



## 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 2019 President's Budget

Defense Acquisition Management  
Information Retrieval  
(DAMIR)

~~This document contains information that may be exempt from mandatory disclosure under the FOIA.~~

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## Sensitivity Originator

**Organization:** CVN 78 GERALD R.FORD Class Nuclear Aircraft Carrier (CVN 78)

**Organization Email:**

**Organization Phone:** 202-781-3969

## 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)

## Program Information

**Program Name**

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

**DoD Component**

Navy

## Responsible Office

Ms. Yeling Wang  
Program Executive Office (PEO) Aircraft Carriers  
PMS 378  
614 Sicard Street SE Stop 7007  
Washington, DC 20376-7007

**Phone:** 202-781-3969  
**Fax:** 202-781-4684  
**DSN Phone:** 326-3969  
**DSN Fax:** 326-4684  
**Date Assigned:** August 26, 2016

[yeling.wang@navy.mil](mailto:yeling.wang@navy.mil)

## References

### CVN 78

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**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

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**SAR Baseline (Development Estimate)**

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## **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

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.

#### USS GERALD R. FORD (CVN 78)

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. On July 22, CVN 78 was commissioned, and six days later conducted the first fixed wing launch and recovery. The ship then commenced the shakedown period, operating 70 days at sea while conducting six Independent Steaming Events (ISEs) as of January 2018, and conducted day time underway replenishment (UNREP) in January 2018. During these ISEs, CVN 78 completed Rotary Wing Dynamic Interface Testing in August, Fixed Wing Aircraft Compatibility Testing in October, and conducted extensive flight operations in November 2017. Two of the eleven Advanced Weapons Elevators (AWEs) have completed basic construction through the testing phase; no AWEs have been certified and turned over to the Navy. All AWEs are scheduled to turnover prior to the end of the Post Shakedown Availability (PSA) in April 2019, before the ship begins work ups for deployment. The Dual Band Radar (DBR) has fully supported fixed wing flight operations, Aircraft Compatibility Testing, Carrier Air Traffic Control Center testing and Detect to Engage testing. Volume Search Radar (VSR) intermittent stability issues are being addressed through the test, analyze, fix, and test approach. The program continues to focus on shakedown activities and Post Shakedown Availability/Selected Restricted Availability (PSA/SRA) preparations. As of January 2018, CVN 78 has completed 747 total successful EMALS catapult launches and 747 successful Advanced Arresting Gear (AAG) arrestments, including 135 launches and recoveries on January 19, 2018 alone.

In between ISEs, the program has taken advantage of maintenance Windows of Opportunities (WOOs) to mitigate PSA/SRA risk by completing discrepancies documented during trials and ISE operations. More than 75% of all trial cards and 23 of 43 starred cards have been closed, which is ahead of schedule.

The PSA/SRA length has been assessed as 12 months, starting in April 2018. Work on the Advanced Weapons Elevator (AWE) and AAG are the critical path for PSA/SRA duration.

#### Electromagnetic Aircraft Launch System (EMALS) (major subprogram)

EMALS aircraft compatibility testing aboard CVN 78 during ISE 2 completed in October 2017 with 83 F/A-18E/F launches. An additional 259 F/A-18E/F aircraft were launched during ISE 3 which completed in November 2017, and 401 F/A-18E/F aircraft were launched in ISE 5 which completed in January 2018. Including the four initial launches conducted in July 2017, EMALS has conducted a total of 747 aircraft launches. The System Development and Demonstration (SDD) program is 99% complete with only the completion of component shock testing remaining. The System Functional Demonstration test site in Lakehurst, NJ remains operational to support shipboard testing engineering investigations, correct deficiencies, and train the CVN 78 crew. The EMALS logistics product development contract is complete. Further updates to Logistics Products will be accomplished both organically by the Government where possible, and through a future sustainment contract with General Atomics.

