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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604112N / <i>GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80</i>
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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	308.708	81.021	105.756	107.895	-	107.895	98.817	39.537	43.135	24.410	Continuing	Continuing
2208: <i>CVN 21</i>	223.164	24.826	88.276	103.702	-	103.702	98.817	39.537	43.135	24.410	Continuing	Continuing
4004: <i>EMALS</i>	85.544	32.076	17.480	4.193	-	4.193	0.000	0.000	0.000	0.000	0.000	139.293
9999: <i>Congressional Adds</i>	0.000	24.119	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.119

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 223

A. Mission Description and Budget Item Justification

The FY 2021 funding request was reduced by \$1.450M to account for the availability of prior year execution balances.

This Navy program addresses unique technologies on Ford Class carriers. The program includes:

- (2208) - Development of ship hull, mechanical, propulsion, electrical, aviation, and combat support systems, subsystems and components to significantly improve aircraft carrier affordability, manpower requirements, survivability, and operational capabilities, and to meet the requirements of existing and pending regulations and statutes critical to the operation of existing and future aircraft carriers.

- (4004) - Development of an advanced technology aircraft launch system in support of the CVN 78 Class design and construction schedule. The Electro Magnetic Aircraft Launch System (EMALS) will replace the current steam catapult on CVN 78 Class ships. EMALS provides better control of applied forces, both peak and transient dynamic, improved reliability and maintainability, increased operational availability and reduced operator and maintainer workload.

This Program Element (PE) and associated projects represent a continuation of efforts previously funded under PE 0603512N projects 2208 and 4004 in FY 2014 and earlier.

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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	83.121	121.310	99.418	-	99.418
Current President's Budget	81.021	105.756	107.895	-	107.895
Total Adjustments	-2.100	-15.554	8.477	-	8.477
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-15.554			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.100	0.000			
• Program Adjustments	0.000	0.000	8.250	-	8.250
• Rate/Misc Adjustments	0.000	0.000	0.227	-	0.227

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 9999: *Congressional Adds*

Congressional Add: *CVN 78 Full Ship Shock Trial*

Congressional Add Subtotals for Project: 9999

Congressional Add Totals for all Projects

	FY 2019	FY 2020
	24.119	0.000
	24.119	0.000
	24.119	0.000

Change Summary Explanation

FY21 - PROJ 2208 CVN 21: Addition of Full Ship Shock Trials (FSST) (+23.3M)

FY21 - PROJ 2208 CVN 21: Program Adjustments (-13.6M)

FY21 - PROJ 2208 CVN 21: Reduction to Account for the Availability of Prior Year Execution Balances (-1.45M)

Schedule:

4004 EMALS

-Added CVN 78 events

-Added CVN 79 Events and Production Milestones

- CVN EMALS Production Complete in 2Q FY 2021

- CVN 79 EMALS Deadload Events from 4Q FY 2020 through 1Q FY 2022

-CVN 79 Preliminary Acceptance in 3Q FY 2022

-Added Aircraft Launch bulletin in 1Q FY 2020

-Training Development end date moved from FY 2020 to 3Q FY 2021 with Ready for Training (RFT) in 3Q FY 2020

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<ul style="list-style-type: none">-Depot Planning/Logistics Development end date moved from 4Q FY 2021 to 1Q FY 2022- IT&E-Correction of Deficiencies end date moved from 2Q FY 2019 to 2Q 2021-Reliability Deadloads moved from 3Q FY 2018 - 2Q FY 2019 to 2Q FY 2019 - 2Q FY 2021-Power Conditioning Sub-System (PCS)/ Launch Control Sub-System (LCS) Environmental Qualification Test (EQT) moved from 1Q FY 2018-4Q FY 2019 to 2Q FY2019 - 2Q FY 2021		

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 2208 / CVN 21
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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
2208: CVN 21	223.164	24.826	88.276	103.702	-	103.702	98.817	39.537	43.135	24.410	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 223

A. Mission Description and Budget Item Justification

This project provides for the development of aircraft carrier specific technologies, the infusion of the ship technology base into existing and future aircraft carriers, and the potential realization of subsystem design capabilities not currently feasible. This project transitions the most promising technologies from the Navy technology base, other government laboratories, and the private sector into specific advanced development efforts. All systems developed in this project have the potential to support emerging requirements and other promising systems technologies for insertion into new aircraft carrier designs. The emphasis is directed toward developing ship hull, mechanical, propulsion, electrical, aviation, warfare systems, and combat support systems, sub-systems and components to significantly improve aircraft carrier affordability, manpower requirements, survivability, and operational capabilities and to meet the requirements of existing and pending regulations and statutes critical to the operation of future aircraft carriers. This project also encompasses those tasks required to support CVN 78 procurement, including, but not limited to engineering support, programmatic and program support, logistics support, modeling and simulation, test and evaluation, manpower and program related studies, and design support systems, such as the Integrated Digital Environment (IDE).

