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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy										Date: March 2019		
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 JT Precision Approach & Ldg Sys							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1,128.971	103.984	101.566	51.341	-	51.341	32.871	28.910	17.435	11.545	Continuing	Continuing
2329: JPALS	1,128.971	103.984	101.566	51.341	-	51.341	32.871	28.910	17.435	11.545	Continuing	Continuing
Program MDAP/MAIS Code: Project MDAP/MAIS Code(s): 238												
A. Mission Description and Budget Item Justification												
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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 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 Early Operational Capability is required to support initial F-35 operational deployments in FY18. 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total				
Previous President's Budget				106.391	101.566	52.553	-	52.553				
Current President's Budget				103.984	101.566	51.341	-	51.341				
Total Adjustments				-2.407	0.000	-1.212	-	-1.212				
• Congressional General Reductions				-	-							
• Congressional Directed Reductions				-	-							
• Congressional Rescissions				-	-							
• Congressional Adds				-	-							
• Congressional Directed Transfers				-	-							
• Reprogrammings				-	-							
• SBIR/STTR Transfer				-2.407	0.000							
• Program Adjustments				0.000	0.000	-1.232	-	-1.232				
• Rate/Misc Adjustments				0.000	0.000	0.020	-	0.020				

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<div><div>Change Summary Explanation</div><div>Technical: N/A</div><div>Schedule: N/A</div><div>Financial: FY 2020 decrease of \$1.212M is due the realignment of funds in preparation for MS C in 2nd quarter FY 2019.</div></div>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603860N / JT Precision Approach & Ldg Sys				Project (Number/Name) 2329 / JPALS			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
2329: JPALS	1,128.971	103.984	101.566	51.341	-	51.341	32.871	28.910	17.435	11.545	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: 238												

A. Mission Description and Budget Item Justification

The restructured Joint Precision Approach and Landing System (JPALS) program (post Nunn-McCurdy certification) completed a successful MS B and entry into the Engineering and Manufacturing Development (EMD) phase in June 2016. This budget reflects the Department of Defense certified Component Cost Position of the restructured 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 Early Operational Capability (EOC) is required to support initial F-35 operational deployments. 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 will be 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 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.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: JPALS Ship Systems and Test	98.548	95.980	45.540	0.000	45.540
Articles:	-	-	-	-	-
Description: JPALS provides for development, integration, installation, and test of Sea-Based JPALS on CVN and LHA/D ships.					
FY 2019 Plans: Attain MS C in 2nd quarter. Perform System Verification Review (SVR) and Integrated Logistics Assessment (ILA) in 1st quarter and Production Readiness Review (PRR) in 2nd quarter. Award LRIP contract in 3rd quarter. Support F-35 operational deployments.					
FY 2020 Base Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Begin Operational Test (OT). Continue to support F-35 operational deployments. Conduct Interactive Electronic Technical Manuals (IETM) Validation and Verification, complete Maintenance Demonstration. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of \$50.440M from FY 2019 to FY 2020 is due to EMD phase ramping down.						
Title: Joint Strike Fighter (JSF) F-35B Marine Corp STOVL and F-35C Navy Carrier Variant Support 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 2019 Plans: Continue support of F-35 operational deployments of JPALS UDB capable F-35 aircraft including delivery, installation, and ship rider support of the JPALS Early Operational Capability (EOC) units onto ships. Begin planning of JPALS two-way, autoland, and M-code implementation into F-35 aircraft. FY 2020 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 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 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Increase of \$.081M from FY 2019 to FY 2020 is due to engineering efforts for development of JPALS two-way and autoland implementation into F-35 aircraft.		3.999 -	4.020 -	4.101 -	0.000 -	4.101 -
Title: MQ-25 Support Articles:		1.437 -	1.566 -	1.700 -	0.000 -	1.700 -

UNCLASSIFIED

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>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.</p> <p>FY 2019 Plans: Provide support to MQ-25 to include JPALS algorithm integration support to Aircraft OEM, validation and verification activities supporting the aircraft software development, support M-code implementation of JPALS, support development of the Patuxent River MQ-25 Systems Integration Lab, and preparation for future testing.</p> <p>FY 2020 Base Plans: Continue JPALS algorithm integration support and testing. Prepare JPALS system integration lab at Patuxent River for MQ-25 shore testing.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in \$.134M from FY 2019 to FY 2020 is due to engineering efforts required for JPALS system integration lab support.</p>					
Accomplishments/Planned Programs Subtotals	103.984	101.566	51.341	0.000	51.341

