Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-223

CVN 78 Gerald R. Ford Class Nuclear Aircraft Carrier (CVN 78)

As of FY 2020 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

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Sensitivity Originator

Organization: CVN 78 GERALD R. FORD Class Nuclear Aircraft Carrier (CVN 78)
Organization Email:
Organization Phone: 202-781-4903

Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance
ACAT - Acquisition Category
ADM - Acquisition Decision Memorandum
APB - Acquisition Program Baseline
APPN - Appropriation
APUC - Average Procurement Unit Cost
$B - Billions of Dollars
BA - Budget Authority/Budget Activity
Blk - Block
BY - Base Year
CAPE - Cost Assessment and Program Evaluation
CARD - Cost Analysis Requirements Description
CDD - Capability Development Document
CLIN - Contract Line Item Number
CPD - Capability Production Document
CY - Calendar Year
DAB - Defense Acquisition Board
DAE - Defense Acquisition Executive
DAMIR - Defense Acquisition Management Information Retrieval
DoD - Department of Defense
DSN - Defense Switched Network
EMD - Engineering and Manufacturing Development
EVM - Earned Value Management
FOC - Full Operational Capability
FMS - Foreign Military Sales
FRP - Full Rate Production
FY - Fiscal Year
FYDP - Future Years Defense Program
ICE - Independent Cost Estimate
IOC - Initial Operational Capability
Inc - Increment
JROC - Joint Requirements Oversight Council
$K - Thousands of Dollars
KPP - Key Performance Parameter
LRIP - Low Rate Initial Production
$M - Millions of Dollars
MDA - Milestone Decision Authority
MDAP - Major Defense Acquisition Program
MILCON - Military Construction
N/A - Not Applicable
O&M - Operations and Maintenance
ORD - Operational Requirements Document
OSD - Office of the Secretary of Defense
O&S - Operating and Support
PAUC - Program Acquisition Unit Cost

PB - President's Budget
PE - Program Element
PEO - Program Executive Officer
PM - Program Manager
POE - Program Office Estimate
RDT&E - Research, Development, Test, and Evaluation
SAR - Selected Acquisition Report
SCP - Service Cost Position
TBD - To Be Determined
TY - Then Year
UCR - Unit Cost Reporting
U.S. - United States
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)
USD(A&S) - Under Secretary of Defense (Acquisition and Sustainment)

Program Information

Program Name
CVN 78 Gerald R. Ford Class Nuclear Aircraft Carrier (CVN 78)

DoD Component
Navy

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References

CVN 78

SAR Baseline (Development Estimate)

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated April 23, 2004

Approved APB

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated April 2, 2013

EMALS

SAR Baseline (Development Estimate)

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated April 23, 2004

Approved APB

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated April 2, 2013

Mission and Description

The CVN 78 Gerald R. Ford Class Nuclear Aircraft Carrier (CVN 78) is the successor to the NIMITZ Class (CVN 68) aircraft carrier. The CVN 78 mission is to provide credible, sustainable, independent forward presence during peacetime without access to land bases; operate as the cornerstone of a joint and/or allied maritime expeditionary force in response to crisis; and carry the war to the enemy through joint multi-mission offensive operations by: (a) being able to operate and support aircraft in attacks on enemy forces ashore, afloat, or submerged independent of forward-based land facilities, (b) protecting friendly forces from enemy attack through the establishment and maintenance of battle space dominance independent of forward-based land facilities, and (c) engaging in sustained operations in support of the United States and its allies independent of forward-based land facilities.

The CVN 78 Class Aircraft Carrier program includes major efforts for Nuclear Propulsion/Electric Plant Design, Electromagnetic Aircraft Launching System (EMALS) and all electric auxiliary systems. Additional design features and new technologies have been added, including a new/enlarged flight deck, improved weapons handling capabilities, and improved survivability.

Executive Summary

Program Highlights Since Last Report

GERALD R. FORD (CVN 78)

CVN 78 arrived at Newport News Shipbuilding on July 15, 2018 to commence a Post Shakedown Availability/Selected Restricted Availability (PSA/SRA). This is a maintenance availability to correct deficiencies identified during shakedown, finish incomplete work items that remain from delivery, and conduct modernization.

More than 86 percent of all trial cards and 26 of 43 starred cards have been closed, which is ahead of schedule. Correction of 14 more starred cards are scheduled during PSA/SRA. The remainder require validation of completion during post PSA underway operations.

Integrated Combat Systems testing has continued during PSA/SRA utilizing the Self-Defense Test Ship (SDTS) in the CVN 78 configuration. To date, a Waterfront Integration Test, an underway Risk Reduction Shot, and an underway Track Exercise have been conducted using the SDTS. During this test, the CVN 78 Ship Self Defense System successfully detected and tracked the Anti-Ship Cruise Missile surrogate target. An Evolved Sea Sparrow Missile was fired which resulted in a successful intercept.

The Navy is planning to conduct the FORD Class Full Ship Shock Trials (FSST) on CVN 78 in FY 2020 following a Post Delivery Test and Trials period. FSST will be followed by the ship's first Planned Incremental Availability to perform maintenance, repairs, and modernization.

Electromagnetic Aircraft Launch System (EMALS) (major subprogram)

EMALS aircraft compatibility testing aboard CVN 78 continued during the eight Independent Steaming Events conducting a total of 747 aircraft launches. The System Development and Demonstration (SDD) program is 99 percent complete. Shock testing to date has uncovered no major deficiencies. The component shock testing and preliminary depot planning efforts will be completed by fourth quarter FY 2019 under the SDD contract. The Integrated Test and Evaluation (IT&E) contract to General Atomics is planned for award in FY 2019 and will support continued correction of deficiencies and deadload launches for reliability growth. The IT&E contract will also support keeping the System Functional Demonstration test site in Lakehurst, NJ operational in order to conduct shipboard testing engineering investigations and train the CVN 78 crew. Logistics contracts are in place for repair of repairables and interim spares, which will maintain an adequate supply chain until the material support date.

JOHN F. KENNEDY (CVN 79)
CVN 79 is 55 percent construction complete with an overall man-hour cumulative cost performance of 0.95. Man-hour cost performance has been driven by material availability, performance in the steel fabrication shops that provide structural units to final assembly and implementation of technical resolutions discovered on the first ship of the class, CVN 78. Assembly performance is expected to improve as technical risks are retired and design solutions are implemented. Assembly trades access to material has improved over the last year from 93 to over 96.5 percent and is expected to help improve production labor performance. Shipbuilder erection schedule performance continues to improve as progress in structural assembly approaches completion. The ship is 87 percent erected with 390 of 448 lifts in the dry dock. The shipbuilder remains on track to launch the ship in November 2019.

ENTERPRISE (CVN 80)/UNNAMED (CVN 81)
CVN 80 Advance Procurement (AP) commenced in 2016. The Navy awarded the CVN 80/81 DD&C contract on January 31, 2019. The two-ship acquisition strategy delivers significant savings to the government – exceeding $4B when compared to the Navy's cost estimate to procure these CVNs separately. The estimate of total procurement costs for CVN 80 is $12.202 billion (less spares) which is $366 million below the $12.568 billion cost cap established in the FY 2018 NDAA. The reduction to the shipbuilder end cost achieved in the contract settlement provides an opportunity to increase the lethality of the FORD Class and meet emerging threats while still meeting the mandated $12.568 billion cost cap. A recent Navy

Resources and Requirements Review Board identified additional capabilities needed on the FORD Class that will drive future modifications. The costs associated with integrating several of these modifications, including the Joint Strike Fighter and MK 38 Gun System, into CVN 80 and CVN 81 is included in the DD&C contract. Executing these modifications in-line with construction results in significant savings compared to back fitting these systems post-delivery. Because these capabilities were negotiated into the settlement, the Navy estimates an additional $100 million in saving for the two-ship buy. This same work was estimated at nearly $200 million if delayed to a post-delivery installation. Throughout construction of these two ships, the Navy will continue to ensure that CVN 80 and CVN 81 will meet projected threats.

CVN 80 is the third ship of the FORD Class and the numerical replacement for USS EISENHOWER (CVN 69). CVN 81, not yet named, will be the fourth ship of the class and will be the numerical replacement for the USS CARL VINSON (CVN 70). CVN 80 delivers in March 2028 and CVN 81 delivers in February 2032.

There are no significant software-related issues with this program at this time.

History of Significant Developments Since Program Initiation

History of Significant Developments Since Program Initiation	
Date	**Significant Development Description**
March 1996	Milestone 0 approval.
October 1998	USD(AT&L) approved the Navy request for a large-capacity (75 aircraft) carrier with new nuclear propulsion plant and electric plant design, employing an evolutionary acquisition approach. The first ship of the class (CVNX-1) to be based upon a NIMITZ-class hull.
December 1999	Navy awarded two Electromagnetic Aircraft Launch System Program Definition and Risk Reduction contracts to General Atomics and Northrop Grumman.
June 2000	Future Aircraft Carrier program (CVNX), the planned successor to the NIMITZ-class aircraft carrier, was granted Milestone I approval on June 15, 2000.
October 2000	Northrop Grumman Newport News was awarded a cost-plus-fixed-fee contract for research and design development engineering services in support of the CVNX. Design and integration efforts for the class began with the Integrated Product and Process Development contract.
April 2001	Completion of the CVNX-1 Systems Requirement Review marked a major milestone toward commencement of design activities to support the Milestone B Defense Acquisition Board planned for September 2002.
February 2002	President's Budget FY 2003 slips the original CVNX-1 program of record for design start construction and delivery by one year to FY 2007, and reflects split funding of CVNX construction over FY 2007 and FY 2008.
September 2002	Milestone B schedule date has been delayed five months from September 2002 to February 2003 due to a delay in the release of the Operational Requirements Document.
December 2002	Program Decision Memorandum dated December 12, 2002 redesignated CVNX as CVN 21, pulling forward technologies originally planned for CVNX-2. Increases in sortie generation rate requirements and additional manpower reduction requirements previously slated for CVNX-2, such as advanced weapons handling and material movement were pulled forward into the lead ship, the follow on CVN 21 is now considered a modified repeat. Additional design features/new technologies were also added and include: improved/enlarged flight deck, advanced arresting gear, improved weapons handling capabilities, and improved survivability.
June 2003	Program reports delay to Early Operational Assessment (from June 2003 to March 2004) and an additional delay to Milestone B to April 2004.
April 2004	Milestone B Defense Acquisition Board Decision Review held on April 2, 2004. Program major milestones construction contract award in FY 2007 and ship delivery planned for FY 2014 remained unchanged.Approved Acquisition Program Baseline low rate initial production quantity not to exceed three ships. Navy down selected General Atomics as the Electromagnetic Aircraft Launch System Prime Contractor and awarded the System Development and Demonstration contract.
April 2004	CVN 78 Construction Preparation contract awarded.
May 2004	Program Office awarded the Construction Preparation contract which funds the Research, Development, Test, and Evaluation), Long Lead Time Material, integrated design, advance procurement and advance construction of components in support of FY 2007 CVN 21 Construction contract.
February 2005	President's Budget FY 2006 moves full funding of the lead ship (CVN 78) from FY 2007 to FY 2008. Key event and acquisition dates have been adjusted to accommodate the change in program funding. Construction contract award delayed from FY 2007 to FY 2008. The overall change to the program is a one year slip in delivery for both the lead ship (CVN 78) and the second ship (CVN 79) which is 2015 and 2019, respectively.

