Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy												Date: May 2021
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 0204228N *I Surface Support*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	90.331	33.248	33.333	13.733	-	13.733	-	-	-	-	-	-
3311: *Navigation Systems*	90.331	33.248	33.333	13.733	-	13.733	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Surface Support RDT&E funding will be used for the research, design, development, integration testing, and documentation of the Inertial Navigation System (INS) AN/WSN-12 for all Navy platforms. The INS provides mission critical ship position and attitude data to shipboard sensors (such as radars), combat systems, gun, and missile systems. The INS uses data from the Global Positioning System (GPS) to periodically update (i.e., reset) its position and internal clock. The INS is the ship's primary position source in the absence of GPS. The INS AN/WSN-12 consists of an Inertial Sensor Module (ISM) and a Navigation Processing Module (NPM) that will provide a significant improvement with respect to attitude and velocity data over previous INS through the use of a Power Spectral Density (PSD) capability. PSD provides a tighter tolerance for error across a wider frequency range. The ISM is being designed, developed, and procured through a competitive contract awarded to Northrop Grumman in November 2015. The NPM is a Government design. The government will serve as integration agent prior to the next AN/WSN-12 competitive contract award. RDT&E funding will support continued system design to create a baseline for Pre-Production Units (PPU), Low Rate Initial Production (LRIP), and Full Rate Production (FRP). The system has completed Critical Design Review (CDR) and will go through Production Readiness Review (PRR). The system will undergo extensive testing including Independent Validation and Verification (IV&V), Developmental Testing (DT) and Operational Testing (OT). Planned FY 2022 efforts include AN/WSN-12 system level Production Readiness Review (PRR), LRIP delivery, and awarding a FRP contract.

Cybersecurity funding will be used for the research, development, documentation and integration testing for cybersecurity hardening and enclave development for navigation systems. Efforts include the development of boundary defense capabilities, platform specific architectures, Navy-Electronic Chart Display and Information System (Navy-ECDIS) secure solution for existing unclassified configurations and CYBERSAFE implementation and conduct of cybersecurity risk and vulnerability assessments including development of system models, threat models, and mission models for representative groupings of Navigation systems and cybersecurity capabilities. Risk assessments along with requirements development will lead to incremental capability development leveraging the Increment 1 Engineering Development Model (EDM) delivery with updated architectures and system level modifications. Follow on capabilities will be developed and added to meet existing threats and requirements. Planned FY 2022 efforts include continuation of Cross Domain Solution (CDS) and cyber Capability Increment 2 development.

Time and Frequency Distribution System-Replacement (TFDS-R) funding will be used for the research, development, documentation, and integration testing for the Submarine TFDS-R system. TFDS is a Commercial Off the Shelf (COTS) timing system utilizing the precision source signals of GPS to discipline two redundant Rubidium clocks to Universal Coordinated Time (UTC). TFDS provides common time to submarine equipment that utilizes clocking pulses or sinusoidal waveforms for proper operation and maintains accurate time in the event of loss of GPS input (holdover). TFDS Uses multiple input power sources for redundancy and provides a built in battery backup. TFDS generates and distributes Precision Time and Timing Interval (PTTI) reference signals to support C4I capabilities needed for Joint, Naval and Allied missions. Planned FY 2022 efforts include LRIP and FRP.

Military GPS User Equipment (MGUE) will provide assured Positioning, Navigation and Timing (PNT) in a GPS degraded environment. Funding will be used for development of interface and performance requirements, shipboard system architecture definition, and MGUE integration into SSNs, Tomahawk, and Advanced Anti-

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy	Date: May 2021
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0204228N *I Surface Support*

Radiation Guided Missile (AARGM). Planned FY 2022 efforts include the completion of integration testing and MGUE testing and integration with Technical Insertion 22 (TI-22) platforms to include SSN 688i and SSBN 726 class submarines.

