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 0604245M *I H-1 Upgrades*

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	0.000	53.083	60.991	62.310	-	62.310	64.587	43.081	14.721	15.017	Continuing	Continuing
3359: *H-1 Improvements*	0.000	53.083	60.991	62.310	-	62.310	64.587	43.081	14.721	15.017	Continuing	Continuing

A. Mission Description and Budget Item Justification

The mission of the AH-1 attack helicopter is to provide rotary wing close air support, anti-armor, armed escort, armed/visual reconnaissance, survivability enhancements, and fire support coordination capabilities under day/night and adverse weather conditions. The mission of the UH-1 utility helicopter is to provide command and control and combat assault support under day/night and adverse weather conditions and special operations support; supporting arms coordination and aeromedical evacuation. Major modifications for both aircraft include 37 AH-1Ws converted to AH-1Zs, build 152 new AH-1Zs, remanufacture ten (10) H-1N helicopters and build 150 new UH-1Y models. AH-1Z and UH-1Y models include a 4-bladed, composite rotor system with semi-automatic bladefold, performance-matched transmissions, T700 Engine Digital Electronic Control Units, 4-bladed tail rotors and drive systems, more effective stabilizers, upgraded landing gear, and common, fully integrated cockpits and avionics systems. These upgrades add 10,000 flight hours to AH-1Z/UH-1Y airframes. The fully integrated cockpits reduce operator workload and improve situational awareness, thus increasing safety and reducing the rate of aircraft attrition. They provide considerable growth potential for future weapon systems and avionics to significantly increase mission effectiveness and survivability. The cockpits also include integration of onboard mission planning, communications, digital fire control, self-navigation, night navigation/targeting, air-to-ground missile and air-launched intercept missile weapon systems management in nearly identical crew stations, which significantly reduces training requirements. These upgrades maximize commonality between the two aircraft and provide needed improvements in crew and passenger survivability, payload, power available, endurance, range, airspeed, maneuverability and supportability.

This budget is required for follow-on improvements to H-1 aircraft via integration of sensors and weapons, avionics, and air vehicle components that will address deficiencies, systems safety, obsolescence, readiness, reliability, supportability, and relevance in the battlespace. Improvements will include all associated System Configuration Set (SCS) updates as well as integration and testing related to the aircraft platforms.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	54.320	65.359	77.151	-	77.151
Current President's Budget	53.083	60.991	62.310	-	62.310
Total Adjustments	-1.237	-4.368	-14.841	-	-14.841
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-4.368			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.237	0.000			
• Program Adjustments	0.000	0.000	-14.469	-	-14.469

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy					Date: February 2020
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy* / BA 5: *System Development & Demonstration (SDD)*		R-1 Program Element (Number/Name) PE 0604245M / *H-1 Upgrades*			
• Rate/Misc Adjustments	0.000	0.000	-0.372	-	-0.372

Change Summary Explanation

The FY 2021 funding request was reduced by $10.7M to account for the availability of prior year execution balances. $4.4M reduced to support higher priority programs. Funding was increased by $0.2M for Navy Working Capital Fund rate adjustments.

Technical: None

Schedule: System Configuration Sets (SCS) will be continuously developed and released in conjunction with required hardware obsolescence and capability improvements. Software development as a whole are accounted for separately on the R-3 and are apportioned into development efforts for Avionics and Sensors & Weapons on the R-2a. Software is no longer portrayed separately on the R-2a or R-4 since SCS builds are linked to the development of hardware. The Mission Description section for Avionics and Sensors and Weapons state that SCS is part of each of the projects.

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 0604245M / *H-1 Upgrades*	Project (Number/Name) 3359 / *H-1 Improvements*	

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
3359: *H-1 Improvements*	0.000	53.083	60.991	62.310	-	62.310	64.587	43.081	14.721	15.017	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The objective of H-1 Improvements is to provide follow-on Research, Development, Test and Evaluation efforts in support of all H-1 aircraft.

