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 0604262N / *V-22A*							
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	9,513.557	131.363	191.235	132.624	-	132.624	139.786	168.248	147.536	119.275	Continuing	Continuing
1425: *V-22*	9,513.557	131.363	177.885	118.475	-	118.475	100.057	132.624	137.630	27.137	36.957	10,375.685
3090: *V-22 Improvement Program*	0.000	0.000	0.000	14.149	-	14.149	39.729	35.624	9.906	92.138	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	13.350	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	13.350
Program MDAP/MAIS Code: **Project MDAP/MAIS Code(s):** 212												

Note

FY 2019 funding does not reflect the enacted rescission amount of $28.651 Million.

A. Mission Description and Budget Item Justification

The V-22 Osprey is an Acquisition Category IC Joint Program led by the Department of the Navy for the purpose of developing, testing, evaluating, procuring and fielding a tilt rotor, vertical takeoff and landing aircraft for Joint Service application. The V-22 program is designed to provide an aircraft to meet the amphibious/vertical assault needs of the Marine Corps, the Carrier Onboard Delivery (COD) needs of the Navy, and the special operations needs of the Air Force and the United States Special Operations Command (USSOCOM). The MV-22 variant is replacing the CH-46E in the Marine Corps and the CMV-22 will replace the C-2A in the Navy. The CV-22 variant replaced the MH-53J and MH-53M and augments the C-130 in the Air Force and USSOCOM. The V-22 is capable of flying over 2,100 nautical miles, with a single refueling, giving the services the advantage of a Vertical/Short Take-off and Landing aircraft that can rapidly self-deploy to any location in the world. This program is funded under Engineering Manufacturing and Development for correction of deficiencies and includes Block A and Block B upgrades which encompassed engineering and manufacturing development of new end-items prior to the production incorporation decision as well as Block C suitability and effectiveness development upgrades. Capability Development Document interoperability requirements were addressed through a spiral upgrade acquisition strategy. It was the first spiral providing Key Enabling Department of Defense mandated open systems architecture upgrades for the mission computer hardware and software while simultaneously addressing required interoperability common avionics upgrades and current avionics obsolescence issues. Future development efforts will include Pre-Planned-Product-Improvements in the Capability Development Document and Re-design efforts to correct critical Reliability, Maintainability and Availability issues in support of readiness Operational Safety Improvement Program as prioritized by the United States Marine Corps or an Urgent Universal Needs Statement.

Note:
The first two CMV production aircraft are test aircraft. They will be delivered to Patuxent River to support Development Testing. Operational Testing (OT) will be conducted as part of a carrier air wing work-up prior to deployment. OT will focus on assessing the effectiveness and suitability of the CMV-22 as the COD platform in the carrier strike group.
There is no Milestone C, because CMV-22 is being executed as an Engineering Change Proposal to V-22 Block C. Initial Operational Capability for CMV-22 is FY21.

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 0604262N / *V-22A*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	135.504	185.105	133.059	-	133.059
Current President's Budget	131.363	191.235	132.624	-	132.624
Total Adjustments	-4.141	6.130	-0.435	-	-0.435
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-7.220			
• Congressional Rescissions	-	-			
• Congressional Adds	-	13.350			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-4.141	0.000			
• Program Adjustments	0.000	0.000	15.082	-	15.082
• Rate/Misc Adjustments	0.000	0.000	-15.517	-	-15.517

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: 9999: *Congressional Adds*		
Congressional Add: *Common Lightweight Cargo System*	0.000	8.350
Congressional Add: *Active vibration control system*	0.000	5.000
Congressional Add Subtotals for Project: 9999	0.000	13.350
Congressional Add Totals for all Projects	0.000	13.350

Change Summary Explanation

FY 2021 net $0.435M decrease from President's Budget is for the addition of $14.0M for Flight Control Computer redesign, addition of $0.8M for CBM+, addition of $0.282M for Navy Working Capital Fund pricing adjustments, a reduction of $9.312M that transferred to PE 0605217N for the Digital Interoperability effort, a reduction of $6.205M for miscellaneous rate / balancing adjustments.

Schedule:
Project Unit 1425:
1. Hardware Development Schedule - Flight Control System (FCS) Re-design is now being shown in Project Unit 3090. Improved Inlet Solution Engine Air Particle Separator 2.0 has been added to the schedule and OT events moved a year as no software changes required an OT test in FY19.
2. Digital Interoperability efforts are moved to PE 0605217N beginning in FY2021.

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 0604262N / *V-22A*

3. CMV Schedule - Test events were updated to reflect current test plan. Live Fire Event was completed in 3Q19. Operational Test updated to end 1Q21. Physical Configuration Audit updated to coincide with production aircraft delivery. Follow-on Operational Test & Evaluation added 1Q23 through 4Q23. Production quantities and deliveries have been updated to reflect current schedule.
4. Electrical System Re-design - Schedule reflects refinement of Non-Recurring Engineering events based on improved understanding of Constant Frequency Generator / Generator Control Unit Re-design complexity. Bell Boeing Integration Support added 1Q19. Bell Boeing will complete lab testing and UTAS will complete Flight Testing. Schedule updated to reflect detail provided in Congressional RFI submitted on 15 April 2019.
5. Infrared Suppressor Schedule (IRS) - Schedule updated to reflect the source selection and award of the improvements contract as the optimum solution for the V-22 IRS and the initial phase of product improvement development. SVR added 3Q21.
6. Open System Architecture / Cyber Security - Schedule updated to reflect current program schedule. Joint Avionics Reconfigurable Virtual Information System (JARVIS) development is the current Open System Architecture effort being developed.
7. DVE / HMD Schedule - Schedule updated to reflect delay in receiving the interface information for the Enhanced Visual Acuity system. Preliminary Design Review added 2Q23.

Schedule
1. Project Unit 3090: FCS Re-design.New schedule added
2. Project Unit C475: New schedule added for Common Lightweight Cargo System (COOLS)
3. Project unit C556: New schedule added for Active Vibration Control System

Technical:
1. PU 3090 created under PE 0604262N for V-22 Product Improvement efforts.
2. PU C475 created under PE 0604262N for V-22 COOLS.
3. PU C556 created under PE 0604262N for V-22 Active Vibration Control System.

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 0604262N / *V-22A*	Project (Number/Name) 1425 / *V-22*	

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
1425: *V-22*	9,513.557	131.363	177.885	118.475	-	118.475	100.057	132.624	137.630	27.137	36.957	10,375.685
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 212

A. Mission Description and Budget Item Justification

The V-22 Osprey is an Acquisition Category IC Joint Program led by the Department of the Navy for the purpose of developing, testing, evaluating, procuring and fielding a tilt rotor, vertical takeoff and landing aircraft for Joint Service application. The V-22 program is designed to provide an aircraft to meet the amphibious/vertical assault needs of the Marine Corps, the Carrier Onboard Delivery (COD) needs of the Navy, and the special operations needs of the Air Force and the United States Special Operations Command (USSOCOM). The V-22 is replacing the CH-46E in the Marine Corps with the MV-22; will supplement the H-60 in the Navy with the MV-22; and replace the MH-53J and MH-53M as well as augment the C-130 in the Air Force and USSOCOM with the CV-22. The V-22 is capable of flying over 2,100 nautical miles, with a single refueling, giving the services the advantage of a Vertical/Short Take-off and Landing aircraft that can rapidly self-deploy to any location in the world. This program is funded under Engineering Manufacturing and Development (EMD) for correction of deficiencies and includes Block A and Block B upgrades which encompassed engineering and manufacturing development of new end-items prior to the production incorporation decision as well as Block C suitability and effectiveness development upgrades. Capability Development Document interoperability requirements were addressed through a spiral upgrade acquisition strategy. It was the first spiral providing Key Enabling Department of Defense mandated open systems architecture upgrades for the mission computer hardware and software while simultaneously addressing required interoperability common avionics upgrades and current avionics obsolescence issues. Future development efforts will include Pre-Planned-Product-Improvements in the Capability Development Document and Re-design efforts to correct critical Reliability, Maintainability and Availability issues in support of readiness Operational Safety Improvement Program as prioritized by the United States Marine Corps or a Urgent Universal Needs Statement.