Submarine Speed Sensors will provide investigation, development, testing and integration of new Own-Ship Speed sensors to address new capabilities, reduce detection, and improve reliability. Planned FY 2022 efforts include the completion of Environmental Qualification Testing (EQT) and Factory Acceptance Test (FAT).

Assured Positioning, Navigation, and Timing (APNT) funding will be used for Alternate GPS-independent sources of Positioning, Velocity, Attitude, and Timing (PVAT) data required to provide fire control solutions, ensure safety of navigation, and support aircraft and combat operations in a GPS degraded/denied environment. This effort provides a secure navigation method using the navigation resources being developed via Office of Naval research (ONR) Future Naval Capabilities (FNC) activity.

Automated Celestial Navigation System (ACNS) funding will be used for the research, development, Engineering Development Model (EDM), documentation and integration testing of the celestial navigation solution for the NoGAPSS navigation implementation on the fleet. Efforts will leverage ONR celestial navigation research into a reproducible ruggedized system fully integrated into the navigation suite. FY 2022 efforts include system development of ACNS capability to be delivered in FY 2023.

Navigation Suite funding will be used to conduct analyses and studies on impact of the PVAT Navy Integrating Capability Construct (NICC) to validate, verify and test latency requirements to combat systems consumers. The program will implement systems engineering processes to investigate and define PNT requirements for the deployed shipboard systems.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	34.602	33.482	20.005	-	20.005
Current President's Budget	33.248	33.333	13.733	-	13.733
Total Adjustments	-1.354	-0.149	-6.272	-	-6.272
• Congressional General Reductions	-	-0.149			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.354	0.000			
• Program Adjustments	0.000	0.000	-5.128	-	-5.128
• Rate/Misc Adjustments	0.000	0.000	-1.144	-	-1.144

Change Summary Explanation

The FY2022 funding request was reduced by $6.272M to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy									Date: May 2021			
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0204228N / *Surface Support*				Project (Number/Name) 3311 / *Navigation Systems*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
3311: *Navigation Systems*	90.331	33.248	33.333	13.733	-	13.733	-	-	-	-	-	-
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Surface Support RDT&E funding will be used for the research, design, development, integration testing, and documentation of the Inertial Navigation System (INS) AN/WSN-12 for all Navy platforms. The INS provides mission critical ship position and attitude data to shipboard sensors (such as radars), combat systems, gun, and missile systems. The INS uses data from the Global Positioning System (GPS) to periodically update (i.e., reset) its position and internal clock. The INS is the ship's primary position source in the absence of GPS. The INS AN/WSN-12 consists of an Inertial Sensor Module (ISM) and a Navigation Processing Module (NPM) that will provide a significant improvement with respect to attitude and velocity data over previous INS through the use of a Power Spectral Density (PSD) capability. PSD provides a tighter tolerance for error across a wider frequency range. The ISM is being designed, developed, and procured through a competitive contract awarded to Northrop Grumman in November 2015. The NPM is a Government design. The government will serve as integration agent prior to the next AN/WSN-12 competitive contract award. RDT&E funding will support continued system design to create a baseline for Pre-Production Units (PPU), Low Rate Initial Production (LRIP), and Full Rate Production (FRP). The system has completed Critical Design Review (CDR) and will go through Production Readiness Review (PRR). The system will undergo extensive testing including Independent Validation and Verification (IV&V), Developmental Testing (DT) and Operational Testing (OT). Planned FY 2022 efforts include AN/WSN-12 system level Production Readiness Review (PRR), LRIP delivery, and awarding a FRP contract.