#### JOHN F. KENNEDY (CVN 79)

The Navy has implemented a two-phase acquisition plan which will allow the basic ship to be constructed and tested in the most efficient manner by the shipbuilder during Phase I. In Phase II select ship systems and compartments will be completed where the work can be performed more affordably through competition or the use of skilled installation teams. The two-phase strategy for CVN 79 capitalizes on schedule flexibility to deliver the ship at the lowest cost and enables the Navy to procure and install at the latest date possible shipboard electronics systems which otherwise would be subject to obsolescence prior to the CVN 79 planned first deployment in 2027. CVN 79 is the force structure replacement for USS NIMITZ (CVN 68), which is scheduled for inactivation in FY 2025.

The Program Manager's estimate of total procurement costs for CVN 79 is \$11.398B and equal to the Congressional cost



cap set in the FY 2016 NDAA.

CVN 79 reached the 50% erected in the dry dock milestone in June 2017 and is on schedule to meet all key events. As of the January cost report, the ship is over 40% complete with 318 of 447 total erectables (71%) landed in the dry dock and an overall manhour cost performance of 0.96. Cost drivers to date have stemmed from material availability, performance in the fabrication and construction of steel pre-erectable units and inefficiencies in the support trades such as staging. The Navy has been actively engaged with the shipbuilder to resolve these performance issues and recovery targets in each of the major areas of remaining work have been identified with specific actions to achieve these improvements. Quarterly targets will be tracked during execution. Improved material availability and utilization of new facilities are expected to aid in cost improvements. Material availability has improved over the last year from 93 to 95% allowing the shipbuilder to complete previously deferred work and more efficiently execute planned work. In the area of facility improvement, the shipbuilder recently earned a facility incentive fee for completing the construction of the Unit Outfitting Hall (UOH) and proving its effectiveness by completing nine ship pre-erectable units in this facility. The UOH is a completely covered structure with all required trade tooling and utilities to support efficient construction. The cost performance of the initial units completed in the facility was above 1.0 and its full employment will improve future unit performance.

#### ENTERPRISE (CVN 80)

CVN 80 is the force structure replacement for USS EISENHOWER (CVN 69) and is programed for delivery in FY 2027. The ship is on track via advanced procurement activities for Government Furnished Equipment (GFE) and execution of the Advanced Procurement (AP) contract with the shipbuilder. The scope of the AP contract includes Long Lead Time Material (LLTM) procurements, advanced planning and engineering tasks and selected advanced fabrication of structural sub-components and pre-assemblies. As of the January cost report, the CVN 80 AP contract is 32% complete based on dollars.

The FY 2018 NDAA set the Congressional cost cap for CVN 80 at \$12.568B and is consistent with the program manager's estimate.

The Navy is continuing to work with the shipbuilder to lower the cost of CVN 80 and has rescheduled the award of the Detailed Design and Construction (DD&C) contract until FY 2019 to maximize these opportunities. To ensure CVN 80 stays on schedule for fleet delivery, the Navy will extend the current AP contract through CY 2018 and increase the scope of advanced fabrication activities and LLTM procurements. Previously planned GFE procurements will continue through FY 2018. The Navy is currently evaluating a two-ship procurement of CVN 80 and CVN 81 in FY 2019 in order to further drive towards meeting FORD Class affordability targets. Two-ship procurements take advantage of stable design through multiple builds (design once, build twice), quantity discounts for material, and level loading of industrial base capabilities. Returns from shipbuilding programs have consistently shown that volume material buys and level-loading the shipbuilder and vendor base are proven practices that reduce shipbuilding program cost. The Program Manager is updating the acquisition strategy and contracting timeline to ensure CVN 80 remains on schedule and maximizes cost reduction opportunities while the Navy pursues OSD approval for a CVN 80/81 two-ship buy and subsequent Congressional authorization.

#### CVN 81

PB 2019 introduces a third year of funding in the FYDP for CVN 81, the fourth ship of the CVN 78 Class. CVN 81 Advance Procurement funding was previously reported in PB 2018 and the December 2016 SAR. PB 2019 and the December 2017 SAR include the CVN 81 whole ship estimate in the funding tables and increase in quantity. Accordingly, this report reflects a quantity increase of one ship from the APB program of record from three ships to four. The CVN 81 full ship estimate is consistent with the PB 2019 CVN 78 Class budget request to Congress, and by adding the CVN 81 full ship cost estimate a procurement cost and operations and support cost APB breach occur. An APB update will be submitted later in 2018 reflecting the addition of CVN 81.

