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 0604215N *I Standards Development*							
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	19.810	3.624	3.642	4.237	-	4.237	4.272	4.344	4.425	4.509	Continuing	Continuing
1857: *Calibration Standards*	19.810	3.624	3.642	4.237	-	4.237	4.272	4.344	4.425	4.509	Continuing	Continuing

Note

Starting in FY17 the Common Helicopters (PU 2312) and Stores Planning and Weaponeering Module (PU 2311) moved to Mission Planning PE (0605215N).
Starting in FY17 the JT Service/NV Std Avionics CP/SB (PU 0572) PE (0604215N) moved to a new Common Avionics PE (0605217N).

A. Mission Description and Budget Item Justification

This project provides for the identification, study, design, development, demonstration, test, evaluation, and qualification of standard avionics capabilities for Navy use, and wherever practicable, use across all Services and Foreign Military Sales. Such air combat electronics developments include communications and airborne networking, navigation and sensors, flight avionics, safety systems, and flight mission information systems for both forward fit and retrofit aircraft. These efforts continue to maintain federated systems while encouraging transition of procurements to support a modular system for enhanced performance and affordability. Consideration is given up front to reduce acquisition costs through larger procurement quantities that satisfy multi-aircraft customer requirements and that reduce life cycle costs in the areas of reliability, maintainability, and training. This project also provides a Navy-wide program to develop required calibration standards (hardware) in all major measurement technology areas in support of Navy Hull, Mechanical and Electrical (HM&E) systems as well as Navy Weapons systems, ground and air, throughout the Fleet. It funds Navy lead-service responsibilities in the Department of Defense and Joint Services Metrology Research and Development program. This project supports the military requirement to verify the performance of all test systems used to validate the operation of HM&E as well as Navy Weapon Systems with calibration standards traceable to the National Institute of Standards and Technology.

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 requirements prior to full-rate production decision.

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 0604215N *I Standards Development*		
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	3.771	3.642	4.160	-	4.160
Current President's Budget	3.624	3.642	4.237	-	4.237
Total Adjustments	-0.147	0.000	0.077	-	0.077
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.147	0.000			
• Rate/Misc Adjustments	0.000	0.000	0.077	-	0.077

Change Summary Explanation

FY21 increase of .007M due to MISC adjustments.

Technical: Change of 0.062 in FY20 due to program adjustment in the amount 0.057 and rate adjustment of 0.005.

0572:
Tactical Communications: Title corrected from Joint Precision Approach Landing System Software (S/W) Integration to Operation Flight Plan S/W Integration.

Ground Proximity Warning Systems/Terrain Awareness Warning System (GPWS/TAWS II): H-60 TAWS II Software Development extended duration from 4Q/15 through 4Q/16 based on projected platform integration schedule.

Military Flight Quality Assurance: Test and Evaluation, MH-53R/S, M/CH-53E, AH-1Z, UH-1Y, Phase 2 Test extended from 3Q/15 to 4Q/15 due to longer testing required for a number of defects found. Phase 2 Test Readiness Review moved from 1Q/15 to 3Q/15 due to integration test took longer than planned due to number of defects found. Deliveries for H-60R/S, CH-53E, AH-1Z and UH-1Y reflect new date of 2Q/15 to align with F/A-18 procurement order.

Mid Air Collision Avoidance Capability: Re-planned FY16-FY21 program as a result of the Business Case Analysis to properly aligned program. Material Development Decision/Acquisition Strategy Review (MDD/ASR) moved from 2Q/16 to 1Q/17. Added Capability Development Document (CDD) Draft added in 4Q16. Added Requirements Development from 1Q/16 to 4Q/16.

Starting in FY17 the JT Service/NV Std Avionics CP/SB (PU 0572) PE (0604215N) moved to a new Common Avionics PE (0605217N).

2311:

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 0604215N *I Standards Development*

WASP V4.0 Systems Development start was delayed from 4Q16 to 2017 and will be displayed under PE 0605215N.