Cybersecurity funding will be used for the research, development, documentation and integration testing for cybersecurity hardening and enclave development for navigation systems. Efforts include the development of boundary defense capabilities, platform specific architectures, Navy-Electronic Chart Display and Information System (Navy-ECDIS) secure solution for existing unclassified configurations and CYBERSAFE implementation and conduct of cybersecurity risk and vulnerability assessments including development of system models, threat models, and mission models for representative groupings of Navigation systems and cybersecurity capabilities. Risk assessments along with requirements development will lead to incremental capability development leveraging the Increment 1 Engineering Development Model (EDM) delivery with updated architectures and system level modifications. Follow on capabilities will be developed and added to meet existing threats and requirements. Planned FY 2022 efforts include continuation of Cross Domain Solution (CDS) and cyber Capability Increment 2 development.

Time and Frequency Distribution System-Replacement (TFDS-R) funding will be used for the research, development, documentation, and integration testing for the Submarine TFDS-R system. TFDS is a Commercial Off the Shelf (COTS) timing system utilizing the precision source signals of GPS to discipline two redundant Rubidium clocks to Universal Coordinated Time (UTC). TFDS provides common time to submarine equipment that utilizes clocking pulses or sinusoidal waveforms for proper operation and maintains accurate time in the event of loss of GPS input (holdover). TFDS Uses multiple input power sources for redundancy and provides a built in battery backup. TFDS generates and distributes Precision Time and Timing Interval (PTTI) reference signals to support C4I capabilities needed for Joint, Naval and Allied missions. Planned FY 2022 efforts include LRIP and FRP.

Military GPS User Equipment (MGUE) will provide assured Positioning, Navigation and Timing (PNT) in a GPS degraded environment. Funding will be used for development of interface and performance requirements, shipboard system architecture definition, and MGUE integration into SSNs, Tomahawk, and Advanced Anti-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

Radiation Guided Missile (AARGM). Planned FY 2022 efforts include the completion of integration testing and MGUE testing and integration with Technical Insertion 22 (TI-22) platforms to include SSN 688i and SSBN 726 class submarines.

Submarine Speed Sensors will provide investigation, development, testing and integration of new Own-Ship Speed sensors to address new capabilities, reduce detection, and improve reliability. Planned FY 2022 efforts include the completion of Environmental Qualification Testing (EQT) and Factory Acceptance Test (FAT).

Assured Positioning, Navigation, and Timing (APNT) funding will be used for Alternate GPS-independent sources of Positioning, Velocity, Attitude, and Timing (PVAT) data required to provide fire control solutions, ensure safety of navigation, and support aircraft and combat operations in a GPS degraded/denied environment. This effort provides a secure navigation method using the navigation resources being developed via Office of Naval research (ONR) Future Naval Capabilities (FNC) activity.

Automated Celestial Navigation System (ACNS) funding will be used for the research, development, Engineering Development Model (EDM), documentation and integration testing of the celestial navigation solution for the NoGAPSS navigation implementation on the fleet. Efforts will leverage ONR celestial navigation research into a reproducible ruggedized system fully integrated into the navigation suite. FY 2022 efforts include system development of ACNS capability to be delivered in FY 2023.