FY21 continues Hardware Development Airframe to fund development efforts in support of V-22 Block upgrades, Time on Wing, ARC-210 Series Radio and Safety Improvement efforts such as Cockpit Engine Health Indicator (CEHI) and Condition Based Maintenance. Continue engineering, logistics, flight test, flight test support and address the correction of deficiencies and obsolescence. Continue V-22 software development/mission computer obsolescence initiatives such as transition tech demo and modular avionics mission computer re-design. Continue V-22 Integrated Aircraft Survivability Equipment to include correcting deficiencies; radar warning system, integration with an upgraded missile warning and active infrared countermeasure system, rotor blade tabs, Miniature Airborne Global Positioning System Receiver, Defensive Weapons capabilities and providing integrated threat warning information on the aircrafts main flight displays. Continue correcting deficiencies of the current Engine Air Particle Separator (EAPS), Primary Lightning Control Unit (PLCU), Flight Director Panel and Enhanced Standby Flight Indicator (ESFI). Continue development of particle separation solutions that will improve maintainability and reliability.

FY21 continues Hardware Development Propulsion to fund the flight/engine hours that are necessary for the design, development, validation and verification of the V-22 propulsion and power systems at the Patuxent River squadron. Rolls-Royce will continue to provide engine support and development of V-22 flight testing.

FY21 continues the CMV-22 Hardware Development efforts which consist of an Engineering Change Proposal (ECP) to modify MV-22 into the CMV-22 configuration to perform the COD mission. The Engineering Change Proposal (ECP) will add such things as (1) the capability to meet the range requirements that the COD mission

demands, (2) a high frequency (HF) radio to transmit/receive beyond line of sight (BLOS) over water and (3) a public address (PA) system for use while transporting passengers. CMV-22 will continue development testing to include preliminary envelope expansion, Electromagnetic Environment Effects testing, HF radio testing, Carrier Suitability and integration testing. CMV will continue to support development efforts such as: EAPS, Infrared Suppressor (IRS) Re-design, Center Console Re-design, and Modular Avionics / Cyber Security Implementation.

FY21 continues Electrical System re-design and reliability improvement efforts. Upgrading the V-22 electrical system reliability and capacity is required to accommodate demands on electrical power system as additional systems are added to the V-22 aircraft. This effort will design, develop, validate and verify engineering solutions to improve (1) the Constant Frequency Generator (CFG), (2) the Variable Frequency Generator(VFG) and (3) all associated electrical system interfaces.

FY21 continues IRS Re-design and Reliability improvement efforts. The IRS system masks the infrared signature of the V-22 aircraft, which increases operational survivability. The current IRS system fails to meet reliability requirements. This effort will design, develop, validate and verify engineering solutions to improve the V-22 IRS system to include funds for the instrumented flight test of IRS system solutions.

FY21 continues Open System Architecture / Cyber Security development efforts to provide new capabilities focused on enhancing survivability, software and hardware modularity and maturation of aircraft interfaces. Joint Avionics Reconfigurable Virtual Information System (JARVIS) is the current Open System Architecture effort being developed. Continue risk reduction and development efforts such as Cyber-Resilient interoperability, Modular Avionics / Cyber Security Implementation, Cyber / Safe Flight Control improvements and Center Console Re-design.

FY21 continues risk reduction and developmental efforts for improved situational awareness and safety in Degraded Visual Environment (DVE) situations. A Digital Helmet Mounted Display (HMD) system is required to interface and function with the new Enhanced Visual Acuity system being developed. Multi-Spectral Sensor is a separate accomplishment due to the increased urgency of Degraded Visual Environment (DVE) / Helmet Mounted Display (HMD.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under OPERATIONAL SYSTEMS DEVELOPMENT because it includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate funding in the current or subsequent fiscal year.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: V-22 Hardware Development Airframe	35.242	28.029	28.784	0.000	28.784
Articles:	-	-	-	-	-
Description: The V-22 Hardware Development Airframe continues to fund development efforts. Continue development in support of V-22 Block upgrades, electrical system capacity efforts, ARC-210 Series Radio, Time on Wing/Reliability Improvements efforts such as testing of Additive Manufacturing processes for selected V-22 components, Aircraft Mission Maneuvering Envelope Expansion and Safety Improvement efforts such as CEHI and Condition Based Maintenance. Continue engineering, logistics, flight test, flight test support and address the correction of deficiencies and obsolescence. Continue V-22 software development/sustainment efforts such as transition tech demo, Modular Avionics Mission Computer Obsolescence Initiative re-design and					

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FCS. Continue V-22 integrated aircraft survivability equipment to include correcting deficiencies; radar warning system, integration with an upgraded missile warning and active infrared countermeasure system, cockpit interface units, electrical power system, rotor blade tabs, Miniature Airborne Global Positioning System Receiver (MAGR2K) - which is part of DI, Defensive Weapons capabilities, Mission system upgrades, and providing integrated threat warning information on the aircraft main flight displays. Continue correcting deficiencies of the current EAPS and the addition of PLCU, Flight Director Panel and ESFI. Continue development of particle separation solutions that will improve maintainability and reliability. ***FY 2020 Plans:*** Continue V-22 development efforts including but not limited to: rotor blade tabs, nacelle sails and MAGR2K. Continue V-22 software development efforts. Continue development in support of V-22 Block upgrades, Time on Wing/Reliability Improvements such as testing of Additive Manufacturing processes for selected V-22 components and Safety Improvement efforts such as CEHI and gearbox vibration monitoring. Continue engineering, logistics, flight test, flight test support, address correction of deficiencies and obsolescence efforts such as Engine Air Particle Separator, Flight Control System, Air Data Unit, Defensive Weapons capabilities, radar warning system, integration with an upgraded missile warning and active infrared countermeasure system, cockpit interface units and also including training upgrades and developments. Continue reliability improvement efforts as well as Re-design efforts to correct critical Reliability, Maintainability and Availability issues in support of readiness Operational Safety Improvement Program. ***FY 2021 Base Plans:*** Continue V-22 development efforts including but not limited to: rotor blade tabs, and MAGR2K. Continue V-22 software development efforts. Continue development in support of V-22 Block upgrades, Time on Wing/ Reliability Improvements such as testing of Additive Manufacturing processes for selected V-22 components, Aircraft Mission Maneuvering Envelope Expansion and Safety Improvement efforts such as CEHI and Condition Based Maintenance. Continue engineering, logistics, flight test, flight test support, address correction of deficiencies and obsolescence efforts such as EAPS, Air Data Unit, Defensive Weapons capabilities, Mission system upgrades, radar warning system, integration with an upgraded missile warning and active infrared countermeasure system, cockpit interface units, training upgrades and developments and in addition PLCU, Flight Director Panel and ESFI. Continue reliability improvement efforts as well as re-design efforts to correct critical Reliability, Maintainability and Availability issues in support of readiness Operational Safety Improvement Program. ***FY 2021 OCO Plans:***					

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in FY 2021 for Hardware Development is due to the re-design of the PLCU due to obsolescence.					
Title: V-22 Hardware Development Propulsion/Mission Care	1.362	2.139	2.219	0.000	2.219
Articles:	-	-	-	-	-
Description: Hardware Development Propulsion / Mission Care funds the flight/engine hours that are necessary for the design, development, validation and verification of the V-22 propulsion and power systems at the Patuxent River squadron. In addition, it pays for Rolls Royce to provide engine support and development of the V-22 flight testing. ***FY 2020 Plans:*** Funds continue for flight/engine hours that are necessary for the design, development, validation and verification of the V-22 propulsion and power systems at the Patuxent River squadron. Rolls Royce will continue to provide engine support and development of V-22 flight testing. ***FY 2021 Base Plans:*** Funds continue for flight/engine hours that are necessary for the design, development, validation and verification of the V-22 propulsion and power systems at the Patuxent River squadron. Rolls Royce will continue to provide engine support and development of V-22 flight testing. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in FY 2021 for Hardware Development Propulsion / Mission Care is due to contracted costs of necessary flight/engine hours for the design, development, validation and verification of the V-22 propulsion and power systems at the Patuxent River squadron.					
Title: V-22 Digital Interoperability	26.693	28.254	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: Digital Interoperability (DI) is the United States Marine Corps Aviation wide implementation of gateway and software defined radios, such as SRP, capable of migration to advanced waveforms and payloads, providing enhanced digital connectivity between forces using dissimilar waveforms and/or protocols. DI will enable fleet integration of new capability through the use of tablets with custom applications. DI is also					