Increment: EMALS - The Executive Summary for the EMALS major subprogram is included as part of the CVN 78 Class program report.

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% 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.

## Threshold Breaches

### CVN 78

APB Breaches			Explanation of Breach
Schedule		<input checked="" type="checkbox"/>	The schedule breach to CVN 78 Combat Systems Trial Rehearsal (CSTR), Delivery and IOC events were previously reported in the December 2015 SAR.
Performance		<input type="checkbox"/>	
Cost	RDT&E	<input type="checkbox"/>	
	Procurement	<input checked="" type="checkbox"/>	
	MILCON	<input type="checkbox"/>	
	Acq O&M	<input type="checkbox"/>	
O&S Cost		<input checked="" type="checkbox"/>	CSTR was completed in January 2017. Shipboard testing progress has continued to be slower than anticipated. As a result, Builder's Trials were completed in April 2017. The delay in sea trials has resulted in a subsequent delay to CVN 78 Delivery which completed in May 2017. IOC is now planned for April 2019.
Unit Cost	PAUC	<input type="checkbox"/>	
	APUC	<input type="checkbox"/>	
Nunn-McCurdy Breaches			If approved, deferral of Full Ship Shock Trials from CVN 78 to CVN 79 will result in the planned earlier completion of Initial Operational Test and Evaluation (IOT&E) and Platform-Level Integration Developmental Test (DT) Period. IOT&E Start, Platform-Level Integration DT Period Complete, and IOT&E Complete have been rescheduled to July 2020, December 2020, and September 2021, respectively.
Current UCR Baseline			CVN 79 DAB Program Review and Start Construction event breaches were previously reported in the December 2014 SAR.
	PAUC	None	
	APUC	None	CVN 80 DAB Program Review has been deferred until November 2018 to align with the CVN 80 planned Detail Design and Construction contract award.
Original UCR Baseline			
	PAUC	None	
	APUC	None	PB 2019 introduces a third year of funding in the FYDP for CVN 81, the fourth ship of the CVN 78 Class. CVN 81 Advance Procurement funding was previously reported in PB 2018 and the December 2016 SAR. PB 2019 and the December 2017 SAR include the CVN 81 whole ship estimate in the funding tables and increase in quantity. Accordingly, this report reflects a quantity increase of one ship from the APB program of record from three ships to four. The CVN 81 full ship estimate is consistent with the PB 2019 CVN 78 Class budget request to Congress, and by adding the CVN 81 full ship cost estimate a procurement cost and operations and support cost APB breach occur. An APB update will be submitted later in 2018 reflecting the addition of CVN 81.
			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.
			The Program Office will submit a Program Deviation Report (PDR) to address these changes and an APB update will be submitted in FY 2018.