WASP V3.2 IOC was delayed from 1Q16 to 3Q16 due to the asynchronous release process and requirement for a new build prior to IOC.

FY17 and out schedule is included in the Mission Planning PE 0605215N.

2312:
Common Helicopters schedule FY17 and out is included in Mission Planning PE 0605215N.

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 0604215N / *Standards Development*	Project (Number/Name) 1857 / *Calibration Standards*	

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
1857: *Calibration Standards*	19.810	3.624	3.642	4.237	-	4.237	4.272	4.344	4.425	4.509	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Navy-wide program which addresses Metrology related RDT&E issues for navy weapon systems, shipboard platforms, Naval Air, and Fleet Ground Marines. It supports development of calibration standards (equipment, procedures and technical data) required to resolve Metcal related safety, obsolescence, new and emerging technology support and cost reduction issues. It funds Navy unique and lead service responsibilities in DoD and Joint Services Metrology Research Programs to develop calibration solutions. The line supports development of measurement requirements to verify performance of all test systems used to validate the operation of Navy Weapon Systems with calibration standards traceable to the National Institute of Standards and Technology to calibrate, sustain and ensure performance accuracy.

This program also provides benefits and efficiencies in a joint collaborative environment within the Tri-Services. Projects are identified and defined so that they will meet the universal requirement. Development efforts are integrated in order to achieve the common capabilities required at minimum cost. This is also a regular and common business practice within the Navy Metrology Community where R&D efforts are communicated and integrated into the multiple testing and Monitoring Systems. This is done in support of Program Managers, Sponsors, and Principle Executive officers. As a result, common requirements are established, duplication of efforts are eliminated, and best value, high quality Metcal products are produced for the Navy.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Calibration Standards	3.624	3.642	4.237	0.000	4.237
Articles:	-	-	-	-	-
FY 2020 Plans: ($1.228) Continue development of (1) calibration hardware standard in electrical/electronic measurement technology to support combat/operational readiness for submarine periscopes magnetic locks and aircraft tail hook non-destructive testing. ($1.1.277) Continue development of (1) calibration hardware standards in electro optical (Multi-mode) measurement technology and (1) high energy measurement technology standard to support shipboard readiness of weapon system communication to missile launch systems, combat Flight operations and ground combat operations. Begin the development (1) Low Level Pulsed upgrade standard to support the warfighter in equipment performance so that the laser designators and rangefinders remain in a ready and operational state. ($.725) Continue development and transition of (1) calibration hardware standard for Chemical/Biological technology to support shipboard and flight safety, and Divers Life Support Systems (DLSS).					