October 2006	FY 2007 National Defense Authorization Act provides contract authority for construction of a CVN 21 class (subsequently re-designated the CVN 78 class) aircraft carrier designated CVN 78, CVN 79, or CVN 80. The Navy received authority for the ships to be split funded across four years. The act also provided a sense of Congress that the first ship of the class, CVN 78, should be named U.S.S. GERALD R. FORD.
April 2008	Navy awarded the Electromagnetic Aircraft Launch System CVN 78 Long Lead Time Material contract to General Atomics.
August 2008	USD(AT&L) chaired Defense Acquisition Board authorized Navy to enter the production phase for CVN 78, and enter the construction preparation phase for the first follow ship, CVN 79.
September 2008	CVN 78 Detail Design and Construction contract awarded.
January 2009	CVN 79 Construction Preparation contract awarded.
April 2009	Department of Defense announced the CVN 21 Program would shift from a four-year to a five-year build cycle, thereby placing the program on a more fiscally sustainable path while continuing to support a minimum of 11 aircraft carriers through FY 2040. This change, which was reflected in the FY 2010 President's Budget, moved the ship authorization year for the CVN 79 from FY 2012 to FY 2013 and the ship authorization year for CVN 80 from FY 2016 to FY 2018.
June 2009	Navy awarded the Electromagnetic Aircraft Launch System CVN 78 shipset contract to General Atomics.
November 2009	General Atomics Electromagnetic Systems division, along with the U.S. Navy Naval Air Systems Command (NAVAIR), celebrated the opening of the Electromagnetic Aircraft Launch System test track at Joint Base McGuire-Dix-Lakehurst, N.J., with a ribbon-cutting ceremony.
December 2010	Electromagnetic Aircraft Launch System successfully performed land-based F/A-18E risk reduction launches.
May 2011	Secretary of the Navy announced on May 29, 2011 that the nuclear-powered aircraft carrier CVN 79 would be named the JOHN F. KENNEDY.
June 2011	Electromagnetic Aircraft Launch System Aircraft Compatibility Testing began.
December 2011	FY 2012 National Defense Authorization Act extended the full funding period for CVN 79 from four years to five years and directed the Electromagnetic Aircraft Launch System be designated as a major subprogram.
August 2012	Navy awarded the Electromagnetic Aircraft Launch System Logistics Product Development contract to General Atomics.
December 2012	Secretary of Navy announced at the December 1, 2012 de-activation ceremony of the ENTERPRISE (CVN 65) that the CVN 80 would be named ENTERPRISE.
January 2013	FY 2013 National Defense Authorization Act extended the full funding period for CVN 79 and CVN 80 from five to six years.
March 2013	An extension to the CVN 79 Construction Preparation contract for efforts through FY 2013 was awarded.
April 2013	Electromagnetic Aircraft Launch System designation as a major subprogram approved by USD(AT&L) on April 2, 2013.
November 2013	CVN 78 was launched on November 17, 2013 and weighed 77,000 tons. The ship was 70% complete – the highest level attained in aircraft carrier new construction.
February 2014	In President's Budget 2015 the Navy modified CVN 79 acquisition strategy to a two-phased delivery strategy, the basic ship to be constructed and tested in the most efficient manner by the shipbuilder (Phase I). Select ship systems and compartments to be completed in a second phase, wherein the work can be completed more affordably. This approach enables the Navy to replace the Dual Band Radar with the Enterprise Radar Suite, increase competitive opportunities, reduce obsolescence at

	delivery and increase Government Furnished Equipment cost savings through common purchases of equipment with follow-on ship CVN 80.
April 2014	The Electromagnetic Aircraft Launch System completes land based Aircraft Compatibility Testing.
May 2014	Navy awarded the Electromagnetic Aircraft Launch System CVN 79 Long Lead Time Material contract to General Atomics.
June 2015	Electromagnetic Aircraft Launching System shipboard catapult testing commenced on schedule, with testing of the bow catapults.
June 2015	Navy awarded Huntington Ingalls Industries - Newport News Shipbuilding a Fixed Price Incentive Firm target contract in the amount of $3.35B for the JOHN F. KENNEDY (CVN 79) Detail Design & Construction effort. The contract represents an 18 percent reduction in man-hours needed to construct CVN 79 as compared to CVN 78. Additionally, a $941M modification to the Construction Preparation contract was awarded the same day. Navy awarded the Electromagnetic Aircraft Launch System CVN 79 shipset contract to General Atomics.
August 2015	CVN 78 crew moved aboard as scheduled.
August 2015	USD(AT&L) ADM directed the Navy to conduct Full Ship Shock Trials on CVN 78 prior to first deployment.
May 2016	Navy awarded a $152M initial contract for CVN 80 long lead time procurements; workload and layout planning; material tracking; development of an integrated master schedule and work packages; as well as other activities necessary to support start of construction in FY 2018.
October 2016	CVN 79 delivery date revised from June 2022 to September 2024 as required by Section 121 of the FY 2017 National Defense Authorization Act (Public Law 114-328). Completion of the CVN 79 Detail Design and Construction contract in June 2022 will represent preliminary acceptance from the shipbuilder.
January 2017	The Electromagnetic Aircraft Launch System (EMALS) aboard CVN 78 was turned over to Ship's Force. To mitigate future cost growth, EMALS and Advanced Arresting Gear (AAG) CVN 80 Firm Fixed Price options to the CVN 79 EMALS/AAG shipset contract with General Atomics were exercised in January 2017 and May 2017, locking in dual ship savings.
May 2017	CVN 78 delivered to the Navy on May 31, 2017 after successfully completing Builder's Sea Trials in April 2017 and Acceptance Trials in May 2017. With delivery of CVN 78, the carrier force returned to 11 ships as required by 10 U.S.C. 5062(b).
June 2017	The Electromagnetic Aircraft Launch System completed land based Aircraft Compatibility Testing to correct deficiencies with launching the F/A-18E/F with external fuel tanks.
June 2017	CVN 79 reached the 50% structurally erected milestone with 224 of the 447 total erectables landed in the dry dock.
July 2017	CVN 78 formally entered in the active fleet following her commissioning ceremony on July 22, 2017.
July 2017	CVN 78 made Naval Aviation history by successfully recovering and launching its first fixed-wing aircraft on July 28, 2017. A total of four launches were conducted on the Electromagnetic Aircraft Launching System and four arrestments on the Advanced Arresting Gear.
January 2018	On January 8, 2018 USD(AT&L) designated the CVN 78 Class Acquisition Category 1C (ACAT 1C) and delegated Milestone Decision Authority (MDA) to the Navy.
April 2018	CVN 79 reached the 75% structurally erected milestone with 341 of the 447 total erectables landed in the dry dock.
June 2018	CVN 78 completed the eighth Independent Steaming Event and completed 747 total successful Electromagnetic Aircraft Launch System catapult launches and 747 successful Advanced Arresting Gear arrestments, including 135 launches and recoveries while underway on January 19, 2018
July 2018	CVN 78 commenced Post Shakedown Availability/Selected Restricted Availability on July 15, 2018.

December 2018	On December 31, 2018 the Secretary of Defense provided Congressional notification in accordance with Section 121 of the FY 2019 National Defense Authorization Act (Public Law 115-232) certifying the CVN 80/81 two-ship buy cost savings and provided the Secretary of the Navy the authority to enter into a contract for the procurement of CVN 80/81 under a single contract.
January 2019	CVN 80/81 two-ship buy Detail Design and Construction contract awarded on January 31, 2019.

Threshold Breaches

CVN 78

APB Breaches		
Schedule		☑
Performance		☐
Cost	RDT&E	☐
	Procurement	☑
	MILCON	☐
	Acq O&M	☐
O&S Cost		☑
Unit Cost	PAUC	☐
	APUC	☐

Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Explanation of Breach

The schedule, procurement cost, and O&S cost breaches were previously reported in the June 2018 SAR. An APB revising the schedule and class costs for the FORD Class is in process.

EMALS

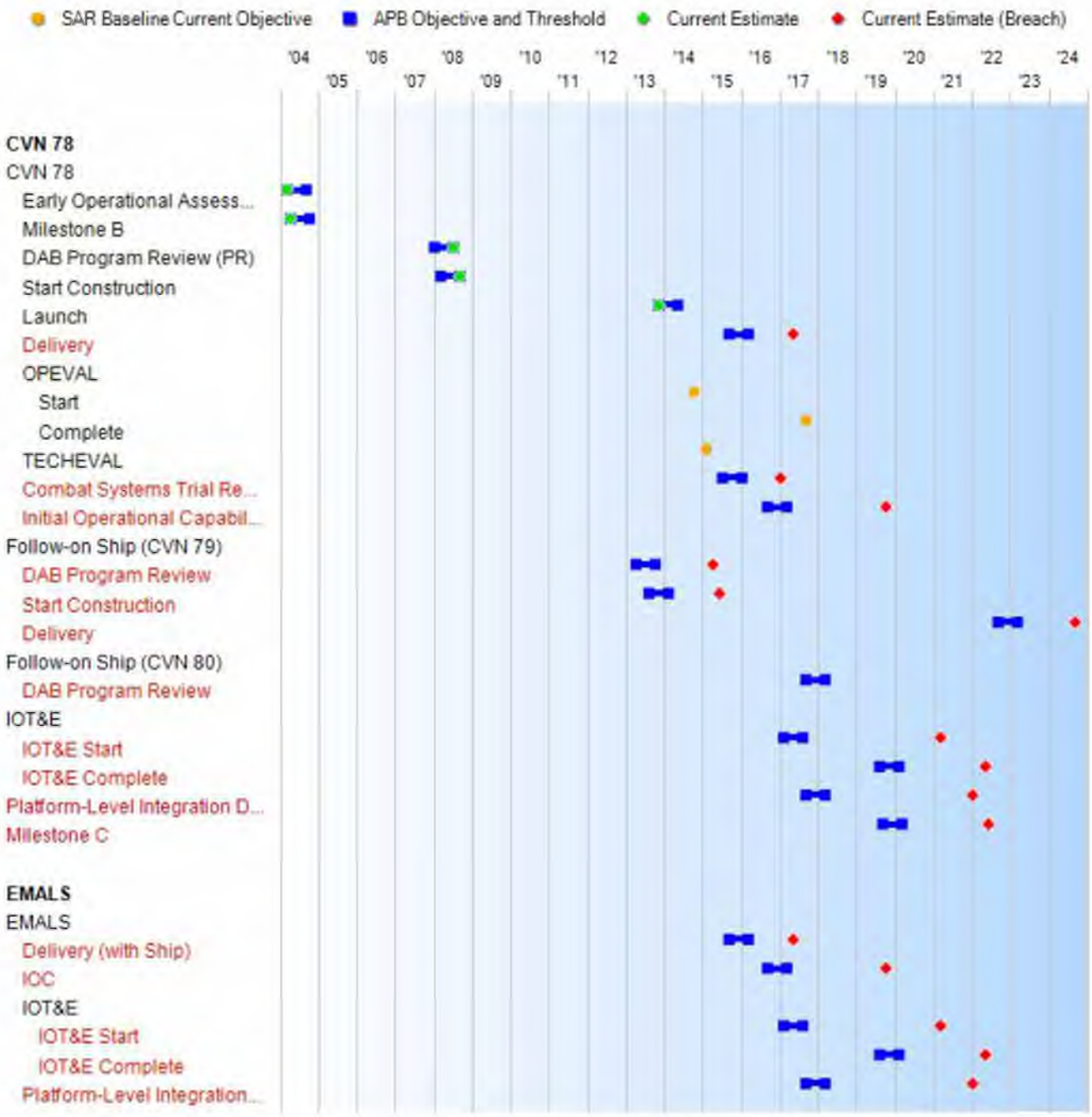
APB Breaches		
Schedule		☑
Performance		☐
Cost	RDT&E	☑
	Procurement	☐
	MILCON	☐
	Acq O&M	☐
O&S Cost		☑
Unit Cost	PAUC	☐
	APUC	☐

Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Explanation of Breach

The schedule, RDT&E cost, and O&S cost breaches were previously reported in the June 2018 SAR. An APB revising the schedule and class costs for the FORD Class is in process.

Schedule


SAR Baseline Current Objective
APB Objective and Threshold
Current Estimate
Current Estimate (Breach)
'04
'05
'06
'07
'08
'09
'10
'11
'12
'13
'14
'15
'16
'17
'18
'19
'20
'21
'22
'23
'24
CVN 78
CVN 78
Early Operational Assess...
Milestone B
DAB Program Review (PR)
Start Construction
Launch
Delivery
OPEVAL
Start
Complete
TECHEVAL
Combat Systems Trial Re...
Initial Operational Capabil...
Follow-on Ship (CVN 79)
DAB Program Review
Start Construction
Delivery
Follow-on Ship (CVN 80)
DAB Program Review
IOT&E
IOT&E Start
IOT&E Complete
Platform-Level Integration D...
Milestone C
EMALS
EMALS
Delivery (with Ship)
IOC
IOT&E
IOT&E Start
IOT&E Complete
Platform-Level Integration...