Navigation Suite funding will be used to conduct analyses and studies on impact of the PVAT Navy Integrating Capability Construct (NICC) to validate, verify and test latency requirements to combat systems consumers. The program will implement systems engineering processes to investigate and define PNT requirements for the deployed shipboard systems.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: AN/WSN-12 Inertial Navigation System - Replacement (INS-R)	7.800	6.119	2.462	0.000	2.462
Articles:	-	-	-	-	-
FY 2021 Plans: Complete ISM Low Rate Initial Production (LRIP) Begin NPM LRIP Complete AN/WSN-12 Developmental Testing Conduct Production Readiness Review (PRR)					
FY 2022 Base Plans: Complete ILA Certification Begin Full Rate Production (FRP) Complete NPM LRIP					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
$3.657M decrease due to completion of ISM and NPM EDM development effort					
Title: Cybersecurity	5.016	2.867	1.500	0.000	1.500
Articles:	-	-	-	-	-
FY 2021 Plans: Complete NAV Enclave Cross Domain Solution (CDS) Phase I Begin NAV Enclave CDS Phase II Complete Boundary Defense Capability (BDC) Increment I					
FY 2022 Base Plans: Continue NAV Enclave CDS Phase II Begin BDC Increment II Development Begin and complete BDC Increment I Integration					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement: $1.367M decrease due to completion of BDC Inc I development and CDS Phase I					
Title: Time Frequency Distribution System (TFDS) Replacement	1.900	1.900	0.500	0.000	0.500
Articles:	-	-	-	-	-
FY 2021 Plans: Conduct Critical Design Review (CDR) Conduct Test Readiness Review (TRR) Conduct Production Readiness Review (PRR) Complete Environmental Qualification Testing (EQT)					
FY 2022 Base Plans: Begin Low Rate Initial Production (LRIP) Begin Full Rate Production (FRP)					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
$1.400M decrease due to completion of development effort					
Title: Military GPS User Equipment (MGUE) ***Articles:*** ***FY 2021 Plans:*** Continue M-Code integration ***FY 2022 Base Plans:*** Complete M-Code integration Conduct TI-22 integration and test ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** $2.204M decrease due to completion of M-code integration	5.003 -	5.760 -	3.556 -	0.000 -	3.556 -
Title: Submarine Speed Sensors (SSS) ***Articles:*** ***FY 2021 Plans:*** Complete TEMPALT Update Continue and complete prototype HW/SW development Continue Indicator-Transmitter Tech Refresh ***FY 2022 Base Plans:*** Conduct Factory Acceptance Testing (FAT) Conduct Environmental Qualification Testing (EQT) Continue Indicator-Transmitter Tech Refresh ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** $0.600M decrease due to completion of prototype HW/SW development	1.200 -	1.500 -	0.900 -	0.000 -	0.900 -
Title: Assured Positioning, Navigation, and Timing (APNT) ***Articles:*** ***FY 2021 Plans:***	3.600 -	3.600 -	3.200 -	0.000 -	3.200 -

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Complete APNT / NoGAPSS efforts Begin APNT ACNS processing and distribution cabinet integration ***FY 2022 Base Plans:*** Continue APNT ACNS processing and distribution cabinet integration ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** $0.400M decrease due to internal realignment of the funding to support the AN/WSN-12 development efforts.					
Title: Automated Celestial Navigation System (ACNS)	3.200	6.040	0.372	0.000	0.372
Articles:	-	-	-	-	-
FY 2021 Plans: Complete system requirements / design reviews Deliver initial Pre-Production Unit (PPU) Begin system development, integration, and test ***FY 2022 Base Plans:*** Continue limited system development, integration, and test. FY20 rephasing reduced the ACNS funding from $5.500M to $0.372M in FY22. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** $5.668M decrease due to rephasing of the ACNS funding from FY22 to FY23.					
Title: Navigation Suite	4.700	3.667	0.500	0.000	0.500
Articles:	-	-	-	-	-
FY 2021 Plans: Complete requirements analysis Begin studies and analyses on PNT requirements for Aegis Combat System ***FY 2022 Base Plans:*** Complete studies and analyses on PNT requirements for Aegis Combat System					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Begin studies and analyses on PNT requirements for Ship Self Defense System ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** $3.167M decrease due to reduced requirements					
Title: Navigation Support	0.829	1.880	0.743	0.000	0.743
Articles:	-	-	-	-	-
FY 2021 Plans: Provide engineering, logistics, and programmatic support for AN/WSN-12, Cybersecurity, TFDS, MGUE, SSS, ACNS, APNT, and Navigation Suite. ***FY 2022 Base Plans:*** Provide engineering, logistics, and programmatic support for AN/WSN-12, Cybersecurity, TFDS, MGUE, SSS, ACNS, APNT, and Navigation Suite. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** $1.137M decrease due to DON22 adjustments and internal realignment of the funding to support the AN/WSN-12 development efforts.					
Accomplishments/Planned Programs Subtotals	33.248	33.333	13.733	0.000	13.733