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: CVN 78 Class Advanced Technology Design & Development	11.394	14.767	1.425	0.000	1.425
Articles:	-	-	-	-	-
Description: CVN 78 Class Advanced Technology Design & Development - Continue development and transition of technologies to support CVN 78 Class Key Performance Parameters (KPPs): maintain sortie generation rate, reductions in manpower, and further recovery of weight and stability service life margins. Continue design activities to integrate the new technologies, such as the new propulsion plant and Electromagnetic Aircraft Launch System into the ship. Complete shock qualification for components of all CVN 78 systems.					
FY 2020 Plans: Cyber-security: Continue developing CVN 78 cyber-security processes, requirements and solutions. Continue development efforts necessary to implement the Defense in Depth Functional Implementation Architecture standard, increasing CVN 78's survivability in a cyber-contested environment. Develop and maintain certification and accreditation packages for system support.					
FY 2021 Base Plans:					

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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
<p>Cyber-security: Continue the development and maintenance of certification and accreditation packages for system support. Continue to update and maintain the CVN 78 Network Topology. Continue planning for Operational Cybersecurity testing. Continue developing physical and logical disconnect procedures for Contractor Furnished Equipment (CFE) and Government Furnished Equipment (GFE) systems under various operating conditions. Begin planning the NAVSEA Red Team cyber survivability assessment of cybersecurity attributes against mission areas.</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Decrease due to reprioritization of funds by the Department; reductions were spread between Advanced Technology Design & Development and Test & Evaluation.</p>					
<p>Title: CVN 21 - Test & Evaluation (T&E)</p> <p align="right">Articles:</p> <p>FY 2020 Plans: Continue Post-Delivery Test & Trials (PDT&T), Consolidated Test Working Group (CTWG) and Carrier Integrated Test Team (CITT) efforts in support of DT/IT-5 testing. The test events scheduled for Developmental Test (DT)/Integrated Test (IT)-5 in FY 20 include continuing Dual Band Radar (DBR) shipboard engineering and developmental testing; platform-level combat systems interoperability testing; platform-level C4I interoperability testing; Combat Systems Ship Qualification Trial (CSSQT); structural test firings of Evolved Sea Sparrow Missile and Rolling Airframe Missile; Radar Cross Section and infrared measurements; degaussing and de-perming; cyber-security inspection; platform-level Hull, Mechanical and Electrical interoperability testing; platform-level aviation systems interoperability testing; and aircraft compatibility testing. Continue planning of Operational Testing (OT), to include Operational Test Phase C1 (OT-C1) and OT-C2 test events. Continue to collect reliability data on new and legacy systems. Continue to monitor corrective actions and track installation and performance on ship. Conduct system cyber vulnerability analysis; develop mitigations and solutions to address discovered vulnerabilities and known cyber-security risks. Conduct development and planning to support cyber-survivability testing during Initial Operational Test & Evaluation.</p> <p>FY 2021 Base Plans: Continue PDT&T, CTWG, and CITT efforts in support of the completion of DT/IT-5 testing. FY 21 activities will include: execution of the Combat Systems Operational Rehearsal Event (CSORE) Phase I, planning of CSORE Phase II, updating the CVN 78 ship characteristics for use in the Probability of Rain Annihilation</p>	13.432	16.009	7.377	0.000	7.377
	-	-	-	-	-

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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
<p>(PRA) testbed, collect data on torpedo evasion runs conducted during Acoustic Trials, and begin platform-level Electronic Warfare assessments. Continue planning of Operational Testing, to include Operational Test Phase C1 (OT-C1) and OT-C2 test events. Continue to collect reliability data on new and legacy systems. Continue to monitor corrective actions and track installation and performance on ship. Begin planning for the Joint Mission Interoperability Test (JMIT).</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Decrease due to reprioritization of funds by the Department; reductions were spread between Advanced Technology Design & Development and Test & Evaluation.</p>					
<p>Title: Integrated Digital Shipbuilding (iDS)</p> <p align="right">Articles:</p> <p>Description: Transformation to Integrated Digital Shipbuilding (iDS).</p> <p>FY 2020 Plans: Integrated Digital Shipbuilding (iDS): Begin iDS transformation, which is a critical affordability initiative to upgrade the shipbuilder's Ford Class Digital Data Environment to include development of applicable interfaces, business processes, supporting systems, and tools to support the construction of FORD Class Aircraft Carriers in a digital environment. The new process for CVN 80 and follow-on ships is to use the Digital Data Environment to develop three-dimensional work instructions which export out of the digital environment to be given to the craftsmen to build the ship. This process would render the overwhelming majority of paper drawings to be obsolete, and result in recurring savings for future FORD Class Aircraft Carriers.</p> <p>FY 2021 Base Plans: Continue CVN 80/81 FY21 Integrated Digital Shipbuilding implementation plan and execute \$54M of the total contract by the Navy. This effort will continue each year through FY 2027 to enable HII-NNS to achieve 2-ship-buy savings. These efforts are directly tied to the construction trade products needed to support the build sequence in the shops and on the waterfront. Failure to fully fund installment clause would result in a change to the contract as funding requirements would not be met. Continue to apply upgrades to the shipbuilders Product Lifecycle Management (PLM) methodology, Product Data Management (PDM), and Software toolsets to support developing interfaces, new business processes, shipyard systems, and overall shipbuilding efficiency increase. Continue to support engineering efforts to define and add product manufacturing information into</p>	0.000	40.000	54.000	0.000	54.000
	-	-	-	-	-

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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
<p>the Product Model to allow design disclosure to the Navy and digital disclosure of work instructions and related technical references on tablet computers for the mechanics to use in the construction of CVN 80/81. Continue planning efforts to develop visual work instructions for manufacturing and constructions Trades. Continue to develop visual build management plans and Critical Chain Project Plans (CCPP) that will enable development of efficiently sequenced build plans.</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: The increase is due to the continued ramp of iDS construction products (Visual Build Management (VBM) and Visual Work Instruction (VWI)) in support of the CVN 80 schedule.</p>					
<p>Title: CVN 78 Full Ship Shock Trial (FSST)</p> <p align="right">Articles:</p> <p>FY 2020 Plans: Finalize environmental, explosive operations, instrumentation, electrical power monitoring, and logistics planning in support of Full Ship Shock Trial (FSST) execution. Finalize all planning documents (e.g., Shock Trial Plan, Shock Trial Procedure). Complete all technical and environmental risk mitigation activities. Secure all necessary support vessels (e.g., fleet assets, environmental monitoring and explosive operations). Complete all pre-trial activities including, but not limited to: explosive charge dry run, installing instrumentation cabling, removal and storage of non-shock qualified items, and conducting ship equipment baseline assessments.</p> <p>FY 2021 Base Plans: Execute the FSST. Begin data reduction, analysis and report. Begin needed repairs.</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Increase is to conduct CVN 78 FSST.</p>	0.000	17.500	40.900	0.000	40.900
	-	-	-	-	-
Accomplishments/Planned Programs Subtotals	24.826	88.276	103.702	0.000	103.702