CVN 78

Schedule Events					
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	
CVN 78					
Early Operational Assessment	Mar 2004	Mar 2004	Sep 2004	Mar 2004	
Milestone B	Apr 2004	Apr 2004	Oct 2004	Apr 2004	
DAB Program Review (PR)	Jan 2006	Jan 2008	Jul 2008	Jul 2008	
Start Construction	Jan 2007	Mar 2008	Sep 2008	Sep 2008	
Launch	Nov 2012	Nov 2013	May 2014	Nov 2013	
Delivery	Sep 2014	Sep 2015	Mar 2016	**May 2017**[1]	
OPEVAL					
Start	Oct 2014	N/A	N/A	N/A	
Complete	Sep 2017	N/A	N/A	N/A	
TECHEVAL	Feb 2015	N/A	N/A	N/A	
Combat Systems Trial Rehearsal (CSTR)	Jul 2014	Jul 2015	Jan 2016	**Jan 2017**[1]	
Initial Operational Capability (IOC)	Sep 2015	Sep 2016	Mar 2017	**Oct 2019**[1]	(Ch-1)
Follow-on Ship (CVN 79)					
DAB Program Review	Jan 2010	Apr 2013	Oct 2013	**Apr 2015**[1]	
Start Construction	Jan 2011	Aug 2013	Feb 2014	**Jun 2015**[1]	
Delivery	Sep 2018	Sep 2022	Mar 2023	**Sep 2024**[1]	
Follow-on Ship (CVN 80)					
DAB Program Review	Jan 2015	Sep 2017	Mar 2018	**N/A**[1]	(Ch-2)
IOT&E					
IOT&E Start	N/A	Feb 2017	Aug 2017	**Mar 2021**[1]	(Ch-3)
IOT&E Complete	N/A	Aug 2019	Feb 2020	**May 2022**[1]	
Platform-Level Integration DT Period Complete	N/A	Sep 2017	Mar 2018	**Jan 2022**[1]	(Ch-3)
Milestone C	Mar 2017	Sep 2019	Mar 2020	**Jun 2022**[1]	

[1] *APB Breach*

Change Explanations

(Ch-1) The current estimate for IOC changed from July 2019 to October 2019 to reflect the extension of the Post Shakedown Availability (PSA) completion date to complete work on the Advanced Weapons Elevators (AWE), other platform systems, and the propulsion plant.
(Ch-2) The current estimate for Follow-on Ship (CVN 80) DAB Program Review changed from November 2018 to N/A to reflect the program re-designation to ACAT 1C in January 2018. In lieu of DAB Program Review, the Secretary of Defense provided a detailed certification package in support of the CVN 80/81 two-ship buy Detailed Design and Construction contract to the Congressional defense committees on December 31, 2018. This event will be deleted in the next APB change request.
(Ch-3) The current estimate for IOT&E Start and Platform-Level Integration DT Period Complete changed from January 2021 to March 2021 and October 2021 to January 2022, respectively, to reflect a schedule shift due to delay in CVN 78 delivery and extension of shakedown period.

Notes

OWLD for CVN 78 is January 2020 and OWLD for CVN 79 is October 2025.

CVN 78 IOC is defined in the ORD (Change 2) for the Future Aircraft Carrier CVN 21 of June 22, 2007 (revalidated by JROC on April 27, 2015) as successful completion of Post Shakedown Availability.

Acronyms and Abbreviations

CAE - Component Acquisition Executive
DD&C - Detail Design and Construction
DT - Developmental Testing
IOT&E - Initial Operational Test & Evaluation
OPEVAL - Operational Evaluation
OWLD - Obligation Work Limiting Date
TECHEVAL - Technical Evaluation

EMALS

Schedule Events					
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	
EMALS					
Delivery (with Ship)	Sep 2015	Sep 2015	Mar 2016	May 2017[1]	
IOC	Sep 2016	Sep 2016	Mar 2017	Oct 2019[1]	(Ch-1)
IOT&E					
IOT&E Start	Feb 2017	Feb 2017	Aug 2017	Mar 2021[1]	(Ch-2)
IOT&E Complete	Aug 2019	Aug 2019	Feb 2020	May 2022[1]	
Platform-Level Integration DT Period Complete	Sep 2017	Sep 2017	Mar 2018	Jan 2022[1]	(Ch-2)

[1] *APB Breach*

Change Explanations

(Ch-1) The current estimate for IOC changed from July 2019 to October 2019 to reflect the extension of the Post Shakedown Availability (PSA) completion date to complete work on the Advanced Weapons Elevators (AWE), other platform systems, and the propulsion plant.
(Ch-2) The current estimate for IOT&E Start and Platform-Level Integration DT Period Complete changed from January 2021 to March 2021 and October 2021 to January 2022, respectively, to reflect a schedule shift due to delay in CVN 78 delivery and extension of shakedown period.

Acronyms and Abbreviations

DT - Developmental Test
IOC - Initial Operational Capability
IOT&E - Initial Operational Test & Evaluation

Performance

CVN 78

Performance Characteristics				
SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Demonstrated Performance	Current Estimate
CVN 78 Class				
Interoperability				
Note 2	N/A	N/A	TBD	N/A
Sustained Sortie Rate				
220	220	160	TBD	172
Surge Sortie Rate				
310	310	270	TBD	284
Ship Service Electrical Generating Capacity (times NIMITZ Class capacity in MW)				
3.0	3.0	2.5	TBD	2.7
Weight Service Life Allowance (% of full load displacement in long tons)				
7.5	7.5	5.0	TBD	5.9
Stability Service Life Allowance (feet)				
2.5	2.5	1.5	TBD	1.5
Ship's Force Manpower (billets)				
2391	2391	2791	TBD	2716
Follow-on Ship				
Interoperability				
Note 2	N/A	N/A	N/A	N/A
Sustained Sortie Rate				
220	N/A	N/A	N/A	N/A
Surge Sortie Rate				
310	N/A	N/A	N/A	N/A
Service Electrical Generating Capacity (times NIMITZ Class capacity in MW)				
3.0	N/A	N/A	N/A	N/A
Weight Service Life Allowance (% of full load displacement in long tons)				
7.5	N/A	N/A	N/A	N/A
Stability Service Life Allowance (feet)				
2.5	N/A	N/A	N/A	N/A
Ship's Force Manpower (billets)				

2391	N/A	N/A	N/A	N/A
Force Protection and Survivability in an Asymmetric Threat Environment				
Survivability				
N/A	Level III as defined by OPNAV Instruction 9070.1	Level II as defined by OPNAV Instruction 9070.1 with the exception of Collective Protection System	TBD	Level II as defined by OPNAV Instruction 9070.1 with the exception of Collective Protection System
Net-Ready				
N/A	Meets 100% of top level IERs	Meets 100% of top level IERs designated as critical	TBD	Meets 100% of top level IERs designated as critical

Classified Performance information is provided in the classified annex to this submission.

Requirements Reference

Operational Requirements Document (ORD) Change 2 dated June 22, 2007

Change Explanations

None

Notes

CVN 78 performance Threshold and Objectives apply to all ships in the class. Current estimates for the follow-on ship will be updated, if different from the lead ship, when they become available.

For additional description regarding CVN 78 and follow-on ship Interoperability and other Performance Characteristics, see Table 4.4, KPPs, contained in the Future Aircraft Carrier (CVN 21) ORD Change 2 dated June 22, 2007.

CVN 21 ORD Change 2 dated June 22, 2007 was revalidated by the JROC on April 27, 2015.

Acronyms and Abbreviations

CBR - Chemical, Biological, Radiological
IER - Interoperability Exchange Requirement
MW - Megawatt
OPNAV - Chief of Naval Operations

EMALS

Performance Characteristics				
SAR Baseline Development Estimate	**Current APB Development Objective/Threshold**		**Demonstrated Performance**	**Current Estimate**
See Note				
N/A	N/A	N/A	TBD	N/A

Requirements Reference

Operational Requirements Document (ORD) Change 2 dated June 22, 2007

Change Explanations

None

Notes

CVN 78 performance Threshold and Objectives apply to all ships in the class. Current estimates for the follow-on ship will be updated, if different from the lead ship, when they become available.

For additional description regarding CVN 78 and follow-on ship Interoperability and other Performance Characteristics, see Table 4.4, KPPs, contained in the Future Aircraft Carrier (CVN 21) ORD Change 2 dated June 22, 2007.

CVN 21 ORD Change 2 dated June 22, 2007 was revalidated by the JROC on April 27, 2015.

Track to Budget

CVN 78

RDT&E

Appn		BA	PE		
Navy	1319	04	0603512N		
	Project		**Name**		
	10C098		Composite Mast for CVN's		(Sunk)
	2208		CVN 21	(Shared)	(Sunk)
	2678		Tech Insertion		(Sunk)
	2693		Ship System Definition		(Sunk)
	4006		CVN 79		(Sunk)
	9181		Adv Battlestations/DSS		(Sunk)
	9349		Aviation Ship Integration Center		(Sunk)
	9516		Surface Ship Composite Moisture Separators		(Sunk)
	9B57A		Carrier Plant Automation and Manning Reduction		(Sunk)
Navy	1319	04	0603564N		
	Project		**Name**		
	2230		CV Feasibility Studies		(Sunk)
	4230		CVNX 1		(Sunk)
Navy	1319	04	0603570N		
	Project		**Name**		
	2692		Advance Nuclear Power System/CVN 21 Propulsion Plant Development		(Sunk)
Navy	1319	04	0604112N		
	Project		**Name**		
	2208		CVN 21		
	9999		Congressional Add: CVN-78 Shock Trials		(Sunk)
	C491		CVN 78 Full Ship Shock Trial		
Navy	1319	05	0604567N		
	Project		**Name**		
	2301		Contract Design		(Sunk)
	3108		CVN 80 Total Ship Integration		
	3179		CVN 79 Total Ship Integration		
	4007		CVN 21 LFT&E		
	4008		CVN 21 Total Ship Integration		(Sunk)
	9999		Congressional Add: CVN Cost Reduction Activities		(Sunk)
	9C20A		Automated Fiber Optic Manufacturing Initiative		(Sunk)

Procurement

Appn	BA	PE

Navy 1611 02 0702898N

Line Item	Name	
2001	Carrier Replacement Program	(Shared)

Navy 1611 02 0204112N

Line Item	Name	
2001	Carrier Replacement Program	(Shared)

Navy 1611 05 0204112N

Line Item	Name	
5110	Outfitting	(Shared)
5300	Completion of Prior Year Shipbuilding	(Sunk)

Navy 1810 04 0204112N

Line Item	Name	
5664	Surface Training Equipment	(Shared)

MILCON

Appn	BA	PE
Navy 1205	01	0203176N

Project	Name	
62688500	Pier 11 CVN-78 Power Booms	(Sunk)

Navy 1205 01 0702776N

Project	Name	
32443998	Drydock 8 Electrical Distribution Upgrade	(Sunk)

Navy 1205 01 0712776N

Project	Name
32443678	Dry Dock Saltwater System - CVN 78

Acq O&M

Appn	BA	PE
Navy 1804	01	0204112N

Subactivity Group	Name	
1B1B	Ship Operations	(Shared)

Navy 1804 01 0702827N

Subactivity Group	Name	
1B2B	Ship Operational Support and Training	(Shared)

EMALS

RDT&E

Appn	BA	PE
Navy 1319	04	0603512N

Project	Name		
2208	CVN 21	(Shared)	(Sunk)
4004	EMALS		(Sunk)
9B58A	Improved Corrosion Protection for EMALS		(Sunk)
9D24A	EMALS Congressional Add		(Sunk)