Air Vehicle and Engine improvements include analysis of structural data to formulate Damage Limits and Tolerances for structural components to reduce life cycle costs and maintenance workload; and redesign of structural components and drive system components to minimize excessive and premature wear, increase reliability, and improve existing design deficiencies. Additional air vehicle upgrades include: redesign of the aircraft power-generating and electrical components (generators, inverters, wiring) to support power requirements for existing and future systems (Aircraft Survivability Equipment, emerging electronic warfare, and Degraded Visual Environment), redesign of the Environmental Control System / Thermal Redesign to support cooling of Technology Refresh Mission Computer and other avionics, redesign to add an auxiliary fuel capability, Intrepid Tiger, and upgrades the UH-1Y cabin floor panels. All air vehicle and engine improvements include related System Configuration Set (SCS) development updates including software, test assets and testing.

Avionics improvements target digital inter-operability, integrated avionics, safety and survivability, and situational awareness for both the pilot and aircrew safety. This includes integrating Joint Battle Command-Platform (JBC-P), Full Motion Video (FMV), Degraded Visual Environment (DVE), Helmet Mounted Display improvements, cockpit displays, precision and Global Positioning System (GPS) non-precision landing capability, Crash Survivable Flight Incident Recorder, collision avoidance, improved Embedded Global Positioning System (EGI), Inertial Navigation System (INS), targeting sensor systems and mission computer. H-1 capability improvements include improved Aircraft Survivability Equipment (ASE), digital operations and transfer of data, digital interoperability, digital video recording, video and data networking, and information integration with aviation combat elements and Marine Air Ground Task Force elements. Mandated capability efforts include - Communications, Navigation and Surveillance system/Air Traffic Management (CNS/ATM), Required Navigation Performance/ Area Navigation (RNP/RNAV), GPS Selective Availability Anti-Spoofing Module (SAASM), Automatic Dependent Surveillance - Broadcast (ADS-B), Crash Survivable Flight Incident Recorder, development efforts required for Depot standup and incorporation of technology and information protection/Information Assurance in critical avionics and sensor systems. In addition, the goal is to reduce total ownership cost for H-1 aircraft and related support systems by improving reliability and maintainability of critical flight and avionics systems along with associated peculiar avionics support equipment and incorporating fact-of-life obsolescence solutions. All avionics improvements include related System Configuration Set (SCS) development updates including software, test assets and testing.

Sensors, Weapons and Helmet Mounted Display System improvements include, manufacturing process improvements, hardware and software redesign to improve reliability, improve production methodologies, implement program security initiatives and increase the collective capability to address emerging battlefield threats. These improvements also address reliability and obsolescence, which collectively enhance Fleet readiness. The technical interface between the aircraft sensor, helmet and weapons is increasingly challenging to effectively employ advanced precision guided weapons and Aircraft Survivability Equipment (ASE) for the interface between the sensors, helmet and precision guided munitions. These systems require extensive software and hardware upgrades that translate into meaningful, sensor fusion based solutions, to provide both battlefield and situational awareness to the H1 platform. Specifically, the AN/ALQ-30 Target Sight System (TSS) will implement several block upgrade efforts with improvements to the IR Pointer, Laser and Cameras as well as adding capabilities such as Laser Spot Tracker and High Definition Video.

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 0604245M / *H-1 Upgrades*	**Project (Number/Name)** 3359 / *H-1 Improvements*

The Optimized TopOwl (OTO) optics upgrades, reliability, additive manufacturing initiatives, will address multiple human factor improvements, to include Degraded Visual Environment (DVE), as well as advanced boresighting and mapping improvements to improve weapons accuracy. The Digital Interoperability of the Helmet and Sensor will extend to improvements in ASE and Smart Dispense Technologies to improve aircraft survivability. Radar and Missile Warning improvements, including APR-39D(V)2 and the Distributed Aperture Infrared Countermeasures (DAIRCM), require extensive integration and testing. Development, test and integration efforts with the Advanced Precision Kill Weapons (APKWS), M299 Launcher improvements, Digital Rocket Launcher (DRL), AIM-9X, the AN/ALQ-231 (V) Intrepid Tiger II Electronic Warfare Pod and the Joint Air-to-Ground Missile (JAGM) Hellfire missile will follow in FY2018. Improving and integrating weapon systems will align with these upgrades to improve the overall accuracy, lethality and survivability of the H-1 platform. All weapon and sensor improvements include related System Configuration Set (SCS) development updates including software, test assets, and testing.