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
envisioned to include logistics tracking (cargo and personnel) with the use of Radio Frequency Identification technology, advanced Electronic Warfare/Cyber capability, and threat data capturing/off-boarding. ***FY 2020 Plans:*** Funds continue for the maturation of Marine Air Ground Task Force Agile Network Gateway Link. This includes DI, Mesh Network Manager and assessment of effectiveness via gateway messaging, data flow, data assurance, and quality of service to support the Information Exchange Requirements to support the approved Integrated Aviation Survivability Equipment information systems Initial Capability Document, distributed electronic warfare operations, data fusion, and mission thread Information exchange Requirements across the range of military operations. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in FY 2021 is due to the zero sum realignment of funds to support the commoditization and program consolidation of the Marine Corps DI efforts.					
Title: V-22 CMV Development	19.816	45.359	29.949	0.000	29.949
Articles:	-	-	-	-	-
Description: Funding supports the implementation of an ECP to incorporate the new systems required for the CMV-22 configuration to perform the COD mission. The ECP will add (1) the capability to meet the range requirements that the COD mission demands (2) a HF radio to transmit/receive BLOS over water and (3) a PA system for use while transporting passengers. CMV-22 will begin development testing to include things such as preliminary envelope expansion, Electromagnetic Environment Effects testing , HF radio testing and begin Carrier Suitability and Integration testing. Continue CMV-22 integrated aircraft survivability equipment to include correcting deficiencies of the current EAPS, Electrical System re-design, IRS re-design, Center Console re-design, FCS re-design and Modular Avionics / Cyber Security Implementation. ***FY 2020 Plans:*** Continues funding for the V-22 CMV Development effort to perform the COD mission. Support the development of Functional Test Plans for the HF radio to transmit/receive beyond line of sight over water and the PA system. Development of the Joint Vertical Experimental Application System Software will continue. Begin					

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
the development testing for the CMV-22 with preliminary envelope expansion testing and Electromagnetic Environment Effects testing. Continue Modular Avionics software development / sustainment efforts such as Mission Computer obsolescence initiative redesign and modular software. Continue developmental efforts such as electrical system re-design, EAPS, IRS re-design and Cyber Security implementation. Continue the test instrumentation design and planning for the CMV-22 aircraft. Continue the Carrier Suitability and Integration testing and will complete developmental test risk reduction activities on the HF radio and complete Alternate Live Fire Test and Evaluation development activities. Begin Operational testing. Begin Interoperability development for additional critical capabilities such as Link-16, Mobile Users Objective System, Required Navigation Performance / Area Navigation, and secondary BLOS. ***FY 2021 Base Plans:*** Continues funding for the V-22 CMV Development effort to perform the COD mission. Support the development of Functional Test Plans for the HF radio to transmit/receive BLOS over water and the PA system. Development of the Joint Vertical Experimental Application System Software will continue. Continue the developmental testing for the CMV-22 preliminary envelope expansion and Electromagnetic Environment Effects. Continue Modular Avionics software development / sustainment efforts such as Mission Computer obsolescence initiative re-design and modular software. Continue developmental efforts such as electrical system re-design, EAPS, IRS re-design, and Cyber Security implementation. Continue the test instrumentation design and planning for the CMV-22 aircraft. Continue the Carrier Suitability and Integration testing. Continue Operational testing. Continue Interoperability development for additional critical capabilities such as Link-16, Terrain Avoidance Warning System II, Mobile Users Objective System, Mobile Expeditionary Communications System and secondary BLOS. Continue the spiral development of the Required Navigation Performance / Area Navigation capability to upgrade to full precision approach capability and coupled approach. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in FY 2021 for CMV Development is in accordance with planned program execution. Development efforts decrease as program moves into Production phase.					
Title: V-22 Aerial Refueling System Development	6.095	0.000	0.000	0.000	0.000
Articles:	-	-	-	-	-
Description: V-22 Aerial Refueling System (VARS) will provide V-22 tanker capability to the Marine Air Ground Task Force, enabling safe and efficient execution of all missions, tactical or humanitarian. The system will allow the V-22 to provide fuel to other Air Combat Element aircraft, such as F-35B, F-18, AV-8B, V-22 and CH-53E/					

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
K, while en-route, in the objective area, or during recovery, extending the operational reach/duration. With the V-22 deployed onboard, amphibious assault ships would gain an organic aerial refueling capability, maximizing response time and agility. ***FY 2020 Plans:*** Program cancelled FY20 and out. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A					
Title: V-22 Electrical System Re-design ***Articles:*** ***Description:*** Continue Electrical System re-design and reliability improvement efforts. Upgrading the V-22 electrical system reliability and capacity is required to accommodate demands on electrical power system as additional systems are added to the V-22 aircraft. This effort will design, develop, validate and verify engineering solutions to improve: (1) the CFG, (2) the VFG and (3) all associated electrical system interfaces. ***FY 2020 Plans:*** Continues Electrical System re-design and reliability improvement efforts with the design, development, validation and verification of engineering solutions to improve the V-22 GCU. ***FY 2021 Base Plans:*** Continues Electrical System re-design and reliability improvement efforts with the design, development, validation and verification of engineering solutions to improve the V-22 CFG/GCU hardware. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in FY 2021 is due to major development efforts that have been completed.	5.815 -	5.926 -	2.558 -	0.000 -	2.558 -
Title: V-22 Infrared Suppressor (IRS) Re-design ***Articles:***	0.934 -	0.000 -	0.304 -	0.000 -	0.304 -

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: IRS re-design and reliability improvement efforts masks the infrared signature of the V-22 aircraft, which increases the operational survivability. The current IRS system fails to meet reliability requirements and continues to be a readiness degrader. V-22 IRS system to include funds for the EMD and instrumented flight test of IRS system solutions. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Funding completes the development and begins the integration of the new IRS system for the V-22. The ISR system masks the infrared signature of an aircraft which increases the survivability. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2020 decrease in funding supported other higher Marine Corp priorities. FY 2021 increase is for IRS integration requirements.					
Title: V-22 Development Support, Test and Evaluation	35.406	48.499	37.747	0.000	37.747
Articles:	-	-	-	-	-
Description: Funds Government Engineering, Contractor Engineering, including Follow-On Test Evaluation (FOT&E), Developmental Test & Engineering (DT&E), and Operational Test & Evaluation (OT&E) for the V-22 flight events. Perform Government oversight. Execute test program risk reduction efforts. ***FY 2020 Plans:*** Funds provided for continued support of FOT&E, DT&E and OT&E to include flight control software, vehicle system operating software, inlet distortion, APR-39D(V)2, structural fatigue, envelope expansion, software airframe loads, Integrated Aircraft Survivability Equipment, Traffic Collision Avoidance System, Bonded Blade Tabs, V-22 Aerial Refueling System and Refueling Envelope Expansion, Tactical Training Theatre Assessment and Planning Phase III (Environmental Testing), Sea Trials, Cockpit Engine Health Indicator and CMV Developmental Test and Live Fire. ***FY 2021 Base Plans:***					