Appn	BA	PE
Navy	1319 04	0604112N

Project	Name
4004	EMALS

Procurement

Appn	BA	PE
Navy	1611 02	0204112N

Line Item	Name	
2001	Carrier Replacement Program	(Shared)

MILCON

Appn	BA	PE
Navy	1205 01	0212176N

Project	Name	
N0400024	EMALS Facility	(Sunk)

Cost and Funding

Cost Summary - Total Program

Total Acquisition Cost - Total Program							
Appropriation	BY 2000 $M			BY 2000 $M	TY $M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	3875.3	4123.4	--	4576.3	4333.4	4744.6	5576.8
Procurement	24825.9	24357.7	--	29269.7	31748.7	33258.8	50638.2
Flyaway	--	--	--	29242.9	--	--	50599.3
Recurring	--	--	--	26070.9	--	--	45937.9
Non Recurring	--	--	--	3172.0	--	--	4661.4
Support	--	--	--	26.8	--	--	38.9
Other Support	--	--	--	26.8	--	--	38.9
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	152.0	--	78.2	0.0	208.5	107.3
Acq O&M	0.0	0.0	--	94.5	0.0	0.0	131.3
Total	28701.2	28633.1	N/A	34018.7	36082.1	38211.9	56453.6

Cost and Funding

Cost Summary - CVN 78

Total Acquisition Cost - CVN 78							
Appropriation	BY 2000 $M			BY 2000 $M	TY $M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	3490.6	3472.2	3819.4	3739.9	3923.0	3999.8	4581.3
Procurement	24235.0	22764.3	25040.7	27865.9[1]	30977.4	30808.7	48171.4
Flyaway	--	--	--	27839.1	--	--	48132.5
Recurring	--	--	--	24667.1	--	--	43471.1
Non Recurring	--	--	--	3172.0	--	--	4661.4
Support	--	--	--	26.8	--	--	38.9
Other Support	--	--	--	26.8	--	--	38.9
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	133.2	146.5	59.4	0.0	187.8	86.6
Acq O&M	0.0	0.0	--	94.5	0.0	0.0	131.3
Total	27725.6	26369.7	N/A	31759.7	34900.4	34996.3	52970.6

[1] *APB Breach*

Cost Notes

If an Independent Cost Estimate, Component Cost Estimate, or Program Office Estimate has been completed for the program in the previous year, list any program risks identified in the estimates, the potential impacts of the risks on program cost, and approaches to mitigate the risks.

No cost estimate has been completed in the last year.

In accordance with Section 121(b) of the Fiscal Year 2019 National Defense Authorization Act (NDAA) (Public Law 115-232), the Secretary of Defense provided a detailed certification package in support of the CVN 80/81 two-ship buy Detailed Design and Construction contract to the Congressional defense committees on December 31, 2018.

The two-ship acquisition strategy resulted in $4 billion in procurement saving on CVN 80 and CVN 81 compared to the Navy single-ship estimates. The FY 2019 APB update will provide an update on all class costs for the FORD Class.

Total Quantity - CVN 78			
Quantity	SAR Baseline Development Estimate	Current APB Development	Current Estimate
RDT&E	0	0	0
Procurement	3	3	4
Total	3	3	4

Cost Summary - EMALS

Total Acquisition Cost - EMALS							
Appropriation	BY 2000 $M			BY 2000 $M	TY $M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	384.7	651.2	748.9	836.4[1]	410.4	744.8	995.5
Procurement	590.9	1593.4	1752.7	1403.8	771.3	2450.1	2466.8
Flyaway	--	--	--	1403.8	--	--	2466.8
Recurring	--	--	--	1403.8	--	--	2466.8
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	18.8	20.7	18.8	0.0	20.7	20.7
Acq O&M	0.0	0.0	--	0.0	0.0	0.0	0.0
Total	975.6	2263.4	N/A	2259.0	1181.7	3215.6	3483.0

[1] *APB Breach*

Cost Notes

If an Independent Cost Estimate, Component Cost Estimate, or Program Office Estimate has been completed for the program in the previous year, list any program risks identified in the estimates, the potential impacts of the risks on program cost, and approaches to mitigate the risks.

No cost estimate has been completed in the last year.

In accordance with Section 121(b) of the Fiscal Year 2019 National Defense Authorization Act (NDAA) (Public Law 115-232), the Secretary of Defense provided a detailed certification package in support of the CVN 80/81 two-ship buy Detailed Design and Construction contract to the Congressional defense committees on December 31, 2018.

The two-ship acquisition strategy resulted in $4 billion in procurement saving on CVN 80 and CVN 81 compared to the Navy single-ship estimates. The FY 2019 APB update will provide an update on all class costs for the FORD Class.

Total Quantity - EMALS			
Quantity	SAR Baseline Development Estimate	Current APB Development	Current Estimate
RDT&E	0	0	0
Procurement	3	3	4
Total	3	3	4

Cost and Funding

Funding Summary - Total Program

Appropriation Summary									
FY 2020 President's Budget / December 2018 SAR (TY$ M)									
Appropriation	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
RDT&E	4413.7	133.2	163.9	143.4	117.3	115.7	101.4	388.2	5576.8
Procurement	28553.5	1608.2	2443.2	2670.1	2333.1	1947.8	1737.1	9345.2	50638.2
MILCON	56.9	0.0	0.0	0.0	50.4	0.0	0.0	0.0	107.3
Acq O&M	92.5	9.0	7.3	5.3	5.6	5.7	5.9	0.0	131.3
PB 2020 Total	33116.6	1750.4	2614.4	2818.8	2506.4	2069.2	1844.4	9733.4	56453.6
PB 2019 Total	33228.0	1774.8	2269.5	3360.7	3004.2	3490.9	2386.3	9124.6	58639.0
Delta	-111.4	-24.4	344.9	-541.9	-497.8	-1421.7	-541.9	608.8	-2185.4

Cost and Funding

Funding Summary - CVN 78

Appropriation Summary FY 2020 President's Budget / December 2018 SAR (TY$ M)									
Appropriation	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
RDT&E	3472.9	100.1	146.4	139.3	117.3	115.7	101.4	388.2	4581.3
Procurement	26904.7	1583.4	2327.4	2593.8	2180.9	1876.9	1638.5	9065.8	48171.4
MILCON	36.2	0.0	0.0	0.0	50.4	0.0	0.0	0.0	86.6
Acq O&M	92.5	9.0	7.3	5.3	5.6	5.7	5.9	0.0	131.3
PB 2020 Total	30506.3	1692.5	2481.1	2738.4	2354.2	1998.3	1745.8	9454.0	52970.6
PB 2019 Total	30832.0	1509.3	2129.6	3275.6	2984.5	3298.5	2092.3	8949.3	55071.1
Delta	-325.7	183.2	351.5	-537.2	-630.3	-1300.2	-346.5	504.7	-2100.5

Quantity Summary FY 2020 President's Budget / December 2018 SAR (TY$ M)										
Quantity	Undistributed	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	3	0	1	0	0	0	0	0	4
PB 2020 Total	0	3	0	1	0	0	0	0	0	4
PB 2019 Total	0	3	0	0	0	0	1	0	0	4
Delta	0	0	0	1	0	0	-1	0	0	0

Funding Summary - EMALS

Appropriation Summary FY 2020 President's Budget / December 2018 SAR (TY$ M)									
Appropriation	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
RDT&E	940.8	33.1	17.5	4.1	0.0	0.0	0.0	0.0	995.5
Procurement	1648.8	24.8	115.8	76.3	152.2	70.9	98.6	279.4	2466.8
MILCON	20.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.7
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2020 Total	2610.3	57.9	133.3	80.4	152.2	70.9	98.6	279.4	3483.0
PB 2019 Total	2396.0	265.5	139.9	85.1	19.7	192.4	294.0	175.3	3567.9
Delta	214.3	-207.6	-6.6	-4.7	132.5	-121.5	-195.4	104.1	-84.9

Quantity Summary FY 2020 President's Budget / December 2018 SAR (TY$ M)										
Quantity	Undistributed	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	3	0	1	0	0	0	0	0	4
PB 2020 Total	0	3	0	1	0	0	0	0	0	4
PB 2019 Total	0	3	0	0	0	0	1	0	0	4
Delta	0	0	0	1	0	0	-1	0	0	0

Cost and Funding

Annual Funding By Appropriation - CVN 78

Annual Funding - CVN 78 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
1997	--	--	--	--	--	--	0.9
1998	--	--	--	--	--	--	46.1
1999	--	--	--	--	--	--	83.3
2000	--	--	--	--	--	--	136.8
2001	--	--	--	--	--	--	189.5
2002	--	--	--	--	--	--	240.5
2003	--	--	--	--	--	--	272.4
2004	--	--	--	--	--	--	268.8
2005	--	--	--	--	--	--	300.3
2006	--	--	--	--	--	--	245.5
2007	--	--	--	--	--	--	229.5
2008	--	--	--	--	--	--	191.5
2009	--	--	--	--	--	--	201.8
2010	--	--	--	--	--	--	179.6
2011	--	--	--	--	--	--	119.9
2012	--	--	--	--	--	--	113.3
2013	--	--	--	--	--	--	104.3
2014	--	--	--	--	--	--	103.8
2015	--	--	--	--	--	--	122.6
2016	--	--	--	--	--	--	101.4
2017	--	--	--	--	--	--	111.3
2018	--	--	--	--	--	--	109.8
2019	--	--	--	--	--	--	100.1
2020	--	--	--	--	--	--	146.4
2021	--	--	--	--	--	--	139.3
2022	--	--	--	--	--	--	117.3
2023	--	--	--	--	--	--	115.7
2024	--	--	--	--	--	--	101.4
2025	--	--	--	--	--	--	102.6
2026	--	--	--	--	--	--	104.8
2027	--	--	--	--	--	--	89.5
2028	--	--	--	--	--	--	91.3
Subtotal	--	--	--	--	--	--	4581.3

Annual Funding - CVN 78 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	BY 2000 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
1997	--	--	--	--	--	--	0.9
1998	--	--	--	--	--	--	46.9
1999	--	--	--	--	--	--	83.7
2000	--	--	--	--	--	--	135.5
2001	--	--	--	--	--	--	185.1
2002	--	--	--	--	--	--	232.6
2003	--	--	--	--	--	--	259.6
2004	--	--	--	--	--	--	249.2
2005	--	--	--	--	--	--	271.3
2006	--	--	--	--	--	--	215.1
2007	--	--	--	--	--	--	196.2
2008	--	--	--	--	--	--	160.8
2009	--	--	--	--	--	--	167.3
2010	--	--	--	--	--	--	146.7
2011	--	--	--	--	--	--	95.7
2012	--	--	--	--	--	--	88.9
2013	--	--	--	--	--	--	81.0
2014	--	--	--	--	--	--	79.5
2015	--	--	--	--	--	--	92.7
2016	--	--	--	--	--	--	75.3
2017	--	--	--	--	--	--	81.2
2018	--	--	--	--	--	--	78.5
2019	--	--	--	--	--	--	70.2
2020	--	--	--	--	--	--	100.6
2021	--	--	--	--	--	--	93.8
2022	--	--	--	--	--	--	77.5
2023	--	--	--	--	--	--	74.9
2024	--	--	--	--	--	--	64.4
2025	--	--	--	--	--	--	63.9
2026	--	--	--	--	--	--	63.9
2027	--	--	--	--	--	--	53.5
2028	--	--	--	--	--	--	53.5
Subtotal	--	--	--	--	--	--	3739.9