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RD TEN / 0604567N: <i>Project Units 3108, 3179, 4007</i>	48.812	42.559	42.029	-	42.029	45.076	45.936	46.850	36.220	Continuing	Continuing
• SCN / 2001: <i>Carrier Replacement Program</i>	930.181	1,062.000	1,068.544	-	1,068.544	1,088.130	1,166.136	1,047.876	2,300.621	0.000	36,949.482
• OMN / 1B2B: <i>CVN 78 Ford Class Training and Sustainment (12BJ0)</i>	8.880	7.109	5.141	-	5.141	5.732	5.862	5.989	6.108	Continuing	Continuing
• OPN / 5664: <i>Surface Training Equipment</i>	7.942	1.412	4.457	-	4.457	2.532	2.418	2.428	2.511	Continuing	Continuing
• SCN / 5300: <i>Completion of PY Shipbldg Progr</i>	0.000	0.000	71.000	-	71.000	74.000	0.000	0.000	0.000	0.000	145.000
• SCN / 2004: <i>CVN 81</i>	643.000	1,214.500	1,645.606	-	1,645.606	1,306.988	759.980	666.968	590.969	5,622.684	12,450.695

Remarks

D. Acquisition Strategy

The CVN 78 is the first ship of the CVN 78 Class of aircraft carriers designed to replace USS ENTERPRISE and the ships of the NIMITZ Class. The CVN 78 will feature a new nuclear propulsion and electrical generation/distribution system, EMALS, advanced arresting gear (AAG) system, all electric auxiliaries, warfare system improvements, survivability enhancements, improved weapons handling, and improved aircraft servicing. These design features will result in lower manpower and total ownership costs as compared to the NIMITZ Class. Additionally, the following war fighting benefits will be realized: increased sortie generation rate, improved ship self-defense capability, increased launch and recovery capability/flexibility, increased operational availability, and increased flexibility to support future upgrades.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)					Project (Number/Name)						
1319 / 4				PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80					2208 / CVN 21						
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced Design & Development	C/CPAF	HII : VA	30.347	0.000		1.919	Oct 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC CARDEROCK : MD	4.451	0.500	Oct 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NAWC PATUXENT RIVER : MD	5.675	0.250	Oct 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC DAHLGREN : VA	7.281	0.500	Oct 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	C/CPAF	RAYTHEON : VA	12.769	9.276	Oct 2018	7.064	Oct 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	C/CPFF	NAVSEA SEAPORT : VARIOUS	23.949	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	Various	MISCELLANEOUS : VARIOUS	2.627	0.250	Nov 2018	0.740	Nov 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC PHILADELPHIA : PA	16.060	0.618	Oct 2018	5.044	Oct 2019	1.012	Nov 2020	-		1.012	Continuing	Continuing	Continuing
Advanced Design & Development	WR	SPAWAR : VARIOUS	6.640	0.000		0.000		0.413	Nov 2020	-		0.413	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NSWC CORONA : CA	1.602	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Advanced Design & Development	WR	NAWC LAKEHURST : NJ	1.338	0.000		0.000		0.000		-		0.000	0.000	1.338	-
Advanced Design & Development	WR	NSWC PORT HUENEME : CA	0.855	0.000		0.000		0.000		-		0.000	0.000	0.855	-
Advanced Design & Development	C/CPFF	BECHTEL : PA	6.400	0.000		0.000		0.000		-		0.000	0.000	6.400	-
Advanced Design & Development	C/CPFF	GRYPHON (SEI&T) : IN	0.352	0.000		0.000		0.000		-		0.000	0.000	0.352	-
Integrated Digital Shipbuilding	C/CPAF	HII : VA	6.965	0.000		40.000	Oct 2019	54.000	Nov 2020	-		54.000	0.000	100.965	-
Subtotal			127.311	11.394		54.767		55.425		-		55.425	Continuing	Continuing	N/A

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

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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			

Remarks
The increase to Integrated Digital Shipbuilding is due to the continued ramp of iDS construction products (Visual Build Management (VBM) and Visual Work Instruction (VWI)) in support of the CVN 80 schedule.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Development Test & Evaluation	C/CPAF	HII : VA	10.267	0.165	Nov 2018	0.625	Nov 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NAWC PATUXENT RIVER : MD	3.096	0.403	Nov 2018	0.633	Oct 2019	0.021	Nov 2020	-		0.021	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NSWC DAHLGREN : VA	10.254	1.648	Nov 2018	2.222	Oct 2019	0.943	Nov 2020	-		0.943	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NSWC CARDEROCK : MD	0.574	0.533	Nov 2018	0.969	Oct 2019	0.472	Nov 2020	-		0.472	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	SPAWAR : VARIOUS	8.381	0.040	Nov 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPAF	RAYTHEON : VARIOUS	5.643	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	Various	MISCELLANEOUS : VARIOUS	1.140	1.366	Oct 2018	3.004	Oct 2019	0.838	Nov 2020	-		0.838	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	NAVSEA SEAPORT : VARIOUS	1.746	1.469	Nov 2018	0.851	Nov 2019	0.793	Nov 2020	-		0.793	Continuing	Continuing	Continuing
Development Test & Evaluation	C/BA	NSWC PORT HUENEME : CA	0.086	0.799	Oct 2018	1.773	Oct 2019	0.427	Nov 2020	-		0.427	Continuing	Continuing	Continuing
Development Test & Evaluation	C/BA	NSWC CORONA : CA	0.263	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NAWC LAKEHURST : NJ	10.681	0.200	Nov 2018	0.922	Nov 2019	0.555	Nov 2020	-		0.555	Continuing	Continuing	Continuing