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Funds provided for continued support of FOT&E, DT&E and OT&E to include vehicle system operating software, inlet distortion, structural fatigue, envelope expansion, software airframe loads, Integrated Aircraft Survivability Equipment, Traffic Collision Avoidance System, Bonded Blade Tabs, Refueling Envelope Expansion, Sea Trials, and CMV Developmental Test and Communications upgrades. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in FY 2021 for Developmental Support, Test and Evaluation is due to the cancellation of the V-22 Aerial Refueling System program and completion of CEHI.					
Title: V-22 Open Systems Architecture / Cyber Security ***Articles:*** ***Description:*** Open System Architecture / Cyber Security provides a non-proprietary architecture focused on enhancing survivability; software and hardware modularity and maturation; rapid technology and capability insertion; obsolescence mitigation; and maturation of aircraft interfaces to support robust, Cyber-Resilient interoperability. The project also includes risk reduction and development efforts such as Modular Avionics Architecture, Cyber Security Implementation, Cyber Safe Flight Control improvements, Center Console re-design, Mission Computer Obsolescence, Control Display Unit obsolescence mitigation / upgrades, Ethernet backbone (High speed ethernet communication), distributed processing and center console improvements. Joint Avionics Reconfigurable Virtual Information System (JARVIS) is the current open system architecture effort being developed. ***FY 2020 Plans:*** Continues development efforts started under the Technology Insertion line. This effort provides new capabilities focused on enhancing survivability; software and hardware modularity and maturation of aircraft interfaces to support Cyber-Resilient Interoperability. Also includes risk reduction and development efforts such as Modular Avionics / Cyber Security Implementation, Cyber / Safe Flight Control Improvements and Center Console Redesign. ***FY 2021 Base Plans:*** Continues requirement analysis, integration studies, risk reduction and developmental efforts for Modular Avionics Architecture, Control Display Unit obsolescence mitigation and Ethernet backbone. Joint Avionics	0.000 -	11.193 -	11.529 -	0.000 -	11.529 -

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Reconfigurable Virtual Information System (JARVIS) is the current open system architecture effort being developed. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in FY 2021 for Open Systems Architecture / Cyber Security supports the additional developmental requirements for the JARVIS single board computer modules.					
Title: V-22 Degraded Visual Envir / Helmet Mounted Display (DVE / HMD ***Articles:*** ***Description:*** The V-22 Digital HMD will reduce heads down time and provide better situational awareness and crew coordination to improve safety in DVE. A digital HMD is required to provide host power and digital video interface for the Enhanced Visual Acuity (EVA) system being developed. ***FY 2020 Plans:*** FY20 continues Degraded Visual Environment developmental efforts to improve safety when landing in obscured tactical zones. ***FY 2021 Base Plans:*** FY21 continues DVE developmental efforts to improve safety when landing in obscured tactical zones and will include requirements analysis, risk reduction and developmental efforts for the digital HMD and EVA interfaces. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in FY 2021 for DVE / HMD is due to the Longwave Infrared camera requirements being deferred.	0.000 -	8.486 -	5.385 -	0.000 -	5.385 -
Accomplishments/Planned Programs Subtotals	131.363	177.885	118.475	0.000	118.475

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 0164: *V-22*	1,157.717	1,266.314	960.876	-	960.876	1,284.970	75.520	127.424	0.000	711.714	35,591.634
• APN 0590: *V-22 Series*	178.838	325.367	334.405	-	334.405	377.405	562.100	582.833	498.498	3,695.658	8,154.842

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

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 0605/J0164: *V-22 Inital Spares*	3.914	2.523	3.328	-	3.328	2.136	3.821	0.000	0.000	377.899	393.621
• RDTE 1160403BB: *CV-22 Special Operations, Aviation Systems*	22.344	28.081	10.093	-	10.093	9.634	17.942	18.360	0.000	0.000	139.296
• RDTE BA07 0401318F: *CV-22 USAF BA07*	15.981	17.906	18.419	-	18.419	17.447	17.427	17.703	15.997	25.948	262.568

Remarks

D. Acquisition Strategy

The V-22 is a post Milestone III ACAT-IC program. As a result of mishaps during and subsequent to V-22 Operational Evaluation (Apr and Dec 00), the program was restructured employing a phased approach to return to flight and tactical introduction. The Contractor and Government defined deficient areas within the program/ aircraft requiring correction prior to return to flight. A Block Upgrade approach was planned, with required efforts identified in Block "A", "B", and "C". Block "A" included those efforts necessary to return the V-22 to safe and operational fleet operations. Block "B" included those efforts necessary to improve the effectiveness and suitability of the aircraft. Block "C" includes mission enhancements like weather radar, cabin effectiveness suitability improvements, i.e., Environmental Control System, and Forward Firing ALE-47. Non-recurring development activities are to be initiated and completed for all efforts identified in Block "A", "B", and "C". The Contractor will develop specific Statements of Work and Preliminary Specification Change Notices required to integrate the Block Upgrade efforts into the baseline Program. A Systems Requirements Review, Initial Design Review, and Final Design Review was held for each of the Block efforts so the design maturity could be reviewed and the Government could redirect activities as appropriate. The CV-22 EMD program is also structured in Blocks to define an evolutionary approach to achieving full operational capability. Block "0" is the initial baseline CV-22 variant. Block "10" enhances mission capability with the addition of terrain following radar, additional fuel tanks, additional radios, and Block "20" includes capabilities such as radio frequency and infrared countermeasures improvements. Additional Blocks are in the planning stages to continue the growth process throughout the operational life of the weapon system. The CMV-22 will add (1) the capability to meet the range requirements that the COD mission demands (2) a HF radio to transmit/receive BLOS over water and (3) a PA system for use while transporting passengers in support of the COD mission.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604262N / *V-22A*	Project (Number/Name) 1425 / *V-22*

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
V-22 Hardware Dev Airframe	Various	Various : Various	115.907	35.242	Jan 2019	28.029	Jan 2020	28.784	Jan 2021	-		28.784	119.132	327.094	-
V-22 Hardware Dev Propulsion	SS/CPIF	Rolls-Royce Corp. : Indianapolis, IN	197.312	1.362	Nov 2018	2.139	Nov 2019	2.219	Nov 2020	-		2.219	2.125	205.157	205.157
V-22 Digital Interoperability	Various	Various : Various	31.206	26.693	Mar 2019	28.254	Mar 2020	0.000		-		0.000	0.000	86.153	-
V-22 CMV Development	Various	Various : Various	133.920	19.816	Jan 2019	45.359	Jan 2020	29.949	Jan 2021	-		29.949	27.994	257.038	-
V-22 Aerial Refueling System Development	SS/CPIF	Bell Boeing : Ridley Park, PA	54.918	6.095	Dec 2018	0.000		0.000		-		0.000	0.000	61.013	61.013
V-22 Electrical System Re-Design	SS/FFP	Hamilton Sundstrand Corp : Rockford, IL	0.973	5.815	Mar 2019	5.926	Mar 2020	2.558	Mar 2021	-		2.558	0.000	15.272	15.272
V-22 IRS Re-design	SS/CPFF	Honeywell : Tempe, AZ	3.959	0.934	May 2019	0.000		0.304	May 2021	-		0.304	0.000	5.197	5.197
V-22 Open Systems Architecture / Cyber Security	Various	Various : Various	0.000	0.000		11.193	Mar 2020	11.529	Mar 2021	-		11.529	84.290	107.012	-
V-22 Degraded Visual Environment / Helmet Mounted Display	C/CPIF	Various : Various	0.000	0.000		8.486	Mar 2020	5.385	Jul 2021	-		5.385	41.979	55.850	55.850
Prior year Prod Dev no longer funded in FYDP	Various	Various : Various	5,149.247	0.000		0.000		0.000		-		0.000	0.000	5,149.247	5,147.522
		Subtotal	5,687.442	95.957		129.386		80.728		-		80.728	275.520	6,269.033	N/A

Remarks

Hardware Development: Increase supports Primary Lightning Control Unit Re-design due to obsolescence. Hardware Development Propulsion: Increase due to contracted costs of necessary flight/engine hours for the design, development, validation and verification of the V-22 propulsion and power systems at the Patuxent River squadron. DI: Decrease due to the zero sum realignment of funds to PMA 209 to support the commoditization and program consolidation of the Marine Corps DI efforts. IRS Redesign: Increase due to IRS integration. Open Systems Architecture: Increase due to additional development requirements for the Joint Avionics Reconfigurable Virtual Information System single board computer modules.