Annual Funding - CVN 78 1611 | Procurement | Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2001	--	21.7	--	--	21.7	--	21.7
2002	--	135.3	--	--	135.3	--	135.3
2003	--	243.7	--	151.8	395.5	--	395.5
2004	--	955.2	--	207.7	1162.9	--	1162.9
2005	--	274.4	--	348.7	623.1	--	623.1
2006	--	241.6	--	377.3	618.9	--	618.9
2007	--	358.3	--	424.5	782.8	--	782.8
2008	1	1774.6	--	1008.4	2783.0	--	2783.0
2009	--	3659.1	--	58.8	3717.9	--	3717.9
2010	--	921.5	--	274.1	1195.6	--	1195.6
2011	--	1872.0	--	553.8	2425.8	--	2425.8
2012	--	453.6	--	101.2	554.8	--	554.8
2013	1	398.8	--	82.7	481.5	--	481.5
2014	--	1214.8	--	267.3	1482.1	--	1482.1
2015	--	1652.1	--	93.7	1745.8	--	1745.8
2016	--	2314.3	--	122.4	2436.7	--	2436.7
2017	--	2357.3	--	119.8	2477.1	--	2477.1
2018	1	3752.0	--	95.7	3847.7	--	3847.7
2019	--	1478.1	--	97.4	1575.5	--	1575.5
2020	1	2230.8	--	95.2	2326.0	--	2326.0
2021	--	2498.1	--	91.0	2589.1	--	2589.1
2022	--	2126.3	--	51.8	2178.1	--	2178.1
2023	--	1836.0	--	38.1	1874.1	--	1874.1
2024	--	1635.7	--	--	1635.7	--	1635.7
2025	--	3119.0	--	--	3119.0	--	3119.0
2026	--	1955.0	--	--	1955.0	--	1955.0
2027	--	1881.2	--	--	1881.2	--	1881.2
2028	--	1734.8	--	--	1734.8	--	1734.8
2029	--	126.3	--	--	126.3	--	126.3
2030	--	48.3	--	--	48.3	--	48.3
2031	--	25.6	--	--	25.6	--	25.6
2032	--	76.9	--	--	76.9	--	76.9
2033	--	98.7	--	--	98.7	--	98.7
Subtotal	4	43471.1	--	4661.4	48132.5	--	48132.5

Annual Funding - CVN 78 1611 | Procurement | Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	BY 2000 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2001	--	19.7	--	--	19.7	--	19.7
2002	--	122.0	--	--	122.0	--	122.0
2003	--	207.7	--	129.4	337.1	--	337.1
2004	--	785.7	--	170.9	956.6	--	956.6
2005	--	216.1	--	274.7	490.8	--	490.8
2006	--	183.8	--	287.1	470.9	--	470.9
2007	--	260.6	--	308.8	569.4	--	569.4
2008	1	1248.4	--	709.3	1957.7	--	1957.7
2009	--	2497.6	--	40.2	2537.8	--	2537.8
2010	--	607.9	--	180.8	788.7	--	788.7
2011	--	1195.7	--	353.7	1549.4	--	1549.4
2012	--	283.3	--	63.2	346.5	--	346.5
2013	1	244.1	--	50.6	294.7	--	294.7
2014	--	729.6	--	160.5	890.1	--	890.1
2015	--	972.0	--	55.1	1027.1	--	1027.1
2016	--	1333.9	--	70.5	1404.4	--	1404.4
2017	--	1331.1	--	67.7	1398.8	--	1398.8
2018	1	2076.9	--	53.0	2129.9	--	2129.9
2019	--	802.2	--	52.8	855.0	--	855.0
2020	1	1186.9	--	50.7	1237.6	--	1237.6
2021	--	1303.1	--	47.4	1350.5	--	1350.5
2022	--	1087.4	--	26.5	1113.9	--	1113.9
2023	--	920.5	--	19.1	939.6	--	939.6
2024	--	804.0	--	--	804.0	--	804.0
2025	--	1503.0	--	--	1503.0	--	1503.0
2026	--	923.6	--	--	923.6	--	923.6
2027	--	871.3	--	--	871.3	--	871.3
2028	--	787.8	--	--	787.8	--	787.8
2029	--	56.2	--	--	56.2	--	56.2
2030	--	21.1	--	--	21.1	--	21.1
2031	--	11.0	--	--	11.0	--	11.0
2032	--	32.3	--	--	32.3	--	32.3
2033	--	40.6	--	--	40.6	--	40.6
Subtotal	4	24667.1	--	3172.0	27839.1	--	27839.1

Navy plans to build 11 CVN 78 Class ships to replace CVN 65 and CVN 68 Class ships.

Cost Quantity Information

Updated funding table to reflect the FY 2020 budget.

The two-ship acquisition strategy resulted in $4B in procurement saving on CVN 80 and CVN 81 compared to the Navy single ship estimates. The FY 2019 APB update will provide an update on all class costs for the FORD Class.

Cost Quantity Information - CVN 78 1611 | Procurement | Shipbuilding and Conversion, Navy		
Fiscal Year	**Quantity**	**End Item Recurring Flyaway (Aligned With Quantity) BY 2000 $M**
2001	--	--
2002	--	--
2003	--	--
2004	--	--
2005	--	--
2006	--	--
2007	--	--
2008	1	6560.7
2009	--	--
2010	--	--
2011	--	--
2012	--	--
2013	1	6060.1
2014	--	--
2015	--	--
2016	--	--
2017	--	--
2018	1	6064.4
2019	--	--
2020	1	5981.9
2021	--	--
2022	--	--
2023	--	--
2024	--	--
2025	--	--
2026	--	--
2027	--	--
2028	--	--
2029	--	--
2030	--	--
2031	--	--
2032	--	--
2033	--	--
Subtotal	4	24667.1

Annual Funding - CVN 78 1810 | Procurement | Other Procurement, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2017	--	--	--	--	--	4.5	4.5
2018	--	--	--	--	--	12.0	12.0
2019	--	--	--	--	--	7.9	7.9
2020	--	--	--	--	--	1.4	1.4
2021	--	--	--	--	--	4.7	4.7
2022	--	--	--	--	--	2.8	2.8
2023	--	--	--	--	--	2.8	2.8
2024	--	--	--	--	--	2.8	2.8
Subtotal	--	--	--	--	--	38.9	38.9

Annual Funding - CVN 78 1810 | Procurement | Other Procurement, Navy							
Fiscal Year	Quantity	BY 2000 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2017	--	--	--	--	--	3.3	3.3
2018	--	--	--	--	--	8.5	8.5
2019	--	--	--	--	--	5.5	5.5
2020	--	--	--	--	--	1.0	1.0
2021	--	--	--	--	--	3.1	3.1
2022	--	--	--	--	--	1.8	1.8
2023	--	--	--	--	--	1.8	1.8
2024	--	--	--	--	--	1.8	1.8
Subtotal	--	--	--	--	--	26.8	26.8

Annual Funding - CVN 78 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	TY $M
	Total Program
2013	32.8
2014	3.4
2015	--
2016	--
2017	--
2018	--
2019	--
2020	--
2021	--
2022	50.4
Subtotal	86.6

Annual Funding - CVN 78 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	BY 2000 $M
	Total Program
2013	24.9
2014	2.5
2015	--
2016	--
2017	--
2018	--
2019	--
2020	--
2021	--
2022	32.0
Subtotal	59.4

Annual Funding - CVN 78 1804 | Acq O&M | Operation and Maintenance, Navy	
Fiscal Year	TY $M
	Total Program
2015	4.8
2016	25.5
2017	41.5
2018	20.7
2019	9.0
2020	7.3
2021	5.3
2022	5.6
2023	5.7
2024	5.9
Subtotal	131.3

Annual Funding - CVN 78 1804 | Acq O&M | Operation and Maintenance, Navy	
Fiscal Year	BY 2000 $M
	Total Program
2015	3.7
2016	19.1
2017	30.5
2018	14.9
2019	6.4
2020	5.1
2021	3.6
2022	3.7
2023	3.7
2024	3.8
Subtotal	94.5

Annual Funding By Appropriation - EMALS

Annual Funding - EMALS 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2000	--	--	--	--	--	--	41.0
2001	--	--	--	--	--	--	41.0
2002	--	--	--	--	--	--	41.0
2003	--	--	--	--	--	--	44.2
2004	--	--	--	--	--	--	37.2
2005	--	--	--	--	--	--	49.4
2006	--	--	--	--	--	--	56.8
2007	--	--	--	--	--	--	108.2
2008	--	--	--	--	--	--	40.5
2009	--	--	--	--	--	--	113.2
2010	--	--	--	--	--	--	90.9
2011	--	--	--	--	--	--	59.1
2012	--	--	--	--	--	--	31.0
2013	--	--	--	--	--	--	54.9
2014	--	--	--	--	--	--	46.9
2015	--	--	--	--	--	--	11.3
2016	--	--	--	--	--	--	12.2
2017	--	--	--	--	--	--	36.8
2018	--	--	--	--	--	--	25.2
2019	--	--	--	--	--	--	33.1
2020	--	--	--	--	--	--	17.5
2021	--	--	--	--	--	--	4.1
Subtotal	--	--	--	--	--	--	995.5

Annual Funding - EMALS 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	BY 2000 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2000	--	--	--	--	--	--	40.6
2001	--	--	--	--	--	--	40.0
2002	--	--	--	--	--	--	39.6
2003	--	--	--	--	--	--	42.1
2004	--	--	--	--	--	--	34.5
2005	--	--	--	--	--	--	44.6
2006	--	--	--	--	--	--	49.8
2007	--	--	--	--	--	--	92.5
2008	--	--	--	--	--	--	34.0
2009	--	--	--	--	--	--	93.9
2010	--	--	--	--	--	--	74.3
2011	--	--	--	--	--	--	47.2
2012	--	--	--	--	--	--	24.3
2013	--	--	--	--	--	--	42.6
2014	--	--	--	--	--	--	35.9
2015	--	--	--	--	--	--	8.5
2016	--	--	--	--	--	--	9.1
2017	--	--	--	--	--	--	26.9
2018	--	--	--	--	--	--	18.0
2019	--	--	--	--	--	--	23.2
2020	--	--	--	--	--	--	12.0
2021	--	--	--	--	--	--	2.8
Subtotal	--	--	--	--	--	--	836.4

Annual Funding - EMALS 1611 | Procurement | Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2007	--	5.8	--	--	5.8	--	5.8
2008	1	25.6	--	--	25.6	--	25.6
2009	--	177.2	--	--	177.2	--	177.2
2010	--	138.6	--	--	138.6	--	138.6
2011	--	251.8	--	--	251.8	--	251.8
2012	--	--	--	--	--	--	--
2013	1	12.6	--	--	12.6	--	12.6
2014	--	65.3	--	--	65.3	--	65.3
2015	--	206.3	--	--	206.3	--	206.3
2016	--	218.4	--	--	218.4	--	218.4
2017	--	151.8	--	--	151.8	--	151.8
2018	1	395.4	--	--	395.4	--	395.4
2019	--	24.8	--	--	24.8	--	24.8
2020	1	115.8	--	--	115.8	--	115.8
2021	--	76.3	--	--	76.3	--	76.3
2022	--	152.2	--	--	152.2	--	152.2
2023	--	70.9	--	--	70.9	--	70.9
2024	--	98.6	--	--	98.6	--	98.6
2025	--	89.0	--	--	89.0	--	89.0
2026	--	190.4	--	--	190.4	--	190.4
Subtotal	4	2466.8	--	--	2466.8	--	2466.8

Annual Funding - EMALS 1611 | Procurement | Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	BY 2000 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2007	--	4.2	--	--	4.2	--	4.2
2008	1	18.0	--	--	18.0	--	18.0
2009	--	121.0	--	--	121.0	--	121.0
2010	--	91.4	--	--	91.4	--	91.4
2011	--	160.8	--	--	160.8	--	160.8
2012	--	--	--	--	--	--	--
2013	1	7.7	--	--	7.7	--	7.7
2014	--	39.2	--	--	39.2	--	39.2
2015	--	121.4	--	--	121.4	--	121.4
2016	--	125.9	--	--	125.9	--	125.9
2017	--	85.7	--	--	85.7	--	85.7
2018	1	218.9	--	--	218.9	--	218.9
2019	--	13.5	--	--	13.5	--	13.5
2020	1	61.6	--	--	61.6	--	61.6
2021	--	39.8	--	--	39.8	--	39.8
2022	--	77.8	--	--	77.8	--	77.8
2023	--	35.5	--	--	35.5	--	35.5
2024	--	48.5	--	--	48.5	--	48.5
2025	--	42.9	--	--	42.9	--	42.9
2026	--	90.0	--	--	90.0	--	90.0
Subtotal	4	1403.8	--	--	1403.8	--	1403.8

Cost Quantity Information

The Navy was successful in using Firm Fixed Price (FFP) Contracting for EMALS on the CVN 78 to control costs and has utilized the same contracting approach for the CVN 79/80 Production contract and will use the same approach for CVN 81.