These improvements will provide considerable growth potential for future weapon systems, air vehicle improvements, software improvements, and avionics upgrades, which will significantly increase mission effectiveness and survivability, while potentially reducing life cycle costs. The cockpits will also include integration of onboard mission planning, communications, digital fire control, self-navigation, night navigation/targeting, precision guided munitions, and air-launched intercept missile weapon systems management in nearly identical crew stations, which significantly reduce training requirements. These upgrades maximize commonality between all H-1 Type/Model/Series aircraft and provide needed improvements in crew and passenger reliability, survivability, payload, power available, endurance, range, airspeed, maneuverability and supportability.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Weapons and Sensors Testing and Integration	10.597	13.010	15.298	0.000	15.298
Articles:	-	-	-	-	-
FY 2020 Plans: Continue prototype developmental testing of TSS Block Upgrade initiatives, to include software compatibility, transfer alignment corrections and high definition video feed to the Optimized Top Owl HMSD (Helmet Mounted Sight Display). Conduct HMSD optics testing, digital upgrades and Sensor/ASE interfaces, to include TopOwl integration of binocular optics. Continue enhanced digital capability efforts, Aircraft Survivability Equipment (ASE) improvements, Helmet Mounted Display improvements, with full visor integration and display enhancements, systems obsolescence mitigation efforts and test Degraded Visual Environment (DVE) solutions with TSS and OTO interfaces. Conduct testing and evaluation of Intrepid Tiger IT-IIV3 and Distributed Aperture Infrared Countermeasures. Weapons and Sensors improvements include test asset components to support validation and verification of designs to include software.					
FY 2021 Base Plans: Continue prototype developmental testing of TSS Block Upgrade initiatives, to include software compatibility, transfer alignment corrections and high definition video feed to the Optimized Top Owl HMSD (Helmet Mounted Sight Display). Conduct HMSD optics testing, digital upgrades and Sensor/ASE interfaces, to include TopOwl integration of binocular optics. Continue enhanced digital capability efforts, Aircraft Survivability Equipment (ASE) improvements, Helmet Mounted Display improvements, with full visor integration and display					

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
enhancements, systems obsolescence mitigation efforts and test Degraded Visual Environment (DVE) solutions with TSS and OTO interfaces. Conduct testing and evaluation of Intrepid Tiger IT-IIV3 and Distributed Aperture Infrared Countermeasures. Weapons and Sensors improvements include test asset components to support validation and verification of designs to include software. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 due to flight testing requirements for TSS Block Upgrade with OTO improvements, specifically to address Transfer Alignment for weapons employment which is the platforms mission computer ability to send pilot commands to the weapon launcher, and address human factor improvements for Degraded Visual Environment (DVE) requirements. Funds are required for the continued testing for Joint Air to Ground Missile (JAGM) integration due to missile operational requirement changes leading to additional software development and testing. Additionally, funds are required to support airworthiness integration of the AIM-9X, Jettison Testing of the Intrepid Tiger (IT-IIV3), and software improvements with the Brite STAR II Laser Spot Tracker (LST) and Joint Urgent Operational Needs Statement (JUONS), Distributed Aperture Infrared Countermeasures (DAIRCM) system integration.					
Title: Air Vehicle and Engines Improvements	16.268	18.277	16.093	0.000	16.093
Articles:	-	-	-	-	-
FY 2020 Plans: Continue redesign and test of structural components to minimize excessive and premature wear, increase reliability, increase aircraft load capabilities, and improve existing design deficiencies including: the fuel system; the aircraft electrical power-generating components and aircraft re-wiring to support power requirements for existing and future systems to include stores select-ability, future Avionics Survivability Equipment (ASE), emerging Electronic Warfare (EW), and Degraded Visual Environment (DVE) systems; the Environmental Control Systems/Thermal to support other avionics on the UH-1Y/AH-1Z; the drive system components (rotor brake/slip ring/standpipe/gearboxes/drive shaft and couplers/chip detectors) to increase reliability and reduce high cost and/or failure rates; main and tail rotor blades including tail rotor mast; and tail=boom design study. Continue survivability upgrades, opaque armor, self-sealing fuel tanks, sump and backing board. Continue UH-1Y structural improvements to increase capability including auxiliary fuel; cabin floor boards to prevent corrosion; floor panel access and other structural reinforcements. Continue UH-1Y and AH-1Z structural					