FY 2019 funding does not reflect the enacted rescission amount of $28.651 Million.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604262N / *V-22A*	Project (Number/Name) 1425 / *V-22*	

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
V-22 MV Govt Engineering Sppt	WR	Various : Pax River, MD	1,115.753	5.346	Nov 2018	3.066	Nov 2019	3.487	Nov 2020	-		3.487	20.915	1,148.567	-
V-22 CMV Govt Engineering Sppt	WR	Various : Pax River, MD	10.699	9.701	Nov 2018	9.797	Nov 2019	4.979	Nov 2020	-		4.979	13.527	48.703	-
Prior Year Support no longer funded in the FYDP	Various	Various : Various	189.718	0.000		0.000		0.000		-		0.000	0.000	189.718	-
		Subtotal	1,316.170	15.047		12.863		8.466		-		8.466	34.442	1,386.988	N/A

Remarks

MV Government Engineering Support: Increases due to NWCF Rate Adjustments.
CMV Government Engineering Support: The CMV program is leveraging Government Engineering Support as the lead system integrator for Link-16, secondary BLOS and Mobile Expeditionary Communications Systems.

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
V-22 Dev Test & Evaluation	WR	NAWCAD : Pax River, MD	1,066.918	8.600	Nov 2018	16.563	Nov 2019	16.894	Nov 2020	-		16.894	48.935	1,157.910	-
V-22 Operational Test & Evaluation	WR	OT&E Force : Norfolk, VA	61.957	2.584	Dec 2018	2.771	Dec 2019	2.826	Dec 2020	-		2.826	23.006	93.144	-
V-22 CMV Dev Test & Evaluation	WR	NAWCAD : Pax River, MD	3.900	2.400	Nov 2018	12.800	Nov 2019	5.000	Nov 2020	-		5.000	25.280	49.380	-
V-22 CMV Operational Test & Evaluation	WR	OT&E Force : Norfolk, VA	0.000	2.357	Dec 2018	1.000	Dec 2019	2.000	Dec 2020	-		2.000	0.000	5.357	-
Prior Year T & E no longer funded in the FYDP	Various	Various : Various	48.200	0.000		0.000		0.000		-		0.000	0.000	48.200	-
		Subtotal	1,180.975	15.941		33.134		26.720		-		26.720	97.221	1,353.991	N/A

Remarks

Development Test & Evaluation: Increase due to inflation. Operational Test & Evaluation: Increase due to inflation. CMV OT&E: Increase completes OT&E testing efforts including Flight Hours, manpower, evaluations and report writing.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

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
V-22 Engineering Tech Sppt	Various	Various : Various	1,048.213	0.991	Dec 2018	0.272	Dec 2019	0.737	Dec 2020	-		0.737	6.361	1,056.574	-
V-22 Management Sppt Svc	Various	Various : Various	158.461	0.233	Jan 2019	0.716	Jan 2020	0.280	Jan 2021	-		0.280	7.429	167.119	-
V-22 Program Mgmt Support	WR	NAWCAD : Pax River, MD	63.567	2.928	Nov 2018	0.839	Nov 2019	0.856	Nov 2020	-		0.856	9.352	77.542	-
V-22 Travel	WR	Various : Various	17.042	0.166	Sep 2019	0.185	Sep 2020	0.185	Sep 2021	-		0.185	2.500	20.078	-
V-22 CMV Travel	WR	Various : Various	0.131	0.100	Sep 2019	0.060	Sep 2020	0.060	Sep 2021	-		0.060	0.140	0.491	-
V-22 CMV Engineering Tech Sppt	Various	Various : Various	0.469	0.000	Jan 2019	0.430	Jan 2020	0.443	Jan 2021	-		0.443	1.440	2.782	-
Prior Year Mgmt Svcs no longer funded in the FYDP	Various	Various : Various	41.087	0.000		0.000		0.000		-		0.000	0.000	41.087	-
		Subtotal	1,328.970	4.418		2.502		2.561		-		2.561	27.222	1,365.673	N/A

Remarks

MV ETS and MSS: Costs in FY21 updated to correctly align funding based on actual execution. No increase in total ETS/MSS support. Program Management Support: Increase due to inflation. CMV Engineering Technical Support: Increase due to inflation.

	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	9,513.557	131.363		177.885		118.475		-		118.475	434.405	10,375.685	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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

Hardware Development

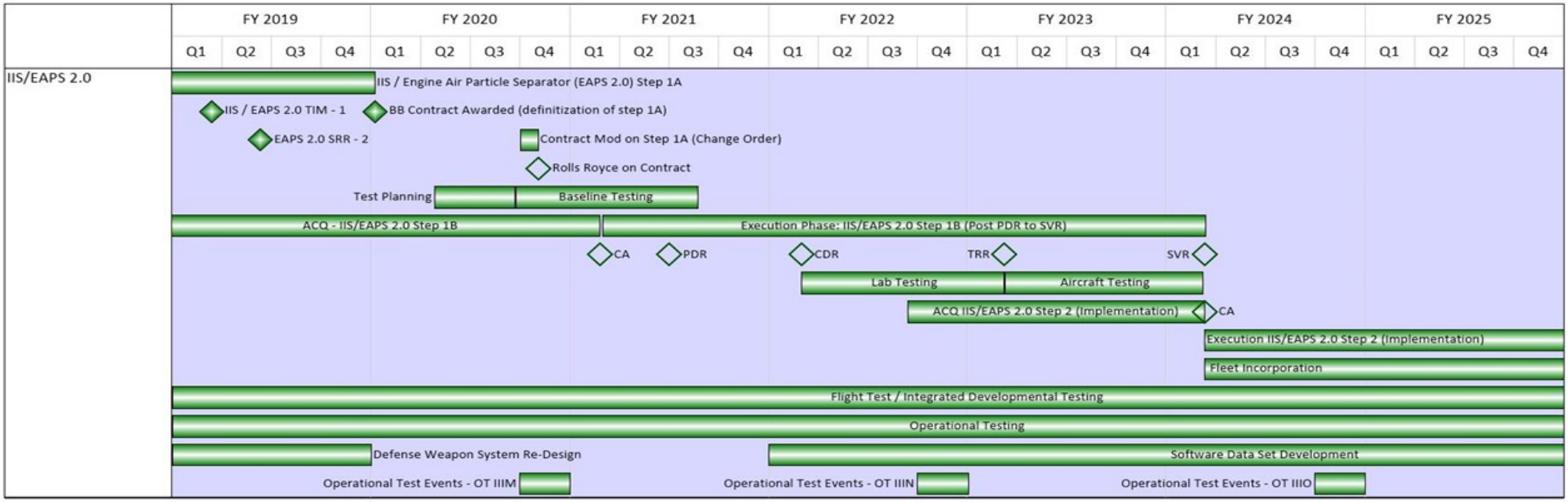

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

Digital Interoperability (MANGL)