Cost Quantity Information - EMALS 1611 | Procurement | Shipbuilding and Conversion, Navy		
Fiscal Year	**Quantity**	**End Item Recurring Flyaway (Aligned With Quantity) BY 2000 $M**
2007	--	--
2008	1	434.7
2009	--	--
2010	--	--
2011	--	--
2012	--	--
2013	1	347.0
2014	--	--
2015	--	--
2016	--	--
2017	--	--
2018	1	330.1
2019	--	--
2020	1	292.0
2021	--	--
2022	--	--
2023	--	--
2024	--	--
2025	--	--
2026	--	--
Subtotal	4	1403.8

Annual Funding - EMALS 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	TY $M Total Program
2004	20.7
Subtotal	20.7

Annual Funding - EMALS 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	BY 2000 $M
	Total Program
2004	18.8
Subtotal	18.8

Low Rate Initial Production

CVN 78

Item	Initial LRIP Decision	Current Total LRIP
Approval Date	4/26/2004	4/26/2004
Approved Quantity	3	3
Reference	Milestone B ADM	Milestone B ADM
Start Year	2004	2004
End Year	2018	2018

The Current Total LRIP Quantity is more than 10% of the total production quantity due to the ADM dated April 26, 2004 approving three ships.

While the current LRIP quantity only reflect three as approved by the CVN 21 (Future Aircraft Carrier) Program Acquisition Decision Memorandum (ADM) of April 26, 2004, this report reflects the quantity of four with the addition of CVN 81 to the budget. A Program Deviation Report was submitted in March 2018 and an APB change request will be submitted in FY 2019.

EMALS

EMALS has no LRIP quantities because the current LRIP decision occurred prior to the establishment of EMALS as a major subprogram.

Foreign Military Sales

CVN 78

Notes

The Program Executive Office for Aircraft Carriers does not have any cooperative development agreements with any foreign governments.

The Navy and the Indian Navy conducted several face to face meetings and continued monthly discussions under their Information Exchange Agreement on Aircraft Carrier Technologies. The Navy has recently provided a Pricing and Availability for a training capsule on ship design aspects related to aviation.

PEO Aircraft Carriers hosted the Indian Navy during the fifth face to face Joint Working Group meeting in the U.S. in June 2018. The next (sixth) face to face meeting is planned for 2019 in India.

EMALS

Notes

The EMALS/Advanced Arresting Gear (AAG) Technology Transfer and Security Assistance Review Board documentation is complete and an Exception to National Disclosure Policy is in place. PMA 251 provided a Pricing and Availability Rough Order of Magnitude statement for EMALS/AAG and the Indian Navy is reviewing the documentation.

The Navy is in discussions with the French Navy to initiate Foreign Military Sales support for the Future French Aircraft Carrier. A French Ministry of Defense decision is expected in 2020 that will determine if EMALS/AAG are included in the replacement for the Charles de Gaulle. The Navy and the French Navy have conducted several face to face meetings and France has signed a Letter of Offer and Acceptance with a total case value of $2 million. Funding is onboard and the first Future French Carrier Working Group meeting was held in December 2018.

Acronyms and Abbreviations

AAG - Advanced Arresting Gear

Nuclear Costs

CVN 78

Nuclear Research and Development and Reactor Plant Government Furnished Equipment costs are included within the program costs in this report; however, Department of Energy nuclear costs are not included in this report.

Shipbuilding & Conversion Navy Nuclear Propulsion Equipment Cost is $8,949.76M in TY dollars for the CVN 78 Class Aircraft Carriers (CVN 78-81).

EMALS

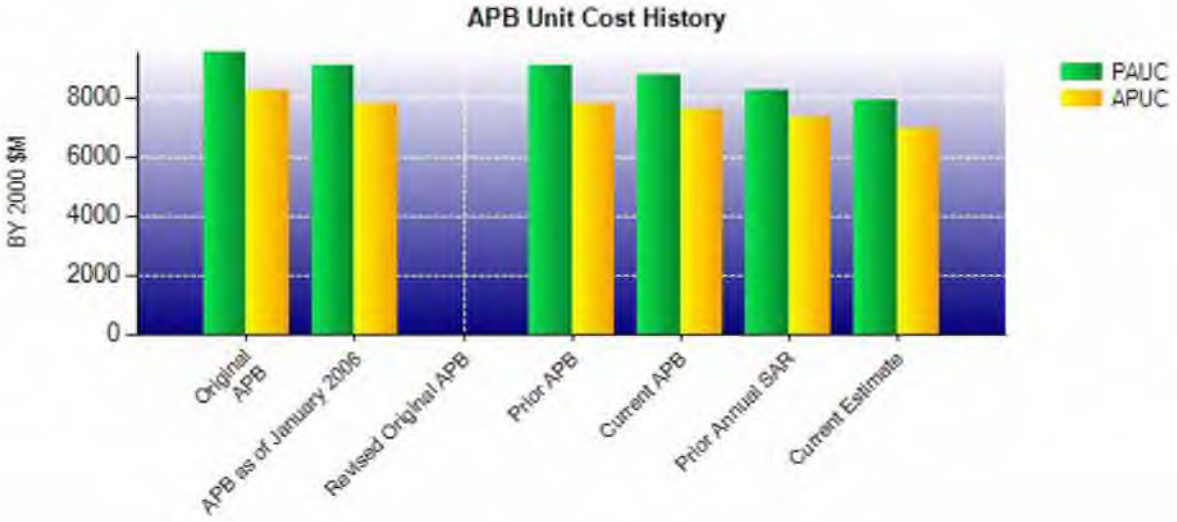
None

Unit Cost

CVN 78

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 $M Current UCR Baseline (Apr 2013 APB)	BY 2000 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	26369.7	31759.7	
Quantity	3	4	
Unit Cost	8789.900	7939.925	-9.67
Average Procurement Unit Cost			
Cost	22764.3	27865.9	
Quantity	3	4	
Unit Cost	7588.100	6966.475	-8.19

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 $M Original UCR Baseline (Apr 2004 APB)	BY 2000 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	28701.2	31759.7	
Quantity	3	4	
Unit Cost	9567.067	7939.925	-17.01
Average Procurement Unit Cost			
Cost	24825.9	27865.9	
Quantity	3	4	
Unit Cost	8275.300	6966.475	-15.82



APB Unit Cost History					
Item	Date	BY 2000 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	Apr 2004	9567.067	8275.300	12027.367	10582.900
APB as of January 2006	Aug 2005	9068.800	7778.000	12004.400	10526.633
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	Nov 2007	9068.800	7778.000	12004.400	10526.633
Current APB	Apr 2013	8789.900	7588.100	11665.433	10269.567
Prior Annual SAR	Dec 2017	8266.050	7351.100	13767.775	12662.050
Current Estimate	Dec 2018	7939.925	6966.475	13242.650	12042.850

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY $M)									
PAUC Development Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
11633.467	1696.025	227.708	37.925	-20.300	-341.875	0.000	9.700	1609.183	13242.650

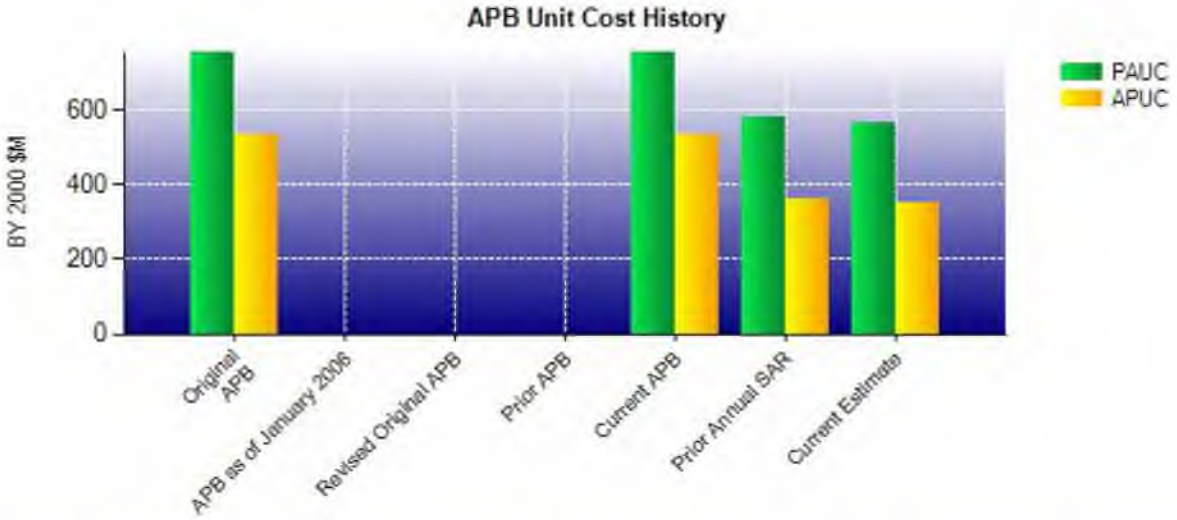
Current SAR Baseline to Current Estimate (TY $M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
10325.800	1670.750	554.625	-26.450	99.725	-591.300	0.000	9.700	1717.050	12042.850

SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone I	N/A	N/A	N/A	N/A
Milestone B	N/A	Apr 2004	N/A	Apr 2004
Milestone C	N/A	Mar 2017	N/A	Jun 2022
IOC	N/A	Sep 2015	N/A	Oct 2019
Total Cost (TY $M)	N/A	34900.4	N/A	52970.6
Total Quantity	N/A	3	N/A	4
PAUC	N/A	11633.467	N/A	13242.650

EMALS

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 $M Current UCR Baseline (Apr 2013 APB)	BY 2000 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	2263.4	2259.0	
Quantity	3	4	
Unit Cost	754.467	564.750	-25.15
Average Procurement Unit Cost			
Cost	1593.4	1403.8	
Quantity	3	4	
Unit Cost	531.133	350.950	-33.92

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 $M Original UCR Baseline (Apr 2013 APB)	BY 2000 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	2263.4	2259.0	
Quantity	3	4	
Unit Cost	754.467	564.750	-25.15
Average Procurement Unit Cost			
Cost	1593.4	1403.8	
Quantity	3	4	
Unit Cost	531.133	350.950	-33.92



APB Unit Cost History					
Item	Date	BY 2000 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	Apr 2013	754.467	531.133	1071.867	816.700
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	N/A	N/A	N/A	N/A	N/A
Current APB	Apr 2013	754.467	531.133	1071.867	816.700
Prior Annual SAR	Dec 2017	579.350	362.300	891.975	633.325
Current Estimate	Dec 2018	564.750	350.950	870.750	616.700

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY $M)									
PAUC Development Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
393.900	128.600	-165.275	-9.175	0.000	522.700	0.000	0.000	476.850	870.750

Current SAR Baseline to Current Estimate (TY $M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
257.100	122.075	-131.075	-9.175	0.000	377.775	0.000	0.000	359.600	616.700

SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	N/A	N/A	N/A
Milestone B	N/A	N/A	N/A	N/A
Milestone C	N/A	N/A	N/A	N/A
IOC	N/A	Sep 2016	N/A	Oct 2019
Total Cost (TY $M)	N/A	1181.7	N/A	3483.0
Total Quantity	N/A	3	N/A	4
PAUC	N/A	393.900	N/A	870.750