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
improvements on composite elevator and Fuel cell design, development and test. Air vehicle improvements include test asset components to support validation and verification of designs to include software. ***FY 2021 Base Plans:*** Continue redesign and test of structural components to minimize excessive and premature wear, increase reliability, increase aircraft load capabilities, and improve existing design deficiencies including: the fuel system; the aircraft electrical power-generating components and aircraft re-wiring to support power requirements for existing and future systems to include stores select-ability, future Avionics Survivability Equipment (ASE), emerging Electronic Warfare (EW), and Degraded Visual Environment (DVE) systems; the Environmental Control Systems/Thermal to support other avionics on the UH-1Y/AH-1Z; the drive system components (rotor brake/slip ring/standpipe/gearboxes/drive shaft and couplers/chip detectors) to increase reliability and reduce high cost and/or failure rates; main and tail rotor blades including tail rotor mast; and tail=boom design study. Continue survivability upgrades, opaque armor, self-sealing fuel tanks, sump and backing board. Continue UH-1Y structural improvements to increase capability including auxiliary fuel; cabin floor boards to prevent corrosion; floor panel access and other structural reinforcements. Continue UH-1Y and AH-1Z structural improvements on composite elevator and Fuel cell design, development and test. Air vehicle improvements include test asset components to support validation and verification of designs to include software. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in funding from FY2020 to FY2021 due to decrease in design and test efforts in support of UH-1Y/ AH-1Z structural improvement and reinforcement initiatives, component redesign efforts, and survivability upgrades.					
Title: Avionics Improvements	26.218	29.704	30.919	0.000	30.919
Articles:	-	-	-	-	-
FY 2020 Plans: Continue with software integration, Development Testing (DT) and Validation and Verification (V&V) activities associated with System Configuration Set (SCS). Support hardware and software design changes associated with SCS in support of Joint Air to Ground Missile (JAGM) and APR-39D(V)2. Continue to support Avionics Test Facility (ATF). Continue development of requirements and software architecture for SCS to include Ethernet Backbone - Aircraft Network Switch (ANS), Advanced Data Transfer System (ADTS), AIM-9X, Tactical Secure Voice, Second Generation Anti-Jam Tactical UHF Radio for NATO (SATURN), and Variable Message Format (VMF) Protocol for ARC-210 RT-1939A Radio, and mission computer. Continue design, development and testing					