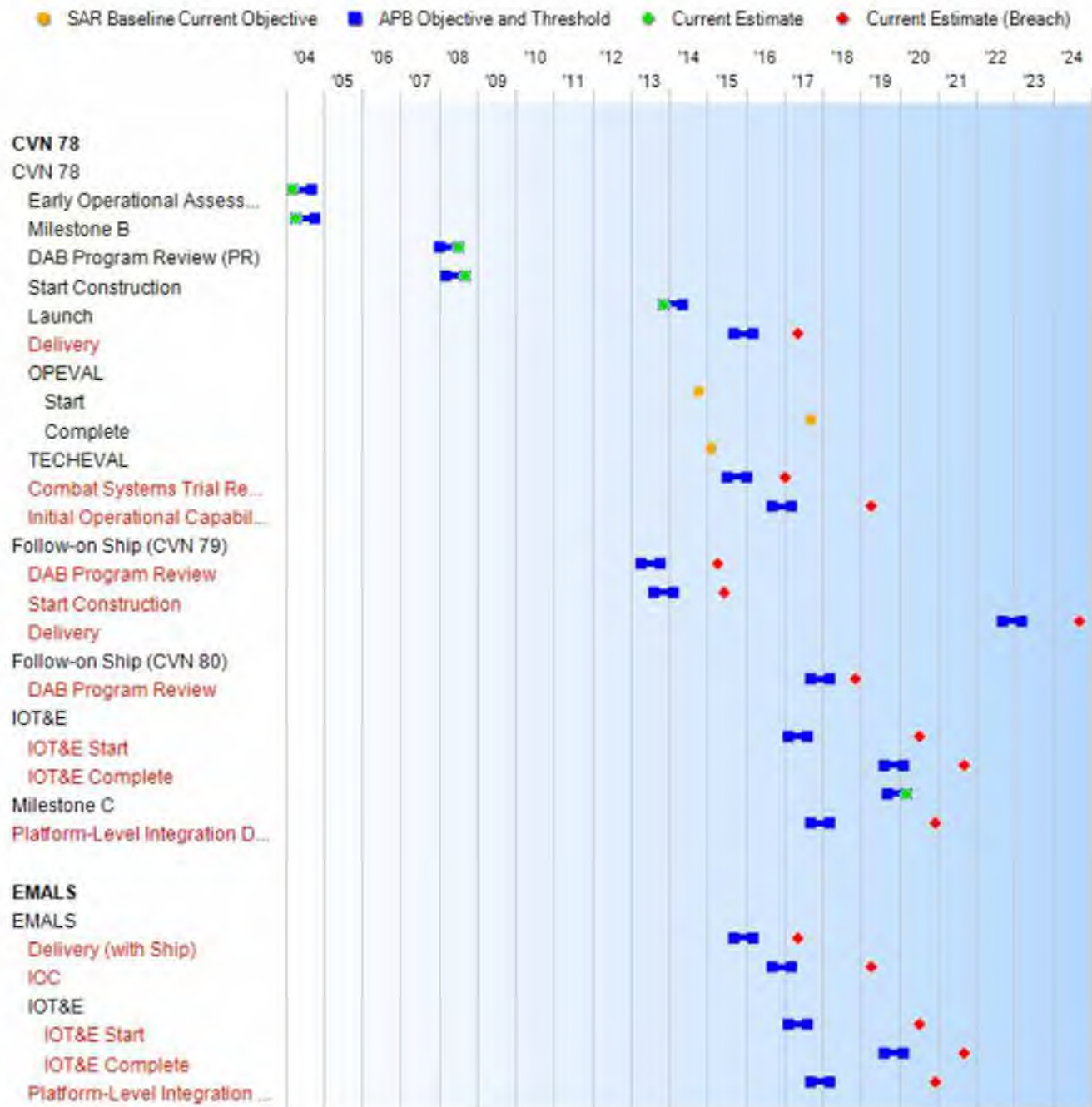


## EMALS

APB Breaches			Explanation of Breach
Schedule		<input checked="" type="checkbox"/>	The schedule breach to IOC was a result of the ship delivery and IOC shifting to May 2017 and April 2019, respectively. EMALS delivered with the ship in May 2017 and will complete IOC as a component to the ship.
Performance		<input type="checkbox"/>	
Cost	RDT&E	<input checked="" type="checkbox"/>	
	Procurement	<input type="checkbox"/>	
	MILCON	<input type="checkbox"/>	
	Acq O&M	<input type="checkbox"/>	
O&S Cost		<input checked="" type="checkbox"/>	EMALS will reach Initial Operational Test & Evaluation (IOT&E) Start, Platform-Level Integration DT Period Complete, and IOT&E Complete with the ship and have been rescheduled to July 2020, December 2020, and September 2021, respectively.
Unit Cost	PAUC	<input type="checkbox"/>	
	APUC	<input type="checkbox"/>	
Nunn-McCurdy Breaches			
Current UCR Baseline			The cost breach to RDT&E was previously reported in the December 2016 SAR for EMALS in the amount of \$61.9M. The program anticipates this breach to increase to approximately \$99.9M. This cost breach is the result of additional costs associated with maintaining the EMALS shore based test site, continued land based testing efforts and depot planning.
	PAUC	None	
	APUC	None	PB 2019 introduces a third year of funding in the FYDP for CVN 81, the fourth ship of the CVN 78 Class. CVN 81 Advance Procurement funding was previously reported in PB 2018 and the December 2016 SAR. PB 2019 and the December 2017 SAR include the CVN 81 whole ship estimate in the funding tables and increase in quantity. Accordingly, this report reflects a quantity increase of one ship from the APB program of record from three ships to four. The CVN 81 full ship estimate is consistent with the PB 2019 CVN 78 Class budget request to Congress, and by adding the CVN 81 full ship cost estimate a procurement cost and operations and support cost APB breach occur. An APB update will be submitted later in 2018 reflecting the addition of CVN 81.
Original UCR Baseline			
	PAUC	None	
	APUC	None	
			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.
			The Program Office will submit a Program Deviation Report to address these changes and an APB update will be submitted in FY 2018.