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• OPN/0670: *Other Navigation*	72.744	74.084	72.300	-	72.300	-	-	-	-	-	-

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

D. Acquisition Strategy

AN/WSN-12 Inertial Sensor Module (ISM) CPIF/CPFF/FFP contract competitively awarded in FY 2016. Contract includes options for conducting R&D milestones, manufacture of Engineering Development Models (EDM) and Pre-Production Units (PPU), and manufacture of Low Rate Initial Production (LRIP) and Full Rate Production (FRP).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0204228N / *Surface Support*	Project (Number/Name) 3311 / *Navigation Systems*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering/ Design	WR	SPAWAR Atlantic : Little Creek, VA	9.792	7.053	Dec 2019	8.950	Oct 2020	2.248	Oct 2021	-		2.248	-	-	-
Systems Engineering/ Design	WR	SPAWAR Pacific : San Diego, CA	1.275	0.600	Dec 2019	0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	C/CPFF	WR Systems : Norfolk, VA	15.977	3.650	Mar 2020	3.500	Oct 2020	4.908	Oct 2021	-		4.908	-	-	-
Systems Engineering/ Design	C/CPFF	Penn State/ARL : Warminster, PA	4.168	0.500	Dec 2019	0.500	Oct 2020	0.150	Oct 2021	-		0.150	-	-	-
Systems Engineering/ Design	WR	NSWC Dahlgren : Dahlgren, VA	0.643	2.000	Dec 2019	4.316	Oct 2020	3.000	Oct 2021	-		3.000	-	-	-
Systems Engineering/ Design	WR	NSWC Dam Neck : Dam Neck, VA	0.340	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	WR	NSWC PHD : Port Hueneme, CA	0.122	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	WR	NUWC Newport : Newport, RI	0.180	0.500	Dec 2019	0.400	Oct 2020	0.300	Oct 2021	-		0.300	-	-	-
Systems Engineering/ Design	C/CPFF	Old Dominion University : Suffolk, VA	0.450	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	C/CPFF	Northrop Grumman : Charlottesville, VA	39.722	2.800	Mar 2020	3.500	Oct 2020	0.212	Oct 2021	-		0.212	-	-	-
Systems Engineering/ Design	WR	SPAWAR Atlantic : Charleston, SC	1.530	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	WR	NSWC Philadelphia : Philadelphia, PA	0.737	0.500	Dec 2019	0.300	Oct 2020	0.000		-		0.000	-	-	-
Systems Engineering/ Design	C/CPFF	Electric Boat : Groton, CA	0.953	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	C/CPFF	John Hopkins, APL : Laurel, MD	6.160	10.216	Dec 2019	7.851	Oct 2020	1.800	Oct 2021	-		1.800	-	-	-
Systems Engineering/ Design	C/CPFF	Draper : Cambridge, MA	1.475	4.200	Dec 2019	2.136	Oct 2020	0.372	Oct 2021	-		0.372	-	-	-
Systems Engineering/ Design	WR	NSWC Crane : Crane, IN	0.121	0.000		0.000		0.000		-		0.000	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0204228N / *Surface Support*	Project (Number/Name) 3311 / *Navigation Systems*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering/ Design	WR	Submarine Special Projects : Washington, DC	0.000	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	MIPR	COMOPTEVFOR : Norfolk, VA	0.021	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	WR	SPAWAR 5.0 : San Diego, CA	0.093	0.000		0.000		0.000		-		0.000	-	-	-
Systems Engineering/ Design	TBD	Carnegie Mellon : Not Specified	0.000	0.400	Dec 2019	0.000		0.000		-		0.000	-	-	-
		Subtotal	83.759	32.419		31.453		12.990		-		12.990	-	-	N/A