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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
for Digital Interoperability (DI) improvements, avionics components / systems obsolescence mitigation efforts, peculiar avionics support equipment, automatic test equipment and mission computer SCS improvements, Satellite Communications improvement, Link 16 development, Full Motion Video (FMV), UH-1Y Aft Cabin Display for situational awareness, portable tablet improvements for Marine Air-Ground Task Force operations, Aircraft Dependent Surveillance Broadcast (ADS-B), and waveform functionality. Continue enhancement of digital map and data storage capabilities, digital video recording, display systems, digital systems upgrades, avionics regression testing. Continue design and development on Terrain Avoidance and Warning System (TAWS), Wireless Intercommunication Systems (WICS), Joint Battlefield Command - Platform (JBC-P), Mobile User Objective System (MUOS) for over the horizon communication, Degraded Visual Environment and collision avoidance capability, Enhanced Navigation - Embedded Global Positioning System/Inertial Navigation System (EGI) upgrade for Selective Availability Anti-Spoofing Module (SAASM), GPS non-precision approach capability and GPS signal protection efforts, Crash Survivable Flight Instrument Recorder (CSFIR), and Link tactical data exchange. Avionics improvements include test asset components to support validation and verification of designs to include software.					
FY 2021 Base Plans: Continue with software integration, Development Testing (DT) and Validation and Verification (V&V) activities associated with System Configuration Set (SCS). Support hardware and software design changes associated with SCS in support of Joint Air to Ground Missile (JAGM) and APR-39D(V)2. Continue to support Avionics Test Facility (ATF). Continue development of requirements and software architecture for SCS to include Ethernet Backbone - Aircraft Network Switch (ANS), Advanced Data Transfer System (ADTS), AIM-9X, Tactical Secure Voice, Second Generation Anti-Jam Tactical UHF Radio for NATO (SATURN), and Variable Message Format (VMF) Protocol for ARC-210 RT-1939A Radio, and mission computer. Continue design, development and testing for Digital Interoperability (DI) improvements, avionics components / systems obsolescence mitigation efforts, peculiar avionics support equipment, automatic test equipment and mission computer SCS improvements, Satellite Communications improvement, Link 16 development, Full Motion Video (FMV), UH-1Y Aft Cabin Display for situational awareness, portable tablet improvements for Marine Air-Ground Task Force operations, Aircraft Dependent Surveillance Broadcast (ADS-B), and waveform functionality. Continue enhancement of digital map and data storage capabilities, digital video recording, display systems, digital systems upgrades, avionics regression testing. Continue design and development on Terrain Avoidance and Warning System (TAWS), Wireless Intercommunication Systems (WICS), Joint Battlefield Command - Platform (JBC-P), Mobile User Objective System (MUOS) for over the horizon communication, Degraded Visual Environment and collision avoidance capability, Enhanced Navigation - Embedded Global Positioning System/Inertial Navigation System (EGI) upgrade for Selective Availability Anti-Spoofing Module (SAASM), GPS non-precision approach capability					

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
and GPS signal protection efforts, Crash Survivable Flight Instrument Recorder (CSFIR), and Link tactical data exchange. Avionics improvements include test asset components to support validation and verification of designs to include software. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY2020 to FY2021 due to increase of hardware and software development, improvement, and integration efforts for enhanced navigation, digital interoperability, and ethernet backbone.					
Accomplishments/Planned Programs Subtotals	53.083	60.991	62.310	0.000	62.310

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
• APN/0178: *UH-1Y/AH-1Z APN1*	782.437	43.982	7.267	-	7.267	1.015	0.124	0.274	0.429	0.000	10,569.460
• APN/0532: *H-1 Series*	77.745	114.059	185.140	-	185.140	183.194	214.774	219.266	223.592	920.693	2,747.889

Remarks

D. Acquisition Strategy

Follow-on H-1 Improvements will be developed using cost plus fixed fee type contracts.

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	SS/CPFF	BHTI : Amarillo, TX	0.000	12.403	Jan 2019	13.600	Jan 2020	10.606	Jan 2021	-		10.606	37.939	74.548	70.162
Primary Hardware Development	Various	Various : Various	0.000	0.520	Jan 2019	3.308	Jan 2020	1.094	Jan 2021	-		1.094	0.000	4.922	-
Systems Engineering	WR	NAWCAD : Patuxent River, MD	0.000	3.018	Nov 2018	1.633	Nov 2019	0.522	Nov 2020	-		0.522	3.774	8.947	-
Systems Engineering	SS/CPFF	BHTI : Amarillo, TX	0.000	0.979	Jan 2019	2.634	Jan 2020	10.607	Jan 2021	-		10.607	0.000	14.220	-
Systems Engineering	Various	Various : Various	0.000	0.258	Jan 2019	0.568	Jan 2020	0.000		-		0.000	0.000	0.826	-
		Subtotal	0.000	17.178		21.743		22.829		-		22.829	41.713	103.463	N/A

Remarks

Increase from FY2020 to FY2021 due to internal USMC re-prioritization of funding to accommodate the system engineering for new and mandated capabilities into the H-1 aircraft such as enhanced navigation to include placement of the radar altimeter, improvements to fight controls and Flight Control Computer to increase stability, space, weight, power, and thermal.