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

CMV Devlopment

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

VARS

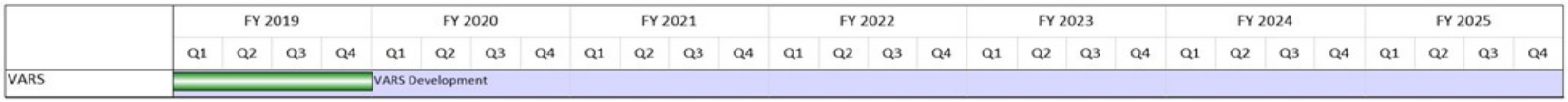

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

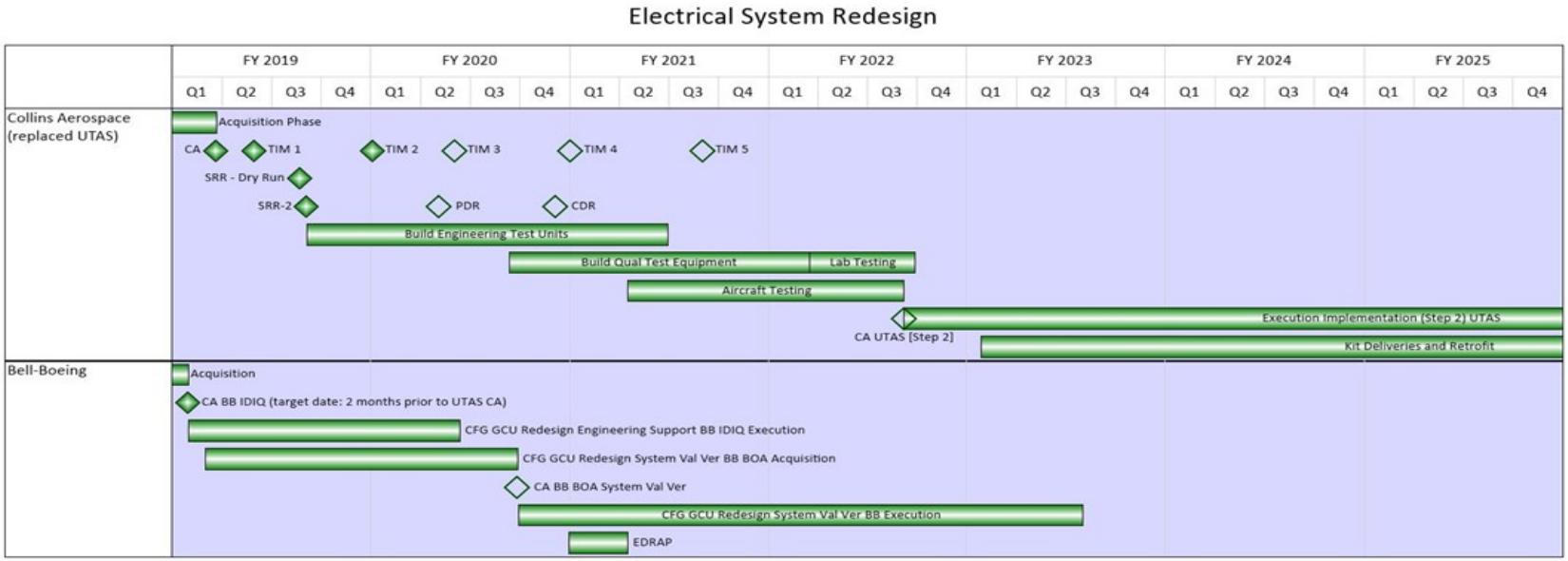

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

Infrared Suppressor Redesign

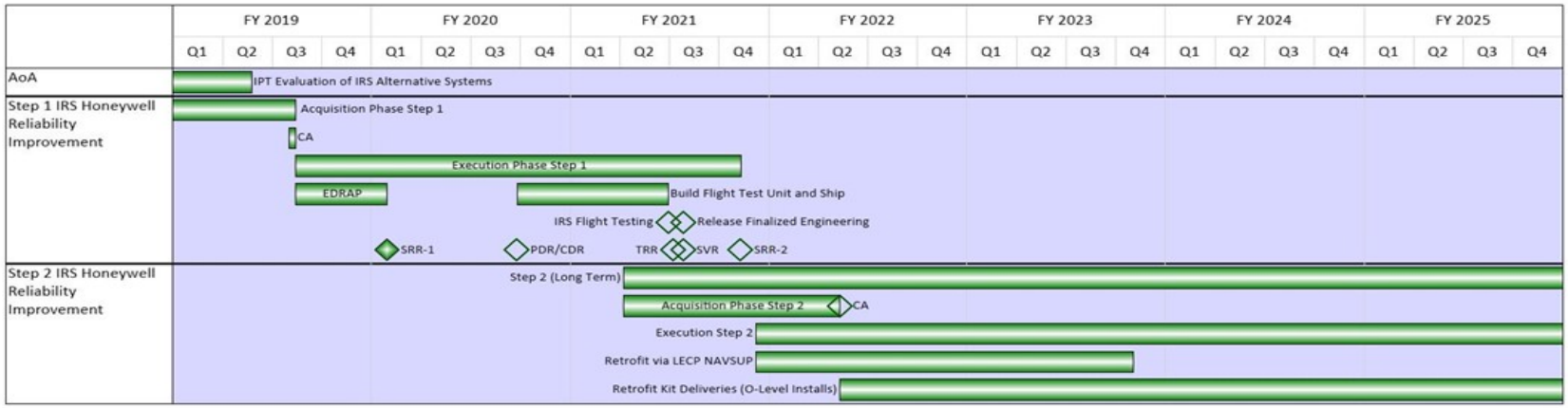

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

Open Systems Architecture / Cyber Security

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

HMD Degraded Visual Environment Development

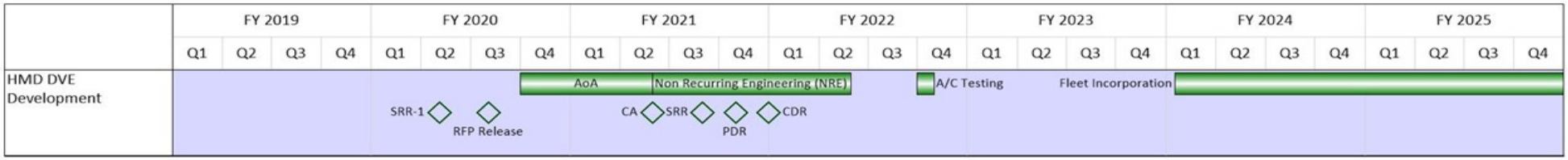

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
V-22 Hardware Development				
Reviews: Reviews: Systems Requirements Review - #2	2	2019	2	2019
Reviews: Reviews: Program Design Review	2	2021	2	2021
Reviews: Reviews: Critical Design Review	1	2022	1	2022
Reviews: Reviews: Test Readiness Review	1	2023	1	2023
Reviews: Reviews: System Verification Review	1	2024	1	2024
Test & Evaluation: Development Test: Development Flight Test / Integrated Test (IT-IIID)	1	2019	4	2025
Test & Evaluation: Development Test: Lab Testing	1	2022	1	2023
Test & Evaluation: Development Test: Aircraft Testing	1	2023	1	2024
Test & Evaluation: Operational Evaluation: Operational Testing	1	2019	4	2025
Test & Evaluation: Operational Test Events: Operational Testing (OT-IIIM)	4	2020	4	2020
Test & Evaluation: Operational Test Events: Operational Testing (OT-IIIN)	4	2022	4	2022
Test & Evaluation: Operational Test Events: Operational Testing (OT-IIIO)	4	2024	4	2024
V-22 Digital Interoperability (DI)				
Test & Evaluation: SRP Bench Test	2	2019	4	2019
V-22 CMV Development				
Reviews: Reviews: Initial Operational Capability	4	2021	4	2021
Reviews: Reviews: Physical Configuration Audit	1	2020	1	2020
Test & Evaluation: Development Test: Developmental Test (DT)	2	2020	4	2022
Test & Evaluation: Operational Evaluation: Live Fire Event	3	2019	3	2019
Test & Evaluation: Operational Evaluation: Operational Test (OT)	4	2020	1	2021
Test & Evaluation: Operational Evaluation: Follow-On Operational Test and Evaluation	1	2023	4	2023

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Production Milestones: Contract Awards: Lot 23 APN MV22 CMV Qty 11	1	2019	1	2019
Production Milestones: Contract Awards: Lot 24 APN MV22 CMV Qty 10	1	2020	1	2020
Production Milestones: Contract Awards: Lot 25 APN MV22 CMV Qty 6	1	2021	1	2021
Production Milestones: Contract Awards: Lot 26 APN MV22 CMV Qty 7	1	2022	1	2022
Production Milestones: Production Deliveries: Lot 23 APN CMV Qty 11	1	2021	4	2021
Production Milestones: Production Deliveries: Lot 24 APN CMV Qty 10	2	2022	4	2022
Production Milestones: Production Deliveries: Lot 25 APN CMV Qty 6	2	2023	4	2023
Production Milestones: Production Deliveries: Lot 26 APN CMV Qty 7	2	2024	4	2024
V-22 Electrical System Re-design				
Reviews: Collins Aerospace: Collins System Requirements Review #2	3	2019	3	2019
Reviews: Collins Aerospace: Collins Preliminary Design Review	2	2020	2	2020
Reviews: Collins Aerospace: Collins Critical Design Review	4	2020	4	2020
Test & Evaluation: Collins Aerospace: Collins Lab Testing	1	2022	3	2022
Test & Evaluation: Collins Aerospace: Collins Aircraft Testing	2	2021	3	2022
Production Milestones: Collins Aerospace: Collins Kit Deliveries	1	2023	4	2025
V-22 Infrared Suppressor (IRS) Re-design				
Reviews: Systems Requirements Review #1	1	2020	1	2020
Reviews: Preliminary Design Review / Critical Design Review	3	2020	3	2020
Reviews: Test Readiness Review	3	2021	3	2021
Reviews: System Verification Review	3	2021	3	2021
Reviews: Systems Requirements Review #2	4	2021	4	2021
Test & Evaluation: Flight Test	3	2021	3	2021
Production Milestones: Retrofit Kit Deliveries	2	2022	4	2025
V-22 Open System Architecture / Cyber Security				
Reviews: Preliminary Design Review	1	2020	1	2020
Reviews: Critical Design Review	2	2020	2	2020