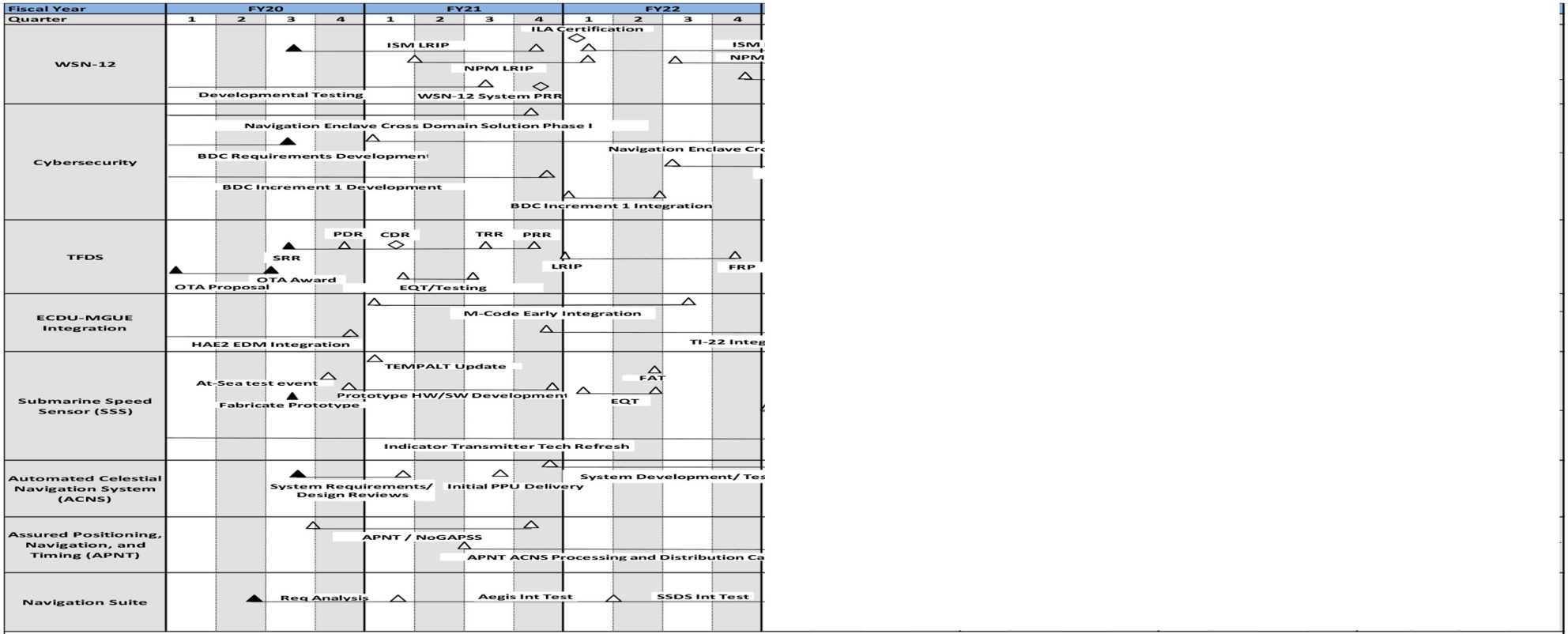
Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	C/CPFF	Various : Not Specified	6.572	0.829	Jan 2020	1.880	Oct 2020	0.743	Oct 2021	-		0.743	-	-	-
		Subtotal	6.572	0.829		1.880		0.743		-		0.743	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	90.331	33.248		33.333		13.733		-		13.733	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*



Acronym List:

- ACNS: Automated Celestial Navigation System
- AoA: Analysis of Alternatives
- APNT: Assured Position, Navigation and Timing
- BDC: Boundary Defense Capability
- CDR: Critical Design Review
- CDS: Cross Domain Solution
- CPD: Capability Production Document
- DOTC: Defense Ordnance Technology Consortium
- ECDU: Enhanced Control Display Unit
- EDM: Eningeering Development Model
- EQT: Environment Qualification Test
- FRP: Full Rate Production
- FAT: Factory Acceptance Test
- FOT&E: Follow-on Test and Evaluation
- HAE2: Host Application Equipment
- HW: Hardware
- ILA: Integrated Logistics Assessment
- IOT&E: Initial Operational Test and Evaluation
- ISM: Inertial Sensor Module
- LRIP: Low Rate Initial Production
- M-Code: Military Code
- NPM: Navigation Processor Module
- OTRR: Operational Test Readiness Review
- OTA: Other Transaction Agreement
- PDR: Preliminary Design Review
- PPU: Pre-Production Unit
- PRR: Production Readiness Review
- SCDU: Secondary Control Display Unit
- SRR: System Requirements Review
- SW: Software
- SSDS: Ship Self Defense System
- TEMP: Test and Evaluation Master Plan
- TFDS-R: Time Frequency Distribution System Replacement
- TRD: Technical Requirements Document

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
3311 RDTE				
AN/WSN-12: AN/WSN-12 ILA Certification	1	2022	1	2022
AN/WSN-12: ISM Production: AN/WSN-12 ISM LRIP	3	2020	4	2021
AN/WSN-12: ISM Production: AN/WSN-12 ISM FRP	1	2022	4	2022
AN/WSN-12: NPM Production: AN/WSN-12 NPM LRIP	2	2021	1	2022
AN/WSN-12: NPM Production: AN/WSN-12 NPM FRP	3	2022	4	2022
AN/WSN-12: AN/WSN-12 Developmental Testing	1	2020	3	2021
AN/WSN-12: AN/WSN-12 System PRR	4	2021	4	2021
AN/WSN-12: AN/WSN-12 Follow-on	4	2022	4	2022
Cybersecurity: Cybersecurity Navigation Enclave Cross Doman Solution Phase I	1	2020	4	2021
Cybersecurity: Cybersecurity Navigation Enclave Cross Domain Solution Phase II	1	2021	4	2022
Cybersecurity: Cybersecurity BDC Increment I Development	1	2020	4	2021
Cybersecurity: Cybersecurity BDC Increment II Development	3	2022	4	2022
Cybersecurity: Cybersecurity BDC Increment I Integration	1	2022	2	2022
TFDS: TFDS-R CDR	1	2021	1	2021
TFDS: TFDS-R TRR	3	2021	3	2021
TFDS: TFDS-R PRR	4	2021	4	2021
TFDS: TFDS-R FRP	4	2022	4	2022
TFDS: TFDS-R EQT/Testing	1	2021	3	2021
TFDS: TFDS-R LRIP	1	2022	4	2022
MGUE: MGUE M-Code Integration	1	2021	3	2022
MGUE: MGUE TI-22 Integration and Test	4	2021	4	2022
SSS: SSS TEMPALT Update	1	2021	1	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0204228N / *Surface Support*	**Project (Number/Name)** 3311 / *Navigation Systems*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SSS: SSS At-Sea Test Event	4	2020	4	2020
SSS: SSS FAT	2	2022	2	2022
SSS: SSS Prototype HW/SW Development	4	2020	4	2021
SSS: SSS EQT	1	2022	2	2022
SSS: SSS Indicator-Transmitter Tech Refresh	1	2020	4	2022
ACNS: ACNS System Requirement/Design Reviews	3	2020	1	2021
ACNS: ACNS Initial PPU Delivery	3	2021	3	2021
ACNS: ACNS System Development, Test, and Evaluation	4	2021	4	2022
APNT: APNT NoGAPSS	3	2020	4	2021
APNT: APNT ACNS Processing and Distribution Cabinet Integration	2	2021	4	2022
NAV Suite: NAV Suite Requirement Analysis	2	2020	1	2021
NAV Suite: NAV Suite Aegis Integration Test	2	2021	1	2022
NAV Suite: NAV Suite SSDS Integration Test	2	2022	4	2022