Increase in system engineering support efforts for Bell include Environmental Control System / Thermal cooling; Distributed Aperture Infrared Countermeasures (DAIRCM) integration; structural component analysis against existing design deficiencies to include fuel system, electrical power-generating components, aircraft re-wiring requirements; ethernet backbone; and associated system configuration set development. Increase also includes support for airworthiness integration of software improvements with the TSS Block Upgrade, Brite STAR II LST and Distributed Aperture Infrared Countermeasure (DAIRCM).

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	SS/FP	Northrup Grumman : Woodland Hills, CA	0.000	17.253	Nov 2018	6.550	Nov 2019	8.781	Nov 2020	-		8.781	32.388	64.972	53.322
Software Development	WR	NAWCWD : China Lake, CA	0.000	2.708	Nov 2018	2.089	Nov 2019	2.094	Nov 2020	-		2.094	12.309	19.200	-
Software Development	WR	NAWCAD : Patuxent River, MD	0.000	2.049	Nov 2018	1.043	Nov 2019	1.046	Nov 2020	-		1.046	0.000	4.138	-
Software Development	Various	Various : Various	0.000	0.675	Jan 2019	0.694	Jan 2020	0.724	Jan 2021	-		0.724	0.000	2.093	-
		Subtotal	0.000	22.685		10.376		12.645		-		12.645	44.697	90.403	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
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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

Increase from FY2020 to FY2021 supports system engineering and software development efforts for Distributed Aperture Infrared Countermeasures (DAIRCM) integration; structural component analysis to include existing design deficiencies such as fuel system and electrical power-generating components; continued Joint Air to Ground Missile (JAGM) integration; system configuration set development for the integration of digital interoperability, Link 16, aircraft dependent surveillance broadcast (ADS-B), ethernet backbone, Mobile User Objective System (MUOS), and Enhanced Navigation - Embedded Global Positioning System/Inertial Navigation System (EGI) for Selective Availability Anti-Spoofing Module (SAASM). Increase also includes support for airworthiness integration of software improvements with the TSS Block Upgrade, Brite STAR II LST and Distributed Aperture Infrared Countermeasure (DAIRCM).