Cost Variance

CVN 78

Summary TY $M					
Item	RDT&E	Procurement	MILCON	Acq O&M	Total
SAR Baseline (Development Estimate)	3923.0	30977.4	--	--	34900.4
Previous Changes					
Economic	+94.1	+6166.4	+0.2	-1.4	+6259.3
Quantity	--	+12544.3	--	--	+12544.3
Schedule	+198.4	+667.4	--	+24.0	+889.8
Engineering	-480.1	+398.9	--	--	-81.2
Estimating	+528.0	-467.9	+36.0	+100.7	+196.8
Other	--	--	--	--	--
Support	--	+36.6	--	--	+36.6
Subtotal	+340.4	+19345.7	+36.2	+123.3	+19845.6
Current Changes					
Economic	+7.8	+516.6	--	+0.4	+524.8
Quantity	--	--	--	--	--
Schedule	+35.1	-773.2	--	--	-738.1
Engineering	--	--	--	--	--
Estimating	+275.0	-1897.3	+50.4	+7.6	-1564.3
Other	--	--	--	--	--
Support	--	+2.2	--	--	+2.2
Subtotal	+317.9	-2151.7	+50.4	+8.0	-1775.4
Total Changes	+658.3	+17194.0	+86.6	+131.3	+18070.2
CE - Cost Variance	4581.3	48171.4	86.6	131.3	52970.6
CE - Cost & Funding	4581.3	48171.4	86.6	131.3	52970.6

Summary BY 2000 $M					
Item	RDT&E	Procurement	MILCON	Acq O&M	Total
SAR Baseline (Development Estimate)	3490.6	24235.0	--	--	27725.6
Previous Changes					
Economic	--	--	--	--	--
Quantity	--	+6091.1	--	--	+6091.1
Schedule	+132.1	--	--	+17.6	+149.7
Engineering	-352.4	+187.7	--	--	-164.7
Estimating	+272.8	-1317.7	+27.4	+71.7	-945.8
Other	--	--	--	--	--
Support	--	+25.4	--	--	+25.4
Subtotal	+52.5	+4986.5	+27.4	+89.3	+5155.7
Current Changes					
Economic	--	--	--	--	--
Quantity	--	--	--	--	--
Schedule	+23.9	--	--	--	+23.9
Engineering	--	--	--	--	--
Estimating	+172.9	-1357.0	+32.0	+5.2	-1146.9
Other	--	--	--	--	--
Support	--	+1.4	--	--	+1.4
Subtotal	+196.8	-1355.6	+32.0	+5.2	-1121.6
Total Changes	+249.3	+3630.9	+59.4	+94.5	+4034.1
CE - Cost Variance	3739.9	27865.9	59.4	94.5	31759.7
CE - Cost & Funding	3739.9	27865.9	59.4	94.5	31759.7

Previous Estimate: June 2018

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+7.8
Additional Schedule variance to support CVN 78 Class Full Ship Shock Trial testing moving from CVN 79 (FY 2023 - FY 2026) to CVN 78 (FY 2020 - FY 2021). (Schedule)	+23.9	+35.1
Adjustment for current and prior escalation. (Estimating)	-1.3	-1.8
Congressional increase in FY 2019 for CVN 78 Full Ship Shock Trial - transfer from SCN line 2. (Estimating)	+17.6	+25.0
Revised estimate for CVN 78 Class for Small Business Innovative Research. (Estimating)	-1.6	-2.3
Revised Estimate to CVN 78 Class due to miscellaneous adjustments. (Estimating)	-5.7	-8.8
Increase to support initial CVN 81 efforts. (Estimating)	+105.7	+175.9
Revised estimates in the out years to support CVN 79 design efforts continuing throughout Phase II to enable full integration of contractor and government furnished material including first at sea tests and integration of the Ford Class combat system with variant 2, three panel Enterprise Air Surveillance Radar and resolve Contractor Furnished Equipment/Government Furnished Equipment specific obsolescence issues. (Estimating)	+30.8	+49.6
Revised estimates to research, develop and integrate CVN 80 warfare systems, including electronic attack and directed energy and support air wing of the future including unmanned aircraft. Continue development of cybersecurity capabilities. (Estimating)	+52.1	+87.1
Revised estimate to support CVN 80 Integrated Digital Shipbuilding efforts. (Estimating)	-19.7	-41.2
Revised estimate for CVN 78 shock qualification of Contractor Furnished Equipment components. (Estimating)	+7.3	+10.0
Revised estimate due to service wide funding adjustments. (Estimating)	-6.3	-9.5
Revised estimate to account for the availability of prior year execution balances. (Estimating)	-2.1	-3.0
Revised estimate due to application of new out year escalation indices. (Estimating)	-3.9	-6.0
RDT&E Subtotal	+196.8	+317.9

Procurement	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+516.6
Acceleration of procurement profile for CVN 81 from FY 2023 to FY 2020. (Schedule)	0.0	-773.2
Adjustment for current and prior escalation. (Estimating)	-96.5	-170.9
Revised estimate for CVN 78 Outfitting and Post Delivery. (Estimating)	+70.5	+129.1
Revised estimate for CVN 78 due to deficiencies identified during testing and changes required to ensure the safety of the ship and personnel. (Estimating)	+77.7	+119.9
Re-phasing to support CVN 79 revised estimate in support outfitting and post delivery requirements. (Estimating)	+19.4	+39.5
Re-allocation of funds from EMALS to CVN 79. (Estimating)	+0.3	+0.5
Congressional undistributed reduction to the Outfitting and Post Delivery account due to Early to Need. $17.623M was applied to CVN 79. (Estimating)	-9.6	-17.6
Revised estimate to CVN 80 to reflect savings from CVN 80 / CVN 81 award. (Estimating)	-254.5	-230.5
Congressional reduction to CVN 80 in FY 2019 for transfer to RDT&E in support of CVN 78 Full Ship Shock Trials line 84. (Estimating)	-13.6	-25.0
Revised estimate for CVN 80 Outfitting and Post Delivery. (Estimating)	+23.5	+53.6

Revised estimate to CVN 81 to reflect savings from CVN 80 / CVN 81 award. (Estimating)	-1150.7	-2571.4
Increase to support and adding the initial estimate for CVN 81 Outfitting and Post Delivery. (Estimating)	+149.0	+347.7
Revised estimate due to application of new out year escalation indices. (Estimating)	-170.9	-345.4
Re-allocation of funds from EMALS to CVN 80. (Estimating)	-1.6	0.0
Revised estimate associated with the acceleration of the procurement of CVN 81 from FY 2023 to FY 2020. (Estimating)	0.0	+773.2
Adjustment for current and prior escalation. (Support)	-0.1	-0.1
Increase in Other Support to continue development and delivery of CVN 78 Class Specific training. (Support)	+1.5	+2.3
Procurement Subtotal	-1355.6	-2151.7

MILCON	$M	
Current Change Explanations	Base Year	Then Year
Increase to support Dry Dock #8 saltwater flowrate improvements at Norfolk Naval Shipyard for CVN 78 Class. (Estimating)	+32.0	+50.4
MILCON Subtotal	+32.0	+50.4

Acq O&M	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+0.4
Adjustment for current and prior escalation. (Estimating)	-0.2	-0.2
Revised estimate for additional local area network drops and support. (Estimating)	+4.8	+6.7
Revised estimate for continued In-Service Engineering Agents training and familiarization of the CVN 78 Class and FORD Class Data Environment support. (Estimating)	+4.6	+7.2
Revised estimate to fund additional Civilian Personnel billets for increased cyber requirements, life cycle support, sustainment and modernization. (Estimating)	-3.7	-5.7
Revised estimate due to application of new out year escalation indices. (Estimating)	-0.1	-0.2
Revised estimate due to miscellaneous adjustments. (Estimating)	-0.2	-0.2
Acq O&M Subtotal	+5.2	+8.0

Cost Variance

EMALS

Summary TY $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	410.4	771.3	--	1181.7
Previous Changes				
Economic	+25.4	+461.6	--	+487.0
Quantity	--	-267.2	--	-267.2
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+578.1	+1567.6	+20.7	+2166.4
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+603.5	+1762.0	+20.7	+2386.2
Current Changes				
Economic	+0.7	+26.7	--	+27.4
Quantity	--	--	--	--
Schedule	--	-36.7	--	-36.7
Engineering	--	--	--	--
Estimating	-19.1	-56.5	--	-75.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-18.4	-66.5	--	-84.9
Total Changes	+585.1	+1695.5	+20.7	+2301.3
CE - Cost Variance	995.5	2466.8	20.7	3483.0
CE - Cost & Funding	995.5	2466.8	20.7	3483.0

Summary BY 2000 $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	384.7	590.9	--	975.6
Previous Changes				
Economic	--	--	--	--
Quantity	--	-136.1	--	-136.1
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+464.7	+994.4	+18.8	+1477.9
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+464.7	+858.3	+18.8	+1341.8
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-13.0	-45.4	--	-58.4
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-13.0	-45.4	--	-58.4
Total Changes	+451.7	+812.9	+18.8	+1283.4
CE - Cost Variance	836.4	1403.8	18.8	2259.0
CE - Cost & Funding	836.4	1403.8	18.8	2259.0

Previous Estimate: June 2018

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+0.7
Adjustment for current and prior escalation. (Estimating)	-0.4	-0.5
Revised estimate due to application of new out year escalation indices. (Estimating)	-0.2	-0.2
Revised estimate due to Small Business Innovation Research. (Estimating)	-0.5	-0.7
Revised estimate due to miscellaneous adjustments. (Estimating)	-0.2	-0.2
Revised estimate for CVN 78 Class EMALS Depot Planning. (Estimating)	-11.7	-17.5
RDT&E Subtotal	-13.0	-18.4

Procurement	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+26.7
Acceleration of procurement profile for one aircraft from FY 2023 to FY 2020. (Schedule)	0.0	-36.7
Adjustment for current and prior escalation. (Estimating)	-7.4	-13.0
Revised estimate due to application of new out year escalation indices. (Estimating)	-6.8	-13.7
Re-allocation of funds to EMALS from CVN 79. (Estimating)	-0.3	-0.5
Re-allocation of funds to EMALS from CVN 80. (Estimating)	+1.7	0.0
Revised estimate to CVN 81 EMALS to reflect savings from CVN 80 / CVN 81 award. (Estimating)	-32.5	-66.0
Revised estimate associated with the acceleration of the procurement of CVN 81 from FY 2023 to FY 2020. (Estimating)	-0.1	+36.7
Procurement Subtotal	-45.4	-66.5

~~(U//FOUO)~~ Contracts

Contract Identification

Appropriation: Procurement
Contract Name: CVN 79 Construction Preparation (CP)
Contractor: Huntington Ingalls Industries (HII) Newport News Shipbuilding (NNS)
Contractor Location: 4101 Washington Avenue
Newport News, VA 23607-2734
Contract Number: N00024-09-C-2116
Contract Type: Cost Plus Fixed Fee (CPFF), Cost Plus Incentive Fee (CPIF)
Award Date: January 15, 2009
Definitization Date: December 08, 2010

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
373.5	N/A	N/A	4244.0	N/A	N/A	4374.4	4375.2

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to award of CVN 79 CP contract extensions for FY 2011 through FY 2014 efforts, a modification awarded on June 5, 2015 which includes the remaining component and steel fabrication and, multiple modifications for procurement of additional material to support the CVN 79 procurement strategy.

(U//~~FOUO~~) Contract Variance		
Item	Cost Variance	Schedule Variance
(b)(4)		

Notes

The Construction Preparation contract is 89.2 percent complete based on dollars.

Contract Identification

Appropriation: Procurement
Contract Name: CVN 79 Detail Design & Construction (DD&C)
Contractor: Huntington Ingalls Industries (HII) Newport News Shipbuilding (NNS)
Contractor Location: 4101 Washington Ave
Newport News, VA 23607
Contract Number: N00024-15-C-2114
Contract Type: Fixed Price Incentive(Firm Target) (FPIF)
Award Date: June 05, 2015
Definitization Date: June 05, 2015

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
3352.6	N/A	1	3381.3	3482.9	1	3398.4	3446.8

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to contract modifications to incorporate approved change orders in support of CVN 79 construction.

(U/~~FOUO~~) Contract Variance		
Item	Cost Variance	Schedule Variance
(b)(4)		

Notes

The Navy awarded a FPIF contract in the amount of $3.35B for the CVN 79 Detail Design & Construction (DD&C) effort. The DD&C contract is 37.1 percent complete based on dollars.