## Schedule



## 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 <sup>1</sup>
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 <sup>1</sup>
Initial Operational Capability (IOC)	Sep 2015	Sep 2016	Mar 2017	Apr 2019 <sup>1</sup>
Follow-on Ship (CVN 79)				
DAB Program Review	Jan 2010	Apr 2013	Oct 2013	Apr 2015 <sup>1</sup>
Start Construction	Jan 2011	Aug 2013	Feb 2014	Jun 2015 <sup>1</sup>
Delivery	Sep 2018	Sep 2022	Mar 2023	Sep 2024 <sup>1</sup>
Follow-on Ship (CVN 80)				
DAB Program Review	Jan 2015	Sep 2017	Mar 2018	Nov 2018 <sup>1</sup>
IOT&E				
IOT&E Start	N/A	Feb 2017	Aug 2017	Jul 2020 <sup>1</sup>
IOT&E Complete	N/A	Aug 2019	Feb 2020	Sep 2021 <sup>1</sup>
Milestone C	Mar 2017	Sep 2019	Mar 2020	Mar 2020
Platform-Level Integration DT Period Complete	N/A	Sep 2017	Mar 2018	Dec 2020 <sup>1</sup>

(Ch-1)

(Ch-2)

(Ch-3)

(Ch-4)

(Ch-5)

<sup>1</sup> APB Breach

**Change Explanations**

(Ch-1) The current estimate for IOC changed from November 2018 to April 2019 to reflect a shift in the PSA start and completion dates.

(Ch-2) The current estimate for CVN 80 DAB Program Review changed from February 2018 to November 2018 to align with the revised estimated award of the CVN 80 DD&C contract in December 2018.

(Ch-3) The current estimate for IOT&E Start changed from December 2020 to July 2020 assumes a schedule shift resulting from Navy's proposed shift to conduct FSST on CVN 79.

(Ch-4) The current estimate for IOT&E Complete changed from February 2022 to September 2021 assumes a schedule shift resulting from Navy's proposed shift to conduct FSST on CVN 79.

(Ch-5) The current estimate for Platform-Level Integration DT Period Complete changed from September 2021 to December 2020 assumes a schedule shift resulting from Navy's proposed shift to conduct FSST on CVN 79.

**Acronyms and Abbreviations**

CSTR - Combat Systems Trial Rehearsal

DD&C - Detail Design and Construction

DT - Developmental Testing

FSST - Full Ship Shock Trials

IOT&E - Initial Operational Test & Evaluation

NDAA - National Defense Authorization Act

OPEVAL - Operational Evaluation

PSA - Post Shakedown Availability

SECNAV - Secretary of the Navy

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 <sup>1</sup>
IOC	Sep 2016	Sep 2016	Mar 2017	Apr 2019 <sup>1</sup>
IOT&E				
IOT&E Start	Feb 2017	Feb 2017	Aug 2017	Jul 2020 <sup>1</sup>
IOT&E Complete	Aug 2019	Aug 2019	Feb 2020	Sep 2021 <sup>1</sup>
Platform-Level Integration DT Period Complete	Sep 2017	Sep 2017	Mar 2018	Dec 2020 <sup>1</sup>

<sup>†</sup> APB Breach

## Change Explanations

(Ch-1) The current estimate for IOC changed from November 2018 to April 2019 to reflect a shift in the PSA start and completion dates.