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

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• OPN/2867: JPALS	0.000	38.094	92.695	-	92.695	100.243	46.728	12.193	5.575	5.808	301.336

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

UNCLASSIFIED

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<p>SDD contract was decided 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 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.</p> <p>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.</p> <p>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.</p> <p><u>E. Performance Metrics</u></p> <p>Milestone C scheduled for second quarter FY19.</p>		

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 4						R-1 Program Element (Number/Name) PE 0603860N / JT Precision Approach & Ldg Sys				Project (Number/Name) 2329 / JPALS					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Ship Integration	WR	NAWCAD : Pax River, MD	55.390	12.482	Nov 2017	12.296	Nov 2018	7.725	Nov 2019	-		7.725	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	68.190	60.693	Nov 2017	60.860	Nov 2018	30.073	Nov 2019	-		30.073	40.100	259.916	259.916
JPALS Modifications for ARC-210	C/CPFF	RCI : Cedar Rapids, IA	5.104	0.000		1.849	Nov 2018	2.650	Nov 2019	-		2.650	0.700	10.303	10.303
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			789.228	73.175		75.005		40.448		-		40.448	Continuing	Continuing	N/A
Remarks															
The Primary Hardware Development contract with Raytheon is a CPIF contract. The increase to JPALS Modifications from FY 2019 to FY 2020 is due to ramping up efforts for ARC-210 modifications required to support JPALS.															
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering Support	WR	NAWCAD : Pax River, MD	175.381	16.822	Nov 2017	16.375	Nov 2018	1.963	Nov 2019	-		1.963	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	NAWCAD : Pax River, MD	27.883	2.659	Nov 2017	2.682	Nov 2018	0.725	Nov 2019	-		0.725	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			224.778	19.481		19.057		2.688		-		2.688	Continuing	Continuing	N/A

UNCLASSIFIED

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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Remarks															
Decrease in Systems Engineering support between FY 2019 and FY 2020 is due to EMD phase ramping down.															
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWCAD : Pax River, MD	69.646	6.637	Nov 2017	2.772	Nov 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	4.308	0.637	Nov 2017	0.638	Nov 2018	0.726	Nov 2019	-		0.726	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	NAWCAD : Pax River, MD	0.000	0.000		0.000		6.387	Nov 2019	-		6.387	0.000	6.387	-
Subtotal			73.954	7.274		3.410		7.113		-		7.113	Continuing	Continuing	N/A
Remarks															
The increase in Operational Test & Evaluation between FY 2019 and FY 2020 is in support of FY 2020 scheduled test events to include TRR, OTRR-2, Techeval-IOT&E Phase 2, and M-DEMO OT.															
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	WR	NAWCAD : Pax River, MD	22.717	3.035	Nov 2017	3.050	Nov 2018	0.917	Nov 2019	-		0.917	Continuing	Continuing	Continuing
PM Support-MSS	C/CPFF	Amelex : Pax River, MD	14.036	0.808	Nov 2017	0.829	Nov 2018	0.133	Nov 2019	-		0.133	1.069	16.875	16.875
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
PM Support-MSS	C/CPFF	SAIC : Pax River, MD	2.346	0.141	Nov 2017	0.142	Nov 2018	0.000		-		0.000	0.000	2.629	2.629

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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	WR	NAVAIR : Pax River, MD	0.320	0.070	Nov 2017	0.073	Nov 2018	0.042	Nov 2019	-		0.042	Continuing	Continuing	Continuing
Subtotal			41.011	4.054		4.094		1.092		-		1.092	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			1,128.971	103.984		101.566		51.341		-		51.341	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy

