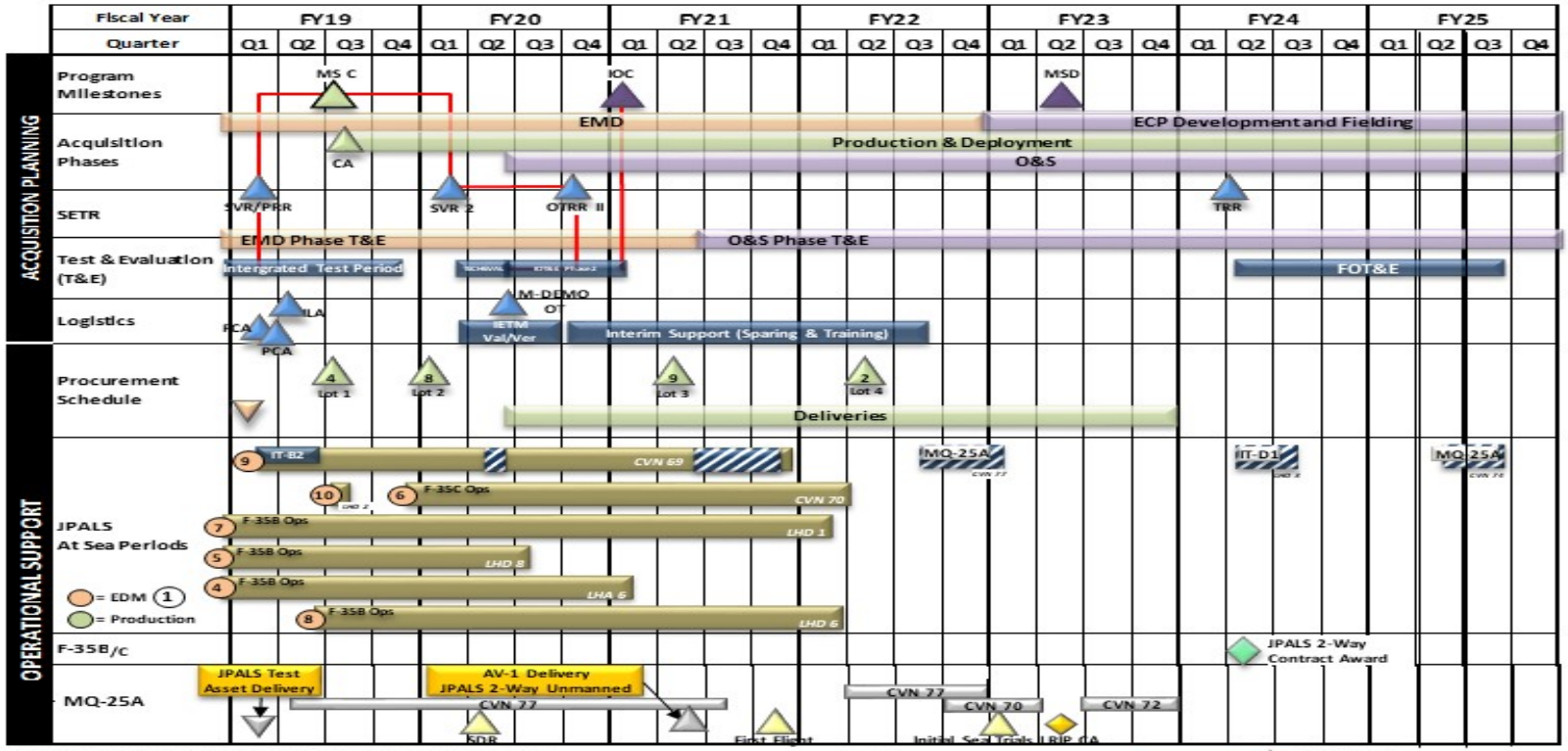

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603860N / *JNT Precision Approach & Ldg Sys*	**Project (Number/Name)** 2329 / *JPALS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
JPALS				
Acquisition Milestones: MS C	3	2019	3	2019
Acquisition Milestones: Initial Operating Capability (IOC)	1	2021	1	2021
Systems Development: Engineering and Manufacturing Development	1	2019	4	2022
Systems Development: Reviews: System Verification Review (SVR)	1	2019	1	2019
Systems Development: Reviews: System Verification Review (SVR) 2	4	2019	4	2019
Systems Development: Reviews: Integrated Logistics Assessment (ILA)	2	2019	2	2019
Systems Development: Contract Awards: LRIP Contract Award	3	2019	3	2019
Test & Evaluation: Operational Test and Evaluation (IOT&E) Phase II	3	2020	1	2021
Test & Evaluation: JPALS Operational Test Readiness Review (OTRR) II	2	2020	2	2020
Production Milestones: Production Readiness Review (PRR)	1	2019	1	2019