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 0604215N / *Standards Development*	**Project (Number/Name)** 1857 / *Calibration Standards*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
($.412) Finish development and transition of (1) calibration standard in analytical and metrology benchtop technology to support equipment operational readiness for both air and sea-based operations.					
FY 2021 Base Plans: ($1.579) Continue development of (1) calibration hardware standard in electrical/electronic measurement technology to support combat/operational readiness for submarine periscopes magnetic locks and aircraft tail hook non-destructive testing. Begin Development of (1) RF Power Measurement calibration standard in support of Navy's ability to detect adversarial threats and to counteract adversarial electronic countermeasures. ($.913) Continue development of (1) calibration hardware standards in electro optical (Multi-mode) measurement technology, (1) high energy measurement technology standard to support shipboard readiness of weapon system communication to missile launch systems, combat Flight operations and ground combat operations, and (1) Low Level Pulsed standard to support laser designators and rangefinders equipment remain in a ready and operational state. ($.528) Continue development of (1) calibration hardware standard in Chemical/Biological technology for measuring Residual Solvent Vapors in support of Divers Life Support Systems (DLSS). ($.493) Begin development of (1) calibration standard in Microwave/millimeter technology in support of Vector Network Analyzers to test and repair Weapon Replaceable Assemblies (WRAs) for F-18/P-3/EP-3-E2C/D, EA-6B and P8 aircraft. ($.398) Begin development (1) calibration standard in analytical and metrology benchtop in support of metrology benchtop automated physical mechanical calibration methods support equipment operational readiness for both for shore, air and sea-based operations. ($.326) Begin development (1) calibration standard in physical mechanical measurement technology to support submarine shipboard safety and sea-based operations					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: ($.595)Funding increase will allow the initial development startup of the Metrology Bench Top capability effort.					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
During the past POM brief, the RDT&E program briefed a shortfall for the Metrology Bench Top Race Phase IV effort. This project had been pushed out several times into the out years as other emerging and critical requirements were given priority. This project has reached a critical juncture and we requested that the METBENCH project be given the opportunity to start its first year of a two-year effort to ensure shipboard operational readiness. METBENCH Phase IV will develop the automated capability of physical dimensional and temperature calibration procedures, which will result in a cost avoidance of continued reliance on expensive calibration support (organic or OEM) and realization of a reduction in savings for Fleet OM&N operations. This type of calibration capability represents a significant amount of the Navy's calibration workload when selecting procedures to automate using METBENCH. This solution compliments other METBENCH efforts currently underway. NAVSEA04 has planned, funded, and implemented shore based implementation of METBENCH at NAVSEA depot labs. The results of this effort will be integrated into the fielded METBENCH / MCMS systems currently being deployed to both calibration labs and Surface Ships. The Surface Ship community will utilize the additional functionality that this project provides, and the METBENCH platform is positioned for adoption on Air Capable Ships that perform this do-cal function also. The 500K plus increase will allow the program to begin work on this project without further delay.					
Accomplishments/Planned Programs Subtotals	3.624	3.642	4.237	0.000	4.237

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Funds provide for in-service engineering initiation of metrology research and developmental efforts of unique non-commercial hardware standards in the development of six key thrust technological areas which correspond to Physical Mechanical, Electro-Optical, Analytical Metrology, Electrical/Electronic systems, Chembio Defense, Microwave/Millimeter wave. These standards will ensure measurement accuracy in advanced and emerging combat weapon systems and associated test equipment.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
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These hardware test standards will also provide for cost effective and efficient system maintenance and calibration measurements that reduce wrong test decisions and will result in lower maintenance cost and higher system performance reliability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
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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	WR	NSWC Corona : Corona, CA	5.510	0.281	Mar 2019	0.374	Mar 2021	0.326	Mar 2021	-		0.326	Continuing	Continuing	Continuing
		Subtotal	5.510	0.281		0.374		0.326		-		0.326	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
Contractor Engineering Support	WR	NSWC Corona : Corona, CA	3.085	0.353	Mar 2019	1.522	Mar 2021	1.334	Mar 2021	-		1.334	0.000	6.294	-
Government Engineering Support	WR	NSWC Corona : Corona, CA	9.667	2.965	Mar 2019	1.711	Mar 2021	2.542	Mar 2021	-		2.542	0.000	16.885	-
Defense Acquisition Workforce	Various	Various : Various	0.482	0.000	Mar 2019	0.000		0.000		-		0.000	0.000	0.482	-
Travel	WR	NSWC Corona : Corona, CA	1.066	0.025	Mar 2019	0.035	Mar 2021	0.035	Mar 2021	-		0.035	0.000	1.161	-
		Subtotal	14.300	3.343		3.268		3.911		-		3.911	0.000	24.822	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	19.810	3.624		3.642		4.237		-		4.237	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 0604215N / *Standards Development*	**Project (Number/Name)** 1857 / *Calibration Standards*