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 0604262N / *V-22A*	**Project (Number/Name)** 1425 / *V-22*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Reviews: Test Readiness Review	4	2020	4	2020
Reviews: Functional Configuration Audit	1	2021	1	2021
Reviews: Production Readiness Review	1	2021	1	2021
Reviews: Physical Configuration Audit	4	2021	4	2021
Test & Evaluation: Qualification Lab Testing	3	2020	3	2022
Test & Evaluation: Flight Test	4	2022	2	2023
Production Milestones: Retrofit Kit Delivery	1	2024	4	2025
V-22 Degraded Visual Environment / Helmet Mounted Display Development				
Reviews: Systems Requirements Review	2	2020	2	2020
Reviews: Systems Requirements Review 2	3	2021	3	2021
Reviews: Preliminary Design Review	4	2021	4	2021
Reviews: Critical Design Review	1	2022	1	2022
Test & Evaluation: Flight Test	4	2022	4	2022
Production Milestones: Fleet Incorporation	1	2024	4	2025

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 0604262N / *V-22A*	Project (Number/Name) 3090 / *V-22 Improvement Program*	

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
3090: *V-22 Improvement Program*	0.000	0.000	0.000	14.149	-	14.149	39.729	35.624	9.906	92.138	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The V-22 Osprey provides a dual-piloted, multi-engine, Vertical/Short Takeoff and Landing (V/STOL), medium lift aircraft for worldwide combat, combat support, combat service support, and Special Operations missions. V-22 Product Improvements addresses requirements necessary to meet the aircraft capabilities specified in the approved Capability Development Document. Efforts included in this Project provide near and long-term improvements to the fleet, addressing deficiencies, systems safety, obsolescence, readiness, reliability, supportability, and relevance in any designated battlespace. Efforts include hardware and software development associated with increased performance capability, avionics upgrades and improvements, increased system processing capability, and the integration with other organic and non-organic systems.

FY21 funds Flight Control System(FCS) Re-design, which will address obsolescence issues, mitigate deficiencies and provide improved capabilities through hardware and software upgrades.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: V-22 Flight Control System Re-Design	0.000	0.000	14.149	0.000	14.149
Articles:	-	-	-	-	-
Description: The FCS will address obsolescence issues, mitigate deficiencies and provide improved capabilities through hardware and software upgrades. Correct critical Reliability and Maintainability issues to increase mission effectiveness, provide additional safety and improve readiness.					
FY 2020 Plans: N/A					
FY 2021 Base Plans: Continue development efforts started under the Hardware Development line. Continue hardware and software architecture upgrades to mitigate obsolescence and throughput constraints such as Flight Control Computer, Cockpit Interface Unit, and Flight Test Interface Panel. Upgrade software language to the Cross Channel Data Link and Flight Control Computer Operational Flight Program.					
FY 2021 OCO Plans:					

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 0604262N / *V-22A*	**Project (Number/Name)** 3090 / *V-22 Improvement Program*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 is the start of the FCS re-design effort under PU 3090. FCS was previously funded under PU 1425.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	14.149	0.000	14.149

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 0164: *V-22*	1,157.717	1,266.314	960.876	-	960.876	1,284.970	75.520	127.424	0.000	711.714	35,591.634
• APN 0590: *V-22 Series*	178.838	325.367	334.405	-	334.405	377.405	562.100	582.833	498.498	3,695.658	8,154.842
• APN 0605/J0164: *V-22 Initial Spares*	3.914	2.523	3.328	-	3.328	2.136	3.821	0.000	0.000	377.899	393.621
• RDTE 1160403BB: *CV-22 Special Operations, Aviation Systems*	22.344	28.081	10.093	-	10.093	9.634	17.942	18.360	0.000	0.000	106.454
• RDTE BA07 0401318F: *CV-22 USAF BA07*	16.502	17.906	18.447	-	18.447	17.473	17.453	17.732	16.022	25.948	263.223

Remarks

D. Acquisition Strategy

V-22 Product Improvements will include design and engineering studies, cost-benefit analyses, and risk-reduction efforts to address improvements for readiness, aircraft capability, safety, component reliability, maintainability, software, and obsolescence.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 5	R-1 Program Element (Number/Name) PE 0604262N / *V-22A*	Project (Number/Name) 3090 / *V-22 Improvement Program*	

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
V-22 Flight Control System Re-Design	SS/BOA	Bell Boeing : Ridley Park, PA	0.000	0.000		0.000		13.206	Jun 2021	-		13.206	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		13.206		-		13.206	Continuing	Continuing	N/A

Remarks

PU 3090 is a new start in FY 21.

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
V-22 Gov't Engineering Support	WR	NAWCAD : Pax River, MD	0.000	0.000		0.000		0.682	Nov 2020	-		0.682	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		0.682		-		0.682	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
V-22 Program Mgmt Support	WR	NAWCAD : Pax River, MD	0.000	0.000		0.000		0.251	Nov 2020	-		0.251	Continuing	Continuing	Continuing
V-22 Travel	WR	Various : Various	0.000	0.000		0.000		0.010	Sep 2021	-		0.010	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		0.261		-		0.261	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		14.149		-		14.149	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 0604262N / *V-22A*	**Project (Number/Name)** 3090 / *V-22 Improvement Program*

Flight Control System Redesign

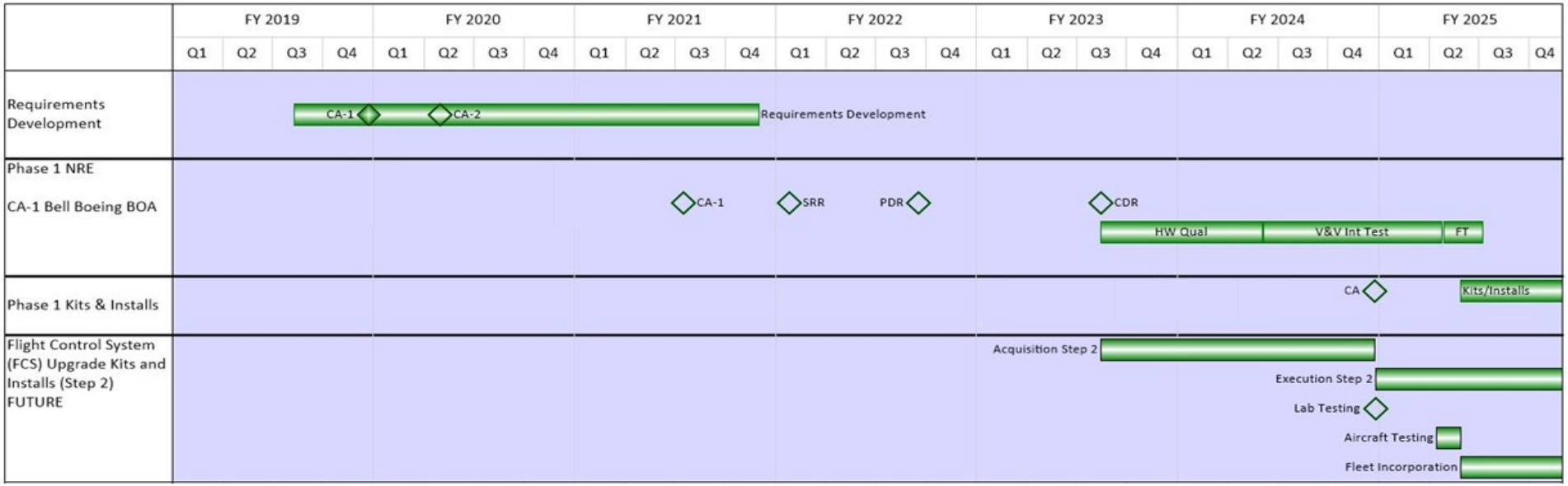

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 3090 / *V-22 Improvement Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Flight Control System Re-Design				
Reviews: System Requirements Review	1	2022	1	2022
Reviews: Preliminary Design Review	3	2022	3	2022
Reviews: Critical Design Review	3	2023	3	2023
Test & Evaluation: V&V Int Testing	2	2024	2	2025
Test & Evaluation: Flight Test	2	2025	2	2025
Test & Evaluation: Lab Testing	4	2024	4	2024
Test & Evaluation: Aircraft Testing	2	2025	2	2025
Production Milestones: Retrofit Kit Delivery	2	2025	4	2025