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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Development Test & Evaluation	WR	NSWC PHILADELPHIA : PA	1.670	3.124	Nov 2018	2.753	Nov 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	COMOPTEVFOR : VA	8.371	2.904	Nov 2018	2.257	Nov 2019	3.328	Nov 2020	-		3.328	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	NAWC PATUXENT RIVER : MD	0.063	0.150	Oct 2018	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	GRYPHON (SEI&T) : IN	0.533	0.631	Dec 2018	0.000		0.000		-		0.000	0.000	1.164	-
Development Test & Evaluation	C/CPFF	GENERAL ATOMICS : CA	11.708	0.000		0.000		0.000		-		0.000	0.000	11.708	-
Full Ship Shock Trial	C/CPFF	BECHTEL : PA	6.500	0.000		1.132	Oct 2019	3.100	Nov 2020	-		3.100	0.000	10.732	-
Full Ship Shock Trial	WR	NAWC PATUXENT RIVER : MD	0.635	0.000		1.445	Oct 2019	2.300	Nov 2020	-		2.300	0.000	4.380	-
Full Ship Shock Trial	WR	NSWC DAHLGREN : VA	0.451	0.000		0.887	Oct 2019	2.780	Nov 2020	-		2.780	0.000	4.118	-
Full Ship Shock Trial	WR	NSWC CARDEROCK : MD	11.692	0.000		9.534	Oct 2019	15.700	Nov 2020	-		15.700	0.000	36.926	-
Full Ship Shock Trial	WR	NSWC PHILADELPHIA : PA	1.259	0.000		4.502	Oct 2019	5.000	Nov 2020	-		5.000	0.000	10.761	-
Full Ship Shock Trial	C/CPAF	HII : VA	0.600	0.000		0.000		12.020	Nov 2020	-		12.020	0.000	12.620	-
Full Ship Shock Trial	WR	SPAWAR : VARIOUS	0.240	0.000		0.000		0.000		-		0.000	0.000	0.240	-
Subtotal			95.853	13.432		33.509		48.277		-		48.277	Continuing	Continuing	N/A

Remarks
Funding increased in FY21 to conduct FSST.

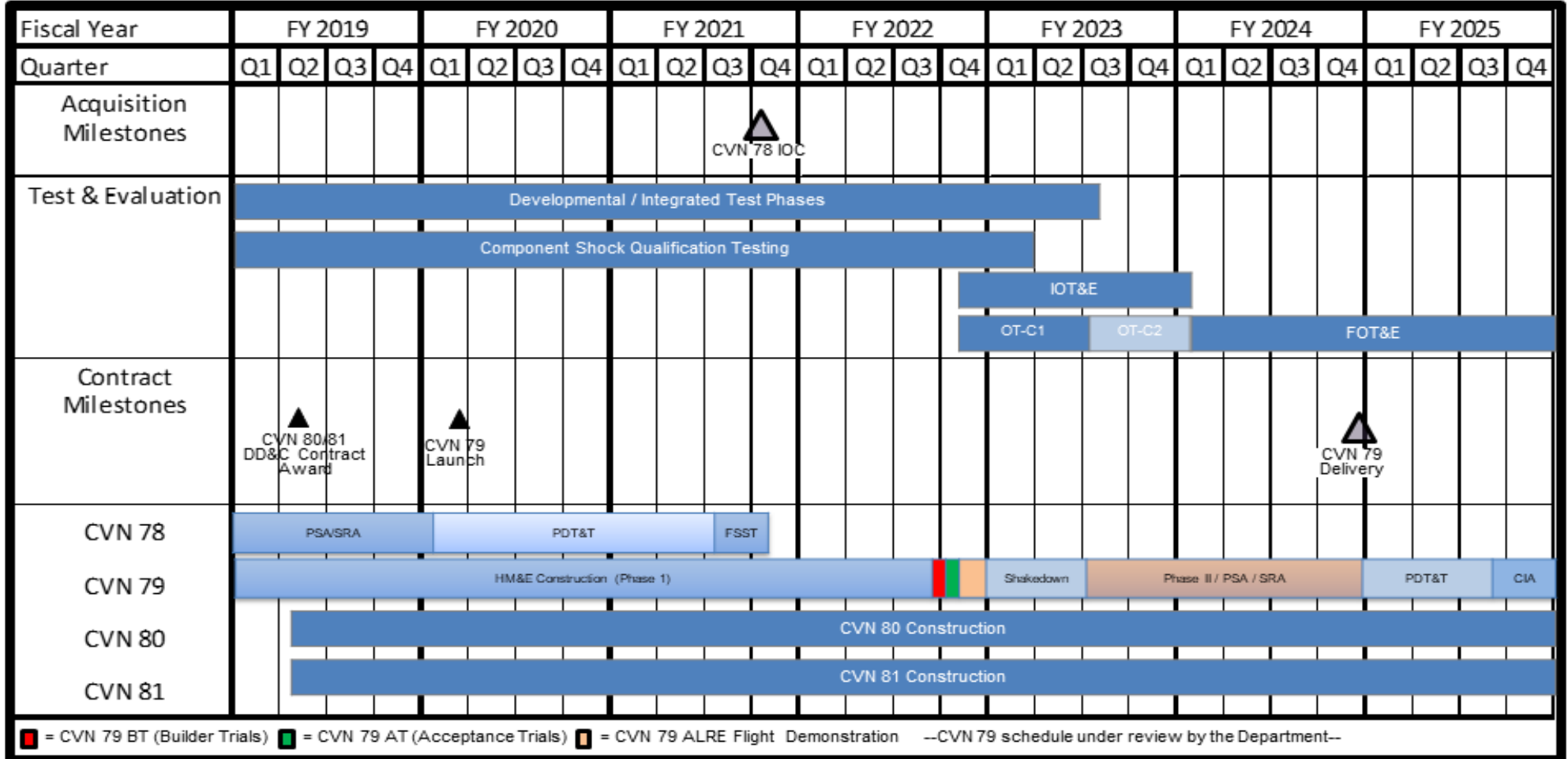
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	223.164	24.826	88.276	103.702	-	103.702	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 2208 / CVN 21