Date: March 2019

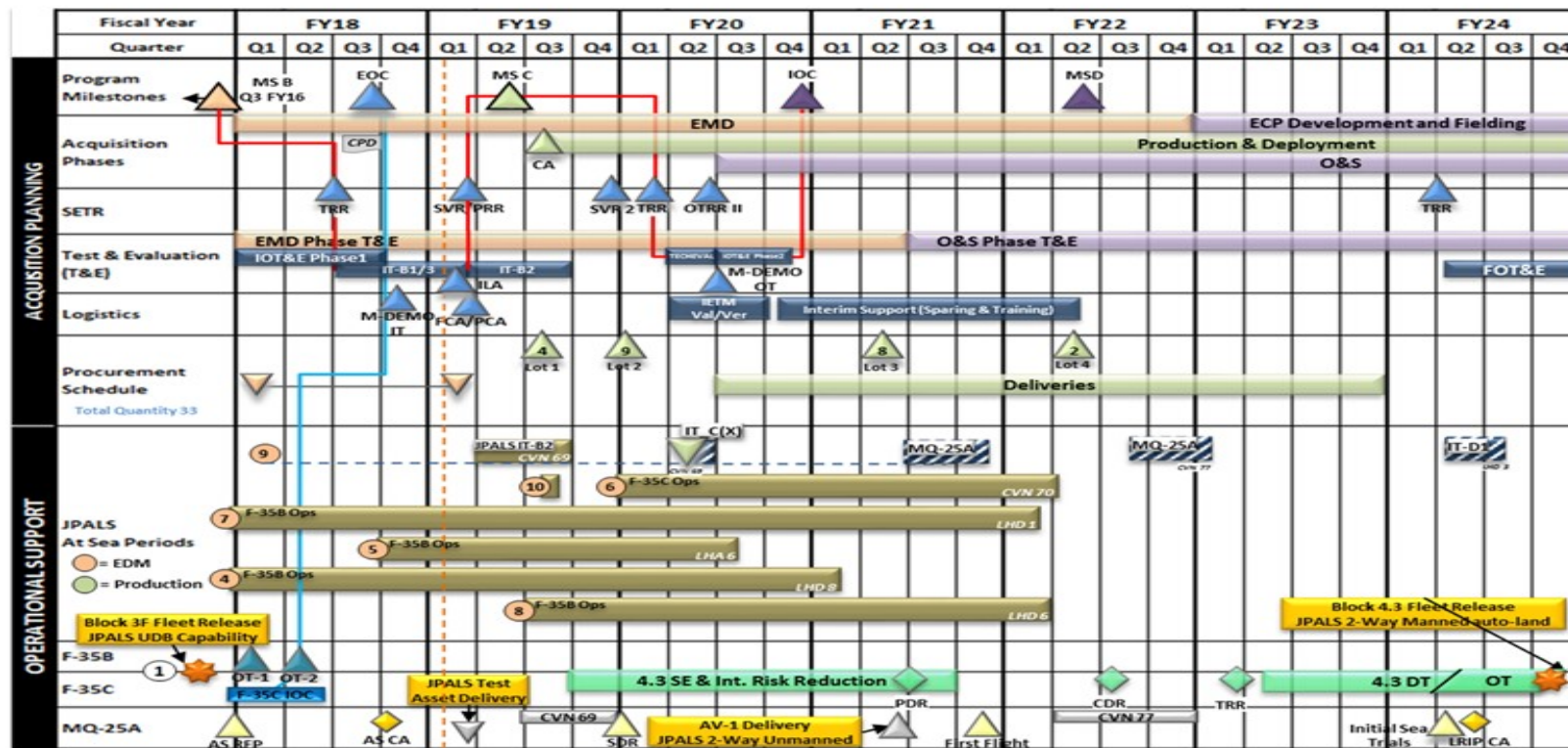
Appropriation/Budget Activity
1319 / 4

R-1 Program Element (Number/Name)
PE 0603860N / JT Precision Approach &
Ldg Sys

Project (Number/Name)
2329 / JPALS



JPALS Program MS C Schedule



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Notes:
① F-35B/C Block 3F Software includes JPALS one-way capability (UHF Data Broadcast (UDB))

Legend:
• Critical Path to JPALS IOC
• Critical Path to F-35 JPALS EOC
• Objective, Threshold

EDM Procurement
Lot Buys
Projected Test/Cert
Production Unit

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603860N / <i>JT Precision Approach & Ldg Sys</i>	Project (Number/Name) 2329 / <i>JPALS</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
JPALS				
Acquisition Milestones: MS C	2	2019	2	2019
Acquisition Milestones: Early Operating Capability (EOC)	3	2018	3	2018
Systems Development: Engineering and Manufacturing Development	1	2018	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)	1	2019	1	2019
Systems Development: Contract Awards: LRIP Contract Award	3	2019	3	2019
Test & Evaluation: Operational Test and Evaluation (IOT&E) Phase 1	1	2018	3	2018
Test & Evaluation: JPALS Operational Test Readiness Review (OTRR)	2	2018	2	2018
Production Milestones: Production Readiness Review (PRR)	2	2019	2	2019