(Ch-2) The current estimate for IOT&E Start changed from December 2020 to July 2020 assumes a schedule shift resulting from Navy's proposed shift to conduct FSST on CVN 79.

(Ch-3) The current estimate for IOT&E Complete changed from February 2022 to September 2021 assumes a schedule shift resulting from Navy's proposed shift to conduct FSST on CVN 79.

(Ch-4) The current estimate for Platform-Level Integration DT Period Complete changed from September 2021 to December 2020 assumes a schedule shift resulting from Navy's proposed shift to conduct FSST on CVN 79.

## Acronyms and Abbreviations

DT - Developmental Test

FSST - Full Ship Shock Trials

IOT&E - Initial Operational Test & Evaluation

PSA - Post Shakedown Availability

## Performance

### CVN 78

Performance Characteristics				
SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Demonstrated Performance	Current Estimate
CVN 78				
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)				

Ch-1

(Ch-1)



2391	N/A	N/A	N/A	N/A
<b>Force Protection and Survivability in an Asymmetric Threat Environment</b>				
<b>Survivability</b>				
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
<b>Net-Ready</b>				
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

(Ch-1) Updated CVN 78 Class manpower estimate per August 2017 Preliminary Ship Manning Document

#### 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 dated June 22, 2007.

CVN-21 Operational Requirements Document (ORD) Change 2 dated June 22, 2007 was revalidated 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 dated June 22, 2007.

CVN-21 Operational Requirements Document (ORD) Change 2 dated June 22, 2007 was revalidated 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)
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	
Navy	2001	Carrier Replacement Program	(Shared)
	1611 02	0204112N	
Line Item		Name	
Navy	2001	Carrier Replacement Program	(Shared)
	1611 05	0204112N	
Line Item		Name	
Navy	5110	Outfitting	(Shared)
	5300	Completion of Prior Year Shipbuilding	(Shared)
	1810 01	0204112N	
	5664	Surface Training Equipment	(Shared)

**MILCON**

Appn	BA	PE
Navy	1205 01	0203176N
Project		Name
Navy	62688500	Pier 11 CVN-78 Power Booms (Sunk)
	1205 01	0702776N
	32443998	Drydock 8 Electrical Distribution Upgrade (Sunk)

**Acq O&M**

Appn	BA	PE
Navy	1804 01	0204112N
Subactivity Group		Name
Navy	1B1B	Ship Operations (Shared)
	1804 01	0702827N
	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
	9B58A	Improved Corrosion Protection for EMALS (Sunk)

				9D24A	EMALS Congressional Add		(Sunk)
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	--	4392.5	4333.4	4744.6	5277.3
Procurement	24825.9	24357.7	--	30853.6	31748.7	33258.8	53181.5
Flyaway	--	--	--	30828.2	--	--	53145.1
Recurring	--	--	--	27656.8	--	--	48496.0
Non Recurring	--	--	--	3171.4	--	--	4649.1
Support	--	--	--	25.4	--	--	36.4
Other Support	--	--	--	25.4	--	--	36.4
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	152.0	--	46.2	0.0	208.5	56.9
Acq O&M	0.0	0.0	--	89.3	0.0	0.0	123.3
Total	28701.2	28633.1	N/A	35381.6	36082.1	38211.9	58639.0

## 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	3543.1	3923.0	3999.8	4263.4
Procurement	24235.0	22764.3	25040.7	29404.4 <sup>1</sup>	30977.4	30808.7	50648.2
Flyaway	--	--	--	29379.0	--	--	50611.8
Recurring	--	--	--	26207.6	--	--	45962.7
Non Recurring	--	--	--	3171.4	--	--	4649.1
Support	--	--	--	25.4	--	--	36.4
Other Support	--	--	--	25.4	--	--	36.4
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	133.2	146.5	27.4	0.0	187.8	36.2
Acq O&M	0.0	0.0	--	89.3	0.0	0.0	123.3
Total	27725.6	26369.7	N/A	33064.2	34900.4	34996.3	55071.1

<sup>1</sup> APB Breach

#### Cost Notes

In accordance with Section 842 of the National Defense Authorization Act for FY 2017, which amended title 10 U.S.C. § 2334, the Director of Cost Assessment and Program Evaluation, and the Secretary of the military department concerned or the head of the Defense Agency concerned, must issue guidance requiring a discussion of risk, the potential impacts of risk on program costs, and approaches to mitigate risk in cost estimates for MDAPs and major subprograms. The information required by the guidance is to be reported in each SAR. This guidance is not yet available; therefore, the information on cost risk is not contained in this SAR.