Gerald R. Ford Class Carriers



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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 2208 / CVN 21

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 2208				
CVN 21	1	2019	4	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 4004 / EMALS
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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
4004: EMALS	85.544	32.076	17.480	4.193	-	4.193	0.000	0.000	0.000	0.000	0.000	139.293
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 223

A. Mission Description and Budget Item Justification

This project provides for the development of an advanced technology aircraft launch system in support of the CVN 78 design and construction schedule, as well as Engineering and Life Cycle System (E&LCS) design. The Electromagnetic Aircraft Launch System (EMALS) will be the aircraft catapult for CVN 78 Class ships. EMALS provides better control of applied forces, both peak and transient dynamic, improved reliability and maintainability, increased operational availability, and reduced operator and maintainer workload.

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

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: EMALS	32.076	17.480	4.193	0.000	4.193
Articles:	-	-	-	-	-
Description: EMALS					
FY 2020 Plans: Continue EMALS Integrated Test & Evaluation (IT&E) land-based testing using deadloads for the correction of deficiencies. Provide interim training for crews until formal schoolhouse training is established. Continue development of the required processes and procedures to plan for Depot Level activities. Continue the planning and analysis necessary to standup EMALS Depot Level maintenance, overhaul and repair facility/facilities for EMALS components.					
FY 2021 Base Plans: Continue EMALS Integrated Test & Evaluation (IT&E) land-based testing using deadloads for the correction of deficiencies. Stand up training facility and achieve Ready For Training. Continue development of the required processes and procedures to plan for Depot Level activities. Continue the planning and analysis necessary to standup EMALS Depot Level maintenance, overhaul and repair facility/facilities for EMALS components.					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 4004 / EMALS

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
The decrease from FY 2020 to FY 2021 is due to the completion of the EMALS depot planning/logistics development.					
Accomplishments/Planned Programs Subtotals	32.076	17.480	4.193	0.000	4.193

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
• RD TEN / 0604567N: <i>Project Units 3108, 3179, 4007</i>	48.812	42.559	42.029	-	42.029	45.076	45.936	46.850	36.220	Continuing	Continuing
• SCN / 2001: <i>Carrier Replacement Program</i>	930.181	1,062.000	1,068.544	-	1,068.544	1,088.130	1,166.136	1,047.876	2,300.621	0.000	36,949.482
• OMN / 1B2B: <i>CVN 78 Ford Class Training and Sustainment (12BJ0)</i>	8.880	7.109	5.141	-	5.141	5.732	5.862	5.989	6.108	Continuing	Continuing
• OPN / 5664: <i>Surface Training Equipment</i>	7.942	1.412	4.457	-	4.457	2.532	2.418	2.428	2.511	Continuing	Continuing
• OPN / 4213: <i>Aircraft Support Equipment</i>	105.693	187.926	187.758	60.217	247.975	214.070	334.429	184.828	145.928	Continuing	Continuing
• SCN / 2004: <i>CVN 81 of PY Shipbldg Progr</i>	643.000	1,214.500	1,645.606	-	1,645.606	1,306.988	759.980	666.968	590.969	5,622.684	12,450.695
• SCN: <i>Completion of PY Shipbldg Progr</i>	0.000	0.000	71.000	-	71.000	74.000	0.000	0.000	0.000	0.000	145.000

Remarks

OPN 4213 includes a portion of line item funding for EMALS.

D. Acquisition Strategy

The CVN 78 is the first ship of the CVN 78 Class of aircraft carriers designed to replace the ships of the NIMITZ Class. The CVN 78 will feature a new nuclear propulsion and electrical generation/distribution system, new electromagnetic aircraft launching system (EMALS), advanced arresting gear (AAG) system, all electric auxiliaries, warfare system improvements, survivability enhancements, improved weapons handling, and improved aircraft servicing. These design features will result in lower manpower and total ownership costs as compared to the NIMITZ Class. Additionally, the following war fighting benefits will be realized: increased sortie generation rate, improved ship self-defense capability, increased launch and recovery capability/flexibility, increased operational availability, and increased flexibility to support future upgrades.