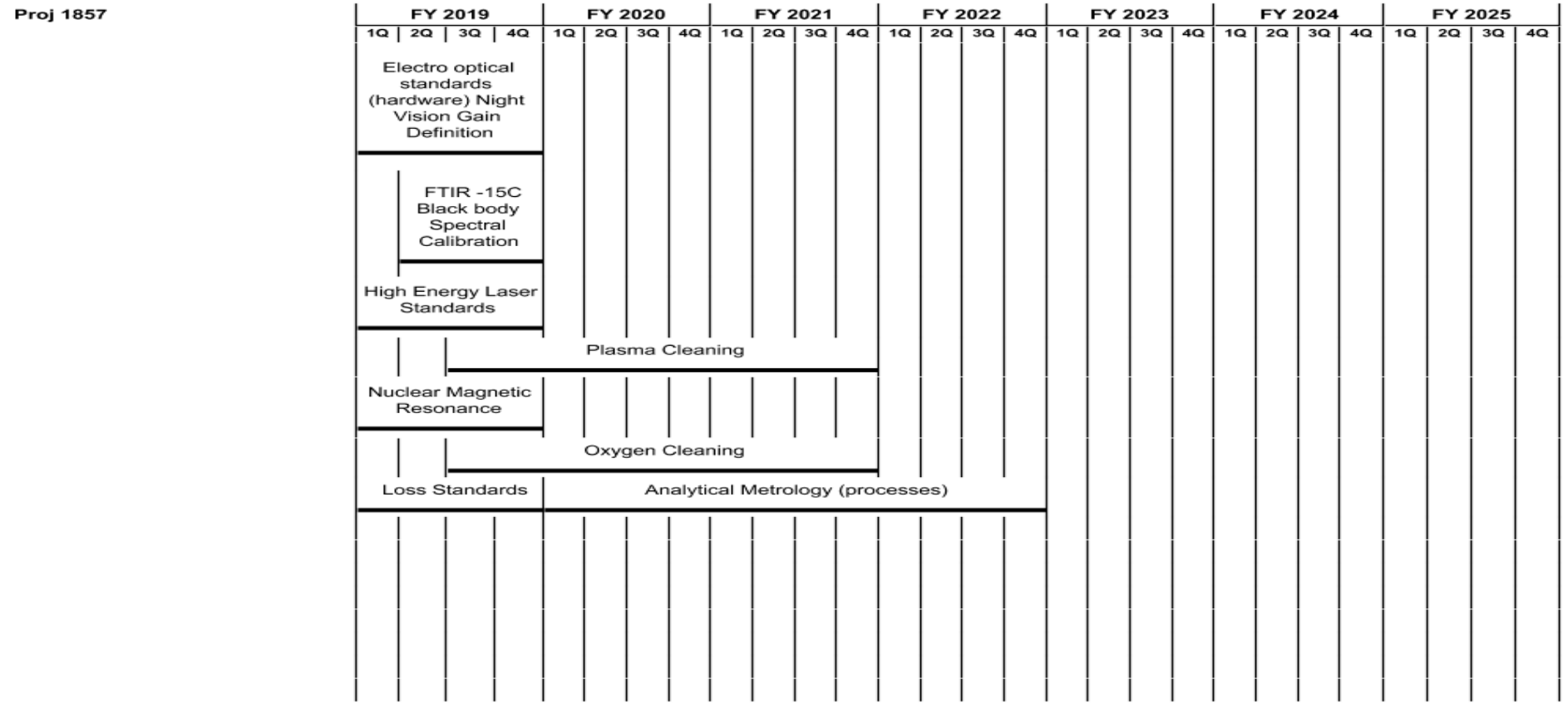

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604215N / *Standards Development*	**Project (Number/Name)** 1857 / *Calibration Standards*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 1857				
Electro optical standards (hardware) Night Vision Gain Definition	1	2019	4	2019
Electro optical standards (hardware) FTIR -15C Black body Spectral Calibration	2	2019	4	2019
Electro optical Standards (hardware) development in High Energy Laser Standards	1	2019	4	2019
Physical Mechanical standards (hardware) development in Plasma Cleaning	3	2019	4	2021
Physical Mechanical standards (hardware) development in Nuclear Magnetic Resonance	1	2019	4	2019
Physical Mechanical standards (hardware) development in Oxygen Cleaning	3	2019	4	2021
Fiber Optic Return Loss Standards	1	2019	4	2019
Analytical Metrology (processes) Reliability Engineering Process Development for Initial Intervals	1	2020	4	2022
Schedule Detail	1	2019	4	2023