Contract Identification

Appropriation: Procurement
Contract Name: CVN 80/CVN 81 Detail Design & Construction (DD&C)
Contractor: Huntington Ingalls Industries (HII) Newport News Shipbuilding (NNS)
Contractor Location: 4101 Washington Avenue
Newport News, VA 23607
Contract Number: N00024-16-C-2116
Contract Type: Fixed Price Incentive(Firm Target) (FPIF)
Award Date: May 23, 2016
Definitization Date: May 23, 2016

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
152.0	N/A	1	16379.0	N/A	1	16379.0	16379.0

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the award of the CVN 80/81 two-ship buy Detail Design and Construction contract on January 31, 2019 using the existing CVN 80 contract number.

Cost and Schedule Variance Explanations

Cost and Schedule Variance reporting is not required on this (FPIF) contract.

Notes

On January 31, 2019 a $14,917,738,145 fixed-price-incentive-firm target modification to previously awarded contract N00024-16-C-2116 for DD&C efforts for CVN 80 and CVN 81 was awarded. Contract Name and Contract Type was updated to reflect this contract modification.

Earned Value Management reporting will start in May 2019 and will be reported in the next SAR.

Contract Identification

Appropriation: Procurement
Contract Name: EMALS CVN 79/CVN 80 Production
Contractor: General Atomics (GA) Electromagnetic Systems
Contractor Location: 3550 General Atomics Court
San Diego, CA 92121
Contract Number: N00019-14-C-0037
Contract Type: Firm Fixed Price (FFP)
Award Date: May 08, 2014
Definitization Date: December 22, 2016

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
1072.5	N/A	2	1076.5	N/A	2	1076.5	1076.5

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the award of an undefinitized contract action in June 2017 that added schedule acceleration incentives.

Cost and Schedule Variance Explanations

Cost and Schedule Variance reporting is not required on this (FFP) contract.

Notes

Contract Number N00019-C-0037 is a combined EMALS and Advanced Arresting Gear (AAG) CVN 79/CVN 80 Production contract with a total contract value of $1,466.1M. The current awarded prices for each ship set are as follows:

CVN 79

AAG = $183.1M

EMALS = $543.9M

CVN 80

AAG = $195.2M

EMALS = $532.6M

In November 2017 a modification was executed to add an additional CLIN for $11.3M for an additional AAG half engine funded with RDT&E.

The AAG program submitted a FY 2020 annual SAR that included procurement funding which is also reported in the CVN 78 Class SAR.

Deliveries and Expenditures

CVN 78

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	0	--
Production	1	1	4	25.00%
Total Program Quantity Delivered	1	1	4	25.00%

Expended and Appropriated (TY $M)			
Total Acquisition Cost	52970.6	Years Appropriated	23
Expended to Date	24772.7	Percent Years Appropriated	62.16%
Percent Expended	46.77%	Appropriated to Date	32198.8
Total Funding Years	37	Percent Appropriated	60.79%

The above data is current as of March 11, 2019.

EMALS

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	0	--
Production	1	1	4	25.00%
Total Program Quantity Delivered	1	1	4	25.00%

Expended and Appropriated (TY $M)			
Total Acquisition Cost	3483.0	Years Appropriated	20
Expended to Date	2045.9	Percent Years Appropriated	74.07%
Percent Expended	58.74%	Appropriated to Date	2668.2
Total Funding Years	27	Percent Appropriated	76.61%

The above data is current as of December 31, 2018.

Operating and Support Cost

CVN 78

Cost Estimate Details

Date of Estimate:	February 05, 2018
Source of Estimate:	POE
Quantity to Sustain:	4
Unit of Measure:	Ship
Service Life per Unit:	50.00 Years
Fiscal Years in Service:	FY 2017 - FY 2082

The current APB Objective/Threshold values reflect Total O&S costs for three ships in accordance with the current Program of Record. A fourth ship representing the CVN 81 was added in PB 2019 and the December 2017 SAR. The Program Office will submit an APB change request in FY 2019. The CVN 78 Class Program is planned for a total of 11 ships over a 50 year service life.

O&S costs are developed at the ship level, on an annual cost per ship basis by cost category and appropriation, with total and annual average cost over the ship's expected service life. Costs are estimated for all categories listed in the CAPE O&S Cost Estimating Guide using historical data from operating carrier classes and the Chief of Naval Operations (OPNAV) "Maintenance" Notices. Maintenance and Personnel costs are the major contributors to the total O&S Program costs.

Sustainment Strategy

Sustainment strategy includes nuclear aircraft carrier certified Naval Shipyards (Norfolk Naval Shipyard (NNSY), Puget Sound Naval Shipyard (PSNSY) & Intermediate Maintenance Facility (IMF)) and/or Huntington-Ingalls, Inc - Newport News Shipyard (HII-NNS) for Depot-level Maintenance in concert with regional multi-ship/multi-option (MSMO) contractors, Intermediate-level activities (e.g., Mid-Atlantic Regional Maintenance Center (MARMC), Southwest Regional Maintenance Center (SWRMC)), Organizational-level maintenance strategies, and the employment of existing shore support to the maximum extent possible.

Antecedent Information

The CVN 68 Class is the antecedent for the CVN 78 Class.

The CVN 68 O&S costs were derived from requirements, actual returns, and the Naval Visibility and Management of Operating and Support Costs (VAMOSC) database, with the primary focus using requirements. Unit Level Manpower was based on authorized billets (3,291) as detailed in the CVN 68 Ship Manpower Document (SMD); the billets were multiplied against the OSD composite rates for calculating the unit level manpower. Indirect Support (6.0) was based on authorized billets (3,291) as detailed in the CVN 68 SMD; the billets were multiplied against the Naval Center for Cost Analysis (NCCA) Manpower Cost Estimating Tool for Enhanced Online Reporting (METEOR) rates for calculating the indirect support cost. Depot Maintenance (3.3) was derived from OPNAV Note 4700 (dated June 8, 2015).

Unit Operations, Intermediate Maintenance, Sustaining Support, and Continuing System Improvements were derived from VAMOSC, with data pulled from FY 2000 through FY 2014; using full year data and excluding CVN 73 which was a forward deployed ship starting in 2008.

Annual O&S Costs BY2000 $M		
Cost Element	**CVN 78 Average Annual Cost Per Ship**	**CVN 68 Class (Antecedent) Average Annual Cost Per Ship**
Unit-Level Manpower	129.019	162.738
Unit Operations	10.130	10.241
Maintenance	101.809	130.099
Sustaining Support	10.985	11.818
Continuing System Improvements	18.513	23.600
Indirect Support	120.180	151.083
Other	0.000	0.000
Total	390.636	489.579

The December 2018 SAR for the AAG program reports a quantity of three units to sustain. Since the CVN 78 SAR O&S Cost includes O&S Costs for AAG, the AAG Program Office extrapolated the current AAG O&S Cost to four units, baselined the value to BY 2000 dollars, and provided this O&S Cost to the CVN 78 Program Office for inclusion in the December 2018 CVN 78 SAR.

Item	Total O&S Cost $M			
	CVN 78			CVN 68 Class (Antecedent)
	Current Development APB Objective/Threshold		Current Estimate	
Base Year	55600.0	61160.0	78127.2[1]	244789.7
Then Year	251600.0	N/A	267689.7	N/A

[1] *APB O&S Cost Breach*

Total O&S cost for 11 ships would be $214,410.9M BY 2000 dollars/$1,025,937.8M in TY dollars.

O&S breach a result of increasing the O&S cost for a quantity of four ships, one ship above the APB quantity of three ships.

Equation to Translate Annual Cost to Total Cost

Total Cost = Average Annual Cost per Ship * Number of Ships * Service Life = $390.636M * 4 * 50 = $78,127.2M

O&S Cost Variance		
Category	**BY 2000 $M**	**Change Explanations**
Prior SAR Total O&S Estimates - Jun 2018 SAR	78127.2	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	

Cost Data Update	0.0
Labor Rate	0.0
Energy Rate	0.0
Technical Input	0.0
Other	0.0
Total Changes	0.0
Current Estimate	78127.2

O&S cost were not updated from the June 2018 SAR.

Disposal Estimate Details

Date of Estimate:	February 05, 2018
Source of Estimate:	POE
Disposal/Demilitarization Total Cost (BY 2000 $M):	5837.4

Disposal costs for CVN 78 include inactivation and disposal of the ship, including EMALS, AAG, and the nuclear reactor core.

Total costs for disposal and inactivation of 11 ships is $16,052.9M in BY 2000 dollars.

EMALS

Cost Estimate Details

Date of Estimate:	February 05, 2018
Source of Estimate:	POE
Quantity to Sustain:	4
Unit of Measure:	Ship
Service Life per Unit:	50.00 Years
Fiscal Years in Service:	FY 2017 - FY 2082

The current APB Objective/Threshold values reflect Total O&S costs for three shipsets in accordance with the current Program of Record. A fourth ship representing the CVN 81 was added in PB 2019 and the December 2017 SAR. The Program Office will submit an APB change request in FY 2019. The CVN 78 Class Program is planned for a total of 11 ships over a 50 year service life.

O&S costs are developed at the ship level, on an annual cost per ship basis by cost category and appropriation, with total and annual average cost over the ship's expected service life. Costs are estimated for all categories listed in the CAPE O&S Cost Estimating Guide using historical data from operating carrier classes and the OPNAV "Maintenance" notices. Maintenance and Personnel costs are the major contributors to the total O&S program.

Sustainment Strategy

EMALS will be under a blended support and sustainment scenario by the Original Equipment Manufacturer (OEM), General Atomics (GA), and Navy support from Naval Air Systems Command (NAVAIR) PMA 251 as applicable. The intention is for GA to provide support and have the shipyards and the Navy to provide both industrial level support, (i.e. cranes, lifts, power (including step down backup) and air) as well as shop modifications, equipment to support motor repairs, equipment storage areas, and temperature controls.

Final maintenance planning information was approved in the first quarter FY 2018 as part of Naval Supply Systems Command approval of the Provisioning Technical Data. Depot planning to support out year requirements is slated to begin in FY 2019 with an estimated completion date of FY 2021.

Antecedent Information

No antecedent.

EMALS is specifically designed to meet the requirements of the CVN 78 Class. The advanced technologies and capabilities, and unique ship interface requirements of EMALS do not exist in any legacy launcher systems. As such, there are no comparable antecedent systems.

Annual O&S Costs BY2000 $M		
Cost Element	**EMALS Average Annual Cost Per Ship**	**No Antecedent (Antecedent) N/A**
Unit-Level Manpower	3.948	0.000
Unit Operations	0.000	0.000
Maintenance	5.995	0.000
Sustaining Support	1.456	0.000
Continuing System Improvements	3.658	0.000
Indirect Support	1.702	0.000
Other	0.000	0.000
Total	16.759	--

Item	Total O&S Cost $M			
	EMALS			No Antecedent (Antecedent)
	Current Development APB Objective/Threshold		Current Estimate	
Base Year	2574.3	2831.7	3351.8[1]	N/A
Then Year	6422.6	N/A	9789.8	N/A

[1] *APB O&S Cost Breach*

Total O&S cost for 11 shipsets would be $7,892.45M in BY2000 dollars/$30,062.78M in TY dollars.

O&S breach a result of increasing the O&S cost for a quantity of four shipsets, one shipset above the APB quantity of three shipsets.

Equation to Translate Annual Cost to Total Cost

Total Cost = Average annual cost per shipset * number of shipsets * Service Life = $16.759M * 4 * 50 = $3,351.8M

O&S Cost Variance		
Category	**BY 2000 $M**	**Change Explanations**
Prior SAR Total O&S Estimates - Jun 2018 SAR	3351.8	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	

Total Changes	0.0
Current Estimate	3351.8

O&S costs were not updated from the June 2018 SAR.

Disposal Estimate Details

Date of Estimate: February 05, 2018

Source of Estimate: POE

Disposal/Demilitarization Total Cost (BY 2000 $M):

EMALS disposal costs are included in the CVN 78 Class Disposal Cost.