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

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 4004 / EMALS
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Primary HW Development - SDD	C/CPFF	General Atomics : San Diego, CA	40.875	0.000		0.000		0.000		-		0.000	0.000	40.875	40.875
Training Development	C/FFP	Pro-Active Technologies, Inc : Oviedo, FL	5.569	0.000		0.000		0.000		-		0.000	0.000	5.569	5.569
Primary HW Development	WR	NAWCAD Lakehurst : Lakehurst, NJ	5.075	2.287	Dec 2018	0.000		0.000		-		0.000	0.000	7.362	-
Prior Year Cost No Longer Funded in FYDP	Various	Various : Various	19.020	0.000		0.000		0.000		-		0.000	0.000	19.020	-
Subtotal			70.539	2.287		0.000		0.000		-		0.000	0.000	72.826	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Engineering Support	WR	Various : Various	0.166	0.050	Jan 2019	0.000		0.000		-		0.000	0.000	0.216	-
Training Support	WR	NAWCAD TSD : Orlando, FL	0.668	0.306	Dec 2018	0.220	Jan 2020	0.202	Nov 2020	-		0.202	0.000	1.396	-
Training Support	WR	NAVFAC : Norfolk, VA	0.083	1.020	Dec 2018	0.000		0.000		-		0.000	0.000	1.103	-
Depot Logistics Development	C/CPFF	General Atomics : San Diego, CA	0.000	7.700	Jul 2019	10.369	Jan 2020	2.913	Jan 2021	-		2.913	0.000	20.982	20.982
Government Eng Support	WR	NAWCAD Lakehurst : Lakehurst, NJ	0.000	1.116	Dec 2018	1.111	Jan 2020	1.078	Nov 2020	-		1.078	0.000	3.305	-
Subtotal			0.917	10.192		11.700		4.193		-		4.193	0.000	27.002	N/A

Remarks
The decrease from FY 2020 to FY 2021 is due to the completion of the EMALS depot planning/logistics development.

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

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 4004 / EMALS
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Integrated Test & Evaluation	WR	NAWC Lakehurst : Lakehurst, NJ	6.166	3.436	Dec 2018	0.833	Jan 2020	0.000		-		0.000	0.000	10.435	-
Integrated Test & Evaluation	C/CPFF	General Atomics : San Diego, CA	2.738	16.161	Jan 2019	4.947	Feb 2020	0.000		-		0.000	0.000	23.846	23.846
Prior Year Cost No Longer Funded in FYDP	Various	Various : Various	5.184	0.000		0.000		0.000		-		0.000	0.000	5.184	-
Subtotal			14.088	19.597		5.780		0.000		-		0.000	0.000	39.465	N/A

Remarks
The decrease from FY2020 to FY2021 is due to the last year of EMALS funding for Integrated Test and Evaluation (IT&E).

	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	85.544	32.076	17.480	4.193	-	4.193	0.000	139.293	N/A

Remarks

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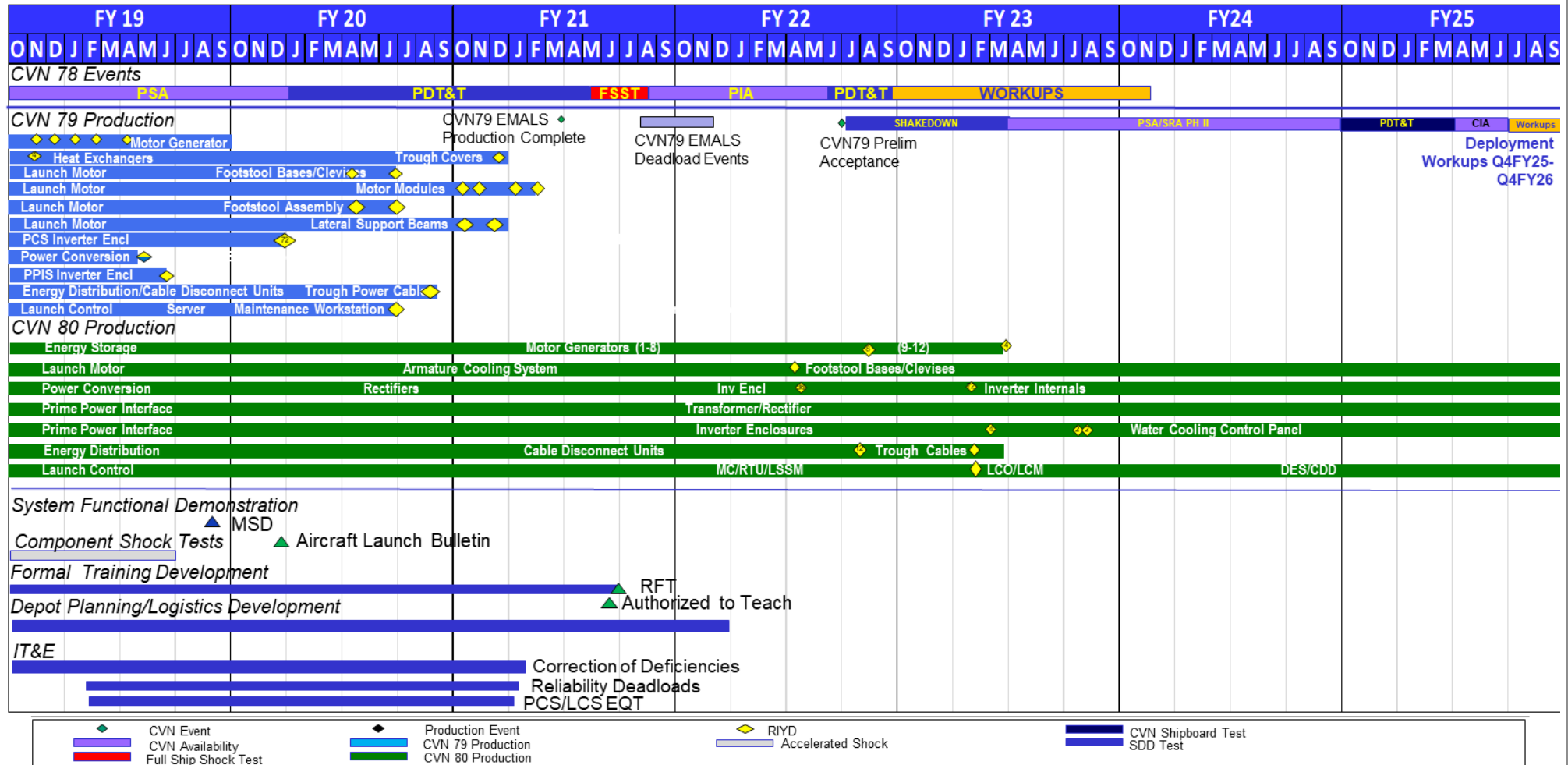
Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy