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
Operational Test and Evaluation	WR	COMOPTEVFOR : Norfolk, VA	0.000	1.431	Nov 2018	1.647	Nov 2019	1.678	Nov 2020	-		1.678	7.295	12.051	-
Operational Test and Evaluation	Various	Various : Various	0.000	1.020	Jan 2019	0.722	Jan 2020	0.738	Jan 2021	-		0.738	0.000	2.480	-
Development Test and Evaluation	WR	NAWCAD : Patuxent River, MD	0.000	7.645	Nov 2018	21.591	Nov 2019	19.405	Nov 2020	-		19.405	79.778	128.419	-
Development Test and Evaluation	Various	Various : Various	0.000	1.016	Jan 2019	0.796	Jan 2020	0.825	Jan 2021	-		0.825	0.000	2.637	-
		Subtotal	0.000	11.112		24.756		22.646		-		22.646	87.073	145.587	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	Various	Various : Various	0.000	0.966	Nov 2018	2.046	Nov 2019	2.083	Nov 2020	-		2.083	1.408	6.503	2.060
Program Management Support	Various	Various : Various	0.000	0.900	Nov 2018	1.845	Nov 2019	1.878	Nov 2020	-		1.878	3.523	8.146	-
Travel	WR	NAVAIR : Patuxent River, MD	0.000	0.242	Oct 2018	0.225	Oct 2019	0.229	Oct 2020	-		0.229	Continuing	Continuing	Continuing
		Subtotal	0.000	2.108		4.116		4.190		-		4.190	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
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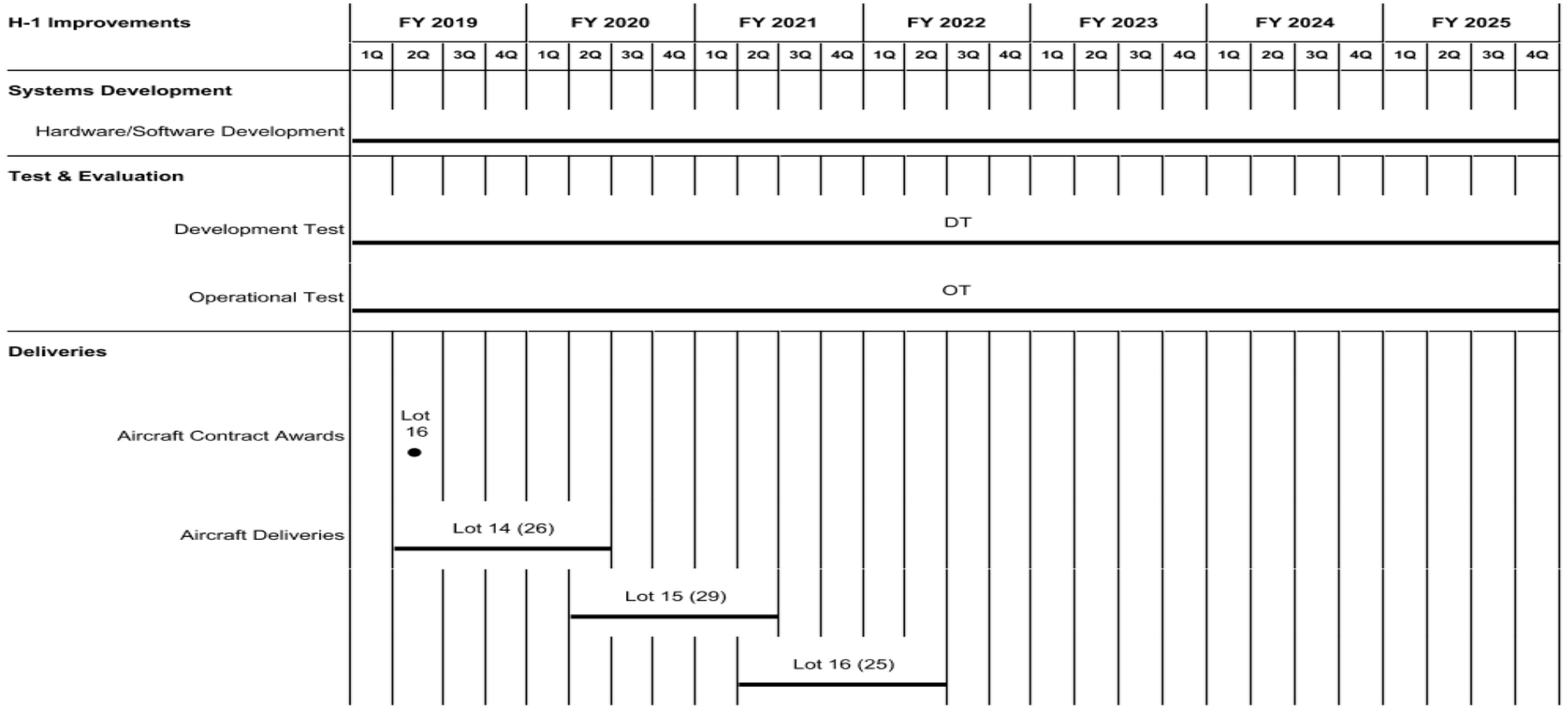
	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	53.083		60.991		62.310		-		62.310	Continuing	Continuing	N/A

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 0604245M / *H-1 Upgrades*	**Project (Number/Name)** 3359 / *H-1 Improvements*



2021DON - 0604245M - 3359

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 0604245M / *H-1 Upgrades*	**Project (Number/Name)** 3359 / *H-1 Improvements*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
H-1 Improvements				
Systems Development: Hardware/Software Development: Schedule Detail	1	2019	4	2025
Test & Evaluation: Development Test: H-1 Improvements DT	1	2019	4	2025
Test & Evaluation: Operational Test: H-1 Improvements OT	1	2019	4	2025
Deliveries: Aircraft Contract Awards: Lot 16	2	2019	2	2019
Deliveries: Aircraft Deliveries: Lot 14 FRP Z	2	2019	2	2020
Deliveries: Aircraft Deliveries: Lot 15 FRP Z	2	2020	2	2021
Deliveries: Aircraft Deliveries: Lot 16 FRP Z	2	2021	2	2022