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 0604262N / *V-22A*	Project (Number/Name) 9999 / *Congressional Adds*	

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
9999: *Congressional Adds*	0.000	0.000	13.350	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	13.350
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The V-22 Osprey is an Acquisition Category IC Joint Program led by the Department of the Navy for the purpose of developing, testing, evaluating, procuring and fielding a tilt rotor, vertical takeoff and landing aircraft for Joint Service application. The V-22 program is designed to provide an aircraft to meet the amphibious/vertical assault needs of the Marine Corps, the Carrier Onboard Delivery (COD) needs of the Navy, and the special operations needs of the Air Force and the United States Special Operations Command (USSOCOM). The V-22 is replacing the CH-46E in the Marine Corps with the MV-22; will supplement the H-60 in the Navy with the MV-22; and replace the MH-53J and MH-53M as well as augment the C-130 in the Air Force and USSOCOM with the CV-22. The V-22 is capable of flying over 2,100 nautical miles, with a single refueling, giving the services the advantage of a Vertical/Short Take-off and Landing aircraft that can rapidly self-deploy to any location in the world. This program is funded under Engineering Manufacturing and Development (EMD) for correction of deficiencies and includes Block A and Block B upgrades which encompassed engineering and manufacturing development of new end-items prior to the production incorporation decision as well as Block C suitability and effectiveness development upgrades. Capability Development Document interoperability requirements were addressed through a spiral upgrade acquisition strategy. It was the first spiral providing Key Enabling Department of Defense mandated open systems architecture upgrades for the mission computer hardware and software while simultaneously addressing required interoperability common avionics upgrades and current avionics obsolescence issues. Future development efforts will include Pre-Planned-Product-Improvements in the Capability Development Document and Re-design efforts to correct critical Reliability, Maintainability and Availability issues in support of readiness Operational Safety Improvement Program as prioritized by the United States Marine Corps or a Urgent Universal Needs Statement.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020
Congressional Add: Common Lightweight Cargo System ***FY 2019 Accomplishments:*** N/A ***FY 2020 Plans:*** Design and develop the lightweight cargo system Integrated Ballistic Protection System	0.000	8.350
Congressional Add: Active vibration control system ***FY 2019 Accomplishments:*** N/A ***FY 2020 Plans:*** Funding for the AVCS will mature both the Circular Force Generators (CFG) technology for the tilt-rotor application and develop the architecture for optimal space, weight, and power required for best value to the fleet with the intent of returning to flight test with a mature product that can support budget requests for implementation	0.000	5.000
Congressional Adds Subtotals	0.000	13.350

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 0604262N / *V-22A*	**Project (Number/Name)** 9999 / *Congressional Adds*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The V-22 is a post Milestone III ACAT-IC program. As a result of mishaps during and subsequent to V-22 Operational Evaluation (Apr and Dec 00), the program was restructured employing a phased approach to return to flight and tactical introduction. The Contractor and Government defined deficient areas within the program/ aircraft requiring correction prior to return to flight. A Block Upgrade approach was planned, with required efforts identified in Block "A", "B", and "C". Block "A" included those efforts necessary to return the V-22 to safe and operational fleet operations. Block "B" included those efforts necessary to improve the effectiveness and suitability of the aircraft. Block "C" includes mission enhancements like weather radar, cabin effectiveness suitability improvements, i.e., Environmental Control System, and Forward Firing ALE-47. Non-recurring development activities are to be initiated and completed for all efforts identified in Block "A", "B", and "C". The Contractor will develop specific Statements of Work and Preliminary Specification Change Notices required to integrate the Block Upgrade efforts into the baseline Program. A Systems Requirements Review, Initial Design Review, and Final Design Review was held for each of the Block efforts so the design maturity could be reviewed and the Government could redirect activities as appropriate. The CV-22 EMD program is also structured in Blocks to define an evolutionary approach to achieving full operational capability. Block "0" is the initial baseline CV-22 variant. Block "10" enhances mission capability with the addition of terrain following radar, additional fuel tanks, additional radios, and Block "20" includes capabilities such as radio frequency and infrared countermeasures improvements. Additional Blocks are in the planning stages to continue the growth process throughout the operational life of the weapon system. The CMV-22 will add (1) the capability to meet the range requirements that the COD mission demands (2) a HF radio to transmit/receive BLOS over water and (3) a PA system for use while transporting passengers in support of the COD mission.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 9999 / *Congressional Adds*

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
Common Lightweight Cargo System	SS/FFP	Collins Aerospace : Charlotte, NC	0.000	0.000		8.350	Jun 2020	0.000		-		0.000	0.000	8.350	8.350
Active Vibration Control System	SS/FFP	Bell Helicopter : Fort Worth, TX	0.000	0.000		5.000	Aug 2020	0.000		-		0.000	0.000	5.000	5.000
		Subtotal	0.000	0.000		13.350		0.000		-		0.000	0.000	13.350	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	0.000	0.000		13.350		0.000		-		0.000	0.000	13.350	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 0604262N / *V-22A*	**Project (Number/Name)** 9999 / *Congressional Adds*

Common Lightweight Cargo System

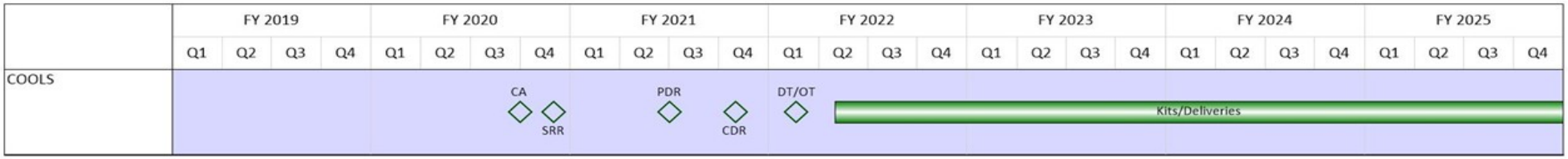

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 9999 / *Congressional Adds*

Active Vibration Control System

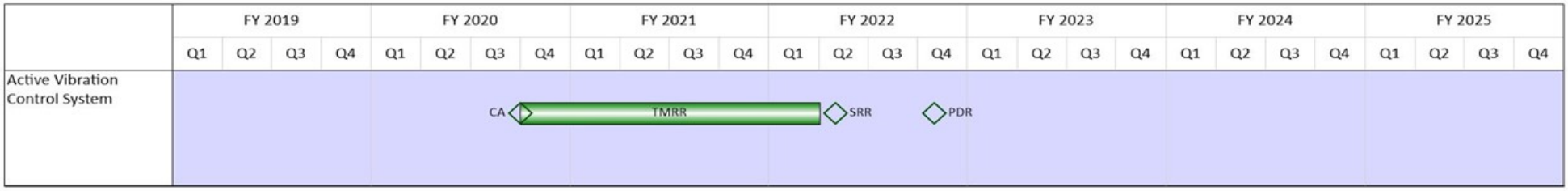

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 5	**R-1 Program Element (Number/Name)** PE 0604262N / *V-22A*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Common Lightweight Cargo System				
Reviews: System Requirements Review	4	2020	4	2020
Reviews: Preliminary Design Review	3	2021	3	2021
Reviews: Critical Design Review	4	2021	4	2021
Test & Evaluation: Developmental Test / Operational Test	1	2022	1	2022
Production Milestones: Kits / Deliveries	2	2022	4	2025
Active Vibration Control System				
Reviews: System Requirements Review	2	2022	2	2022
Reviews: Preliminary Design Review	4	2022	4	2022