Date: February 2020

Appropriation/Budget Activity
1319 / 4

R-1 Program Element (Number/Name)
PE 0604112N / GERALD R FORD CI NUC
AIRCRAFT CARRIER CVN 78-80

Project (Number/Name)
4004 / EMALS



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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 4004 / EMALS

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 4004				
Training: EMALS Training Development	1	2019	3	2021
Depot Development: EMALS Depot Level Planning	1	2019	1	2022
Test and Evaluation: EMALS Component Shock Test	1	2019	3	2019
Test and Evaluation: EMALS Integrated Test & Evaluation (IT&E)	1	2019	2	2021
Test and Evaluation: EMALS Reliability Deadloads	2	2019	2	2021
Test and Evaluation: EMALS Launch Control Subsystem (LCS) Environmental Qualification Testing (EQT)	2	2019	2	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 9999 / Congressional Adds
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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: <i>Congressional Adds</i>	0.000	24.119	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	24.119
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides for planning for the Full Ship Shock Trial (FSST) for the USS Gerald Ford (CVN 78).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020
Congressional Add: CVN 78 Full Ship Shock Trial	24.119	0.000
FY 2019 Accomplishments: Full Ship Shock Trial (FSST) - Continued planning for a CVN 78 FSST to be conducted in FY 2021. Developed the DRAFT CVN 78 FSST Plan and provided to stakeholders for review and comment. Continued the Modeling & Simulation effort supporting the CVN 78 FSST pre-trial predictions. Continued planning to mitigate potential environmental impacts. Continued working with support activities to coordinate transport and storage of explosive charges. Continued modeling effort to characterize the charge behavior while being towed by the explosive ops vessel. Developed explosive operations procedures and conducted explosive operations rehearsal in July 2019. Began logistics planning to develop FSST spares strategy and storage of planned offloaded equipment. Continued developing list of post-shock check-out procedures for integration into a single timeline for system checks between shots. Developed risk mitigation strategies for all identified equipment / systems risks.		
Component Shock Qualification - Continued component shock qualification of CVN 78 Government-Furnished Equipment components / systems. Successful component shock qualification will support the required NAVSEA post-delivery shock certification of CVN 78 prior to deployment. Shock qualification testing was executed on Electromagnetic Aircraft Launch System and Advanced Arresting Gear components. Continued planning for shock testing of the Signal Data Processor, a Dual Band Radar component. This testing will help to mitigate risk during the FSST and may be used along with FSST results toward shock qualification.		
FY 2020 Plans: N/A		
Congressional Adds Subtotals	24.119	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 9999 / Congressional Adds

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

Line Item	FY 2019	FY 2020	FY 2021	FY 2021	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Cost To	
			Base	OCO	Total					Complete	Total Cost
• RD TEN / 0604567N: Project Units 3108, 3179, 4007	48.812	42.559	42.029	-	42.029	45.076	45.936	46.850	36.220	Continuing	Continuing
• SCN / 2001: Carrier Replacement Program	930.181	1,062.000	1,068.544	-	1,068.544	1,088.130	1,166.136	1,047.876	2,300.621	0.000	36,949.482
• OMN / 1B2B: CVN 78 Ford Class Training and Sustainment (12BJ0)	8.880	7.109	5.141	-	5.141	5.732	5.862	5.989	6.108	Continuing	Continuing
• OPN / 5664: Surface Training Equipment	7.942	1.412	4.457	-	4.457	2.532	2.418	2.428	2.511	Continuing	Continuing
• SCN / 5300: Completion of PY Shipbldg Progr	0.000	0.000	71.000	-	71.000	74.000	0.000	0.000	0.000	0.000	145.000
• SCN / 2004: CVN 81	643.000	1,214.500	1,645.606	-	1,645.606	1,306.988	759.980	666.968	590.969	5,622.684	12,450.695

Remarks

D. Acquisition Strategy

The CVN 78 is the first ship of the CVN 78 Class of aircraft carriers designed to replace USS ENTERPRISE and the ships of the NIMITZ Class. The CVN 78 will feature a new nuclear propulsion and electrical generation / distribution system, new electromagnetic aircraft launch system (EMALS), advanced arresting gear (AAG) system, all electric auxiliaries, warfare system improvements, survivability enhancements, improved weapons handling, and improved aircraft servicing. These design features will result in lower manpower and total ownership costs as compared to the NIMITZ Class. Additionally, the following war fighting benefits will be realized: increased sortie generation rate, improved ship self-defense capability, increased launch and recovery capability / flexibility, increased operational availability, and increased flexibility to support future upgrades.

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

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 9999 / Congressional Adds
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Component Shock	WR	NSWC PHILADELPHIA : PA	0.000	0.890	Dec 2018	0.000		0.000		-		0.000	0.000	0.890	-
Component Shock	WR	NUWC NEWPORT : RI	0.000	0.859	Dec 2018	0.000		0.000		-		0.000	0.000	0.859	-
Component Shock	Various	SPAWAR SAN DIEGO : CA	0.000	1.372	Nov 2018	0.000		0.000		-		0.000	0.000	1.372	-
Component Shock	C/CPAF	RAYTHEON : MA	0.000	10.972	Mar 2019	0.000		0.000		-		0.000	0.000	10.972	-
Component Shock	Various	NAWC LAKEHURST : NJ	0.000	0.530	Dec 2018	0.000		0.000		-		0.000	0.000	0.530	-
Component Shock	WR	NSWC CARDEROCK : MD	0.000	0.260	Dec 2018	0.000		0.000		-		0.000	0.000	0.260	-
Full Ship Shock Trial	WR	NSWC CARDEROCK : MD	0.000	4.260	Jan 2019	0.000		0.000		-		0.000	0.000	4.260	-
Full Ship Shock Trial	WR	NSWC DAHLGREN : VA	0.000	0.270	Nov 2018	0.000		0.000		-		0.000	0.000	0.270	-
Full Ship Shock Trial	WR	NSWC PHILADELPHIA : PA	0.000	2.167	Dec 2018	0.000		0.000		-		0.000	0.000	2.167	-
Full Ship Shock Trial	WR	NAWC PATUXENT RIVER : MD	0.000	0.308	Jan 2019	0.000		0.000		-		0.000	0.000	0.308	-
Full Ship Shock Trial	C/CPAF	HII-NNS : VA	0.000	0.031	Jan 2019	0.000		0.000		-		0.000	0.000	0.031	-
Full Ship Shock Trial	C/BA	FLUOR MARINE PROPULSION : PA	0.000	2.200	Jan 2019	0.000		0.000		-		0.000	0.000	2.200	-
Subtotal			0.000	24.119		0.000		0.000		-		0.000	0.000	24.119	N/A

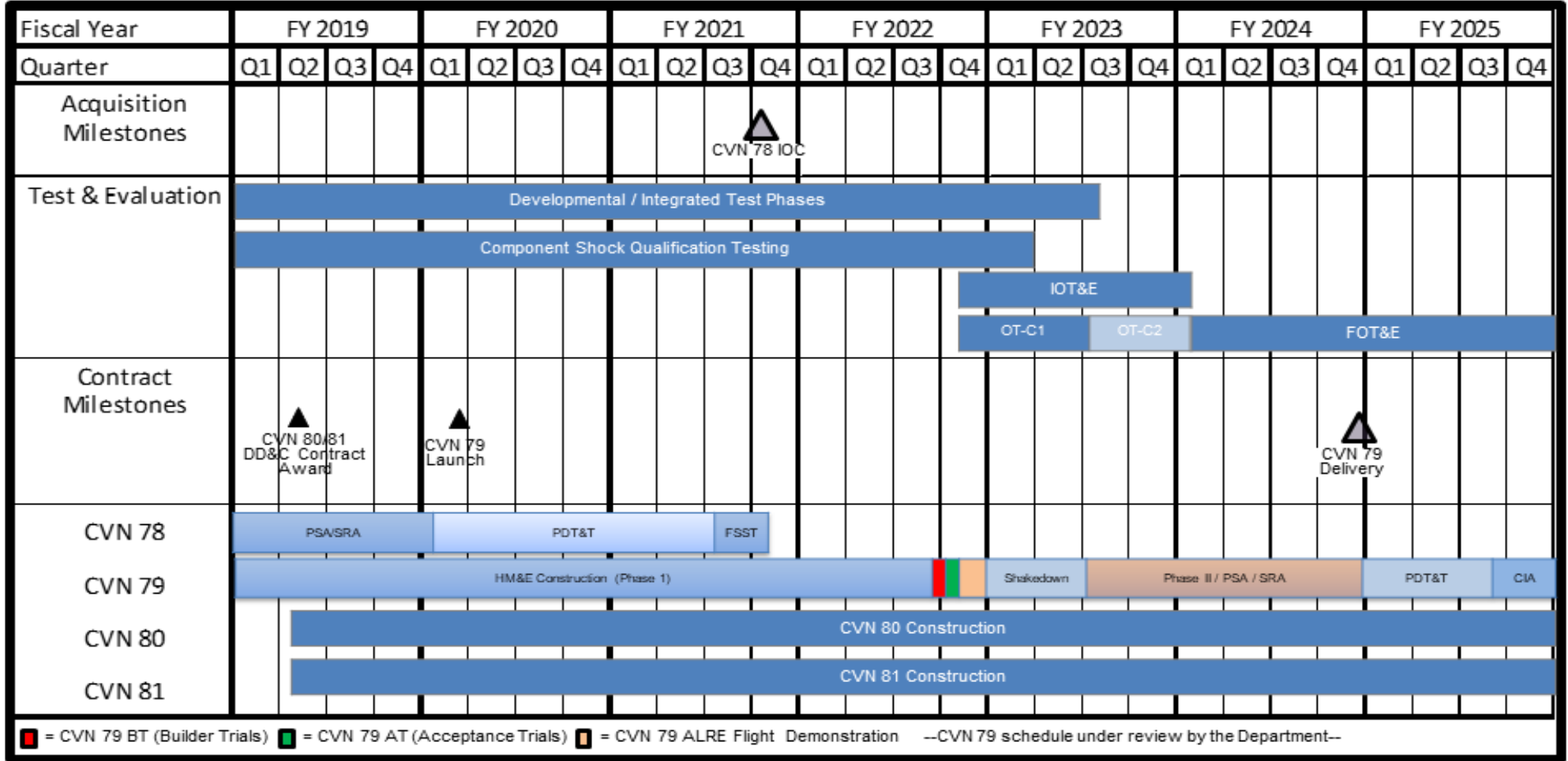
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals		0.000	24.119	0.000	0.000	-	0.000	24.119	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 9999 / Congressional Adds

Gerald R. Ford Class Carriers



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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0604112N / GERALD R FORD CI NUC AIRCRAFT CARRIER CVN 78-80	Project (Number/Name) 9999 / Congressional Adds

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 9999				
CVN 21	1	2019	4	2025