PB 2019 PB introduces a third year of funding in the FYDP for CVN 81, the fourth ship of the CVN 78 Class. CVN 81 Advance Procurement funding was previously reported in the PB 2018 and the December 2016 SAR. PB 2019 and the December 2017 SAR include the CVN 81 whole ship estimate in the funding tables and increase in quantity. Accordingly, this report reflects a quantity increase of one ship from the APB program of record from three ships to four. The CVN 81 full ship estimate is consistent with the PB 2019 CVN 78 Class budget request to Congress, and by adding the CVN 81 full ship cost estimate a procurement cost and operations and support cost APB breach occur. An APB update will be submitted later in 2018 reflecting the addition of CVN 81.

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	849.4 <sup>1</sup>	410.4	744.8	1013.9
Procurement	590.9	1593.4	1752.7	1449.2	771.3	2450.1	2533.3
Flyaway	--	--	--	1449.2	--	--	2533.3
Recurring	--	--	--	1449.2	--	--	2533.3
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	2317.4	1181.7	3215.6	3567.9

<sup>1</sup> APB Breach

### Cost Notes

In accordance with Section 842 of the National Defense Authorization Act for FY 2017, which amended title 10 U.S.C. § 2334, the Director of Cost Assessment and Program Evaluation, and the Secretary of the military department concerned or the head of the Defense Agency concerned, must issue guidance requiring a discussion of risk, the potential impacts of risk on program costs, and approaches to mitigate risk in cost estimates for MDAPs and major subprograms. The information required by the guidance is to be reported in each SAR. This guidance is not yet available; therefore, the information on cost risk is not contained in this SAR.

PB 2019 PB introduces a third year of funding in the FYDP for CVN 81, the fourth ship of the CVN 78 Class. CVN 81 Advance Procurement funding was previously reported in the PB 2018 and the December 2016 SAR. PB 2019 and the December 2017 SAR include the CVN 81 whole ship estimate in the funding tables and increase in quantity. Accordingly, this report reflects a quantity increase of one ship from the APB program of record from three ships to four. The CVN 81 full ship estimate is consistent with the PB 2019 CVN 78 Class budget request to Congress, and by adding the CVN 81 full ship cost estimate a procurement cost and operations and support cost APB breach occur. An APB update will be submitted later in 2018 reflecting the addition of CVN 81.

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 2019 President's Budget / December 2017 SAR (TY\$ M)									
Appropriation	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
RDT&E	4268.7	138.1	108.2	103.8	89.1	77.1	86.5	405.8	5277.3
Procurement	24178.5	4500.0	1657.6	2157.5	3265.3	2920.2	3397.3	11105.1	53181.5
MILCON	56.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.9
Acq O&M	71.8	14.0	9.0	8.2	6.3	6.9	7.1	0.0	123.3
PB 2019 Total	28575.9	4652.1	1774.8	2269.5	3360.7	3004.2	3490.9	11510.9	58639.0
PB 2018 Total	28516.1	4652.1	1734.7	2359.0	3072.1	2439.0	2473.6	488.9	45735.5
Delta	59.8	0.0	40.1	-89.5	288.6	565.2	1017.3	11022.0	12903.5

## Cost and Funding

### Funding Summary - CVN 78

Appropriation Summary									
FY 2019 President's Budget / December 2017 SAR (TY\$ M)									
Appropriation	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
RDT&E	3353.1	112.1	75.1	86.3	71.6	72.9	86.5	405.8	4263.4
Procurement	22925.1	4319.7	1425.2	2035.1	3197.7	2904.7	3204.9	10635.8	50648.2
MILCON	36.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.2
Acq O&M	71.8	14.0	9.0	8.2	6.3	6.9	7.1	0.0	123.3
PB 2019 Total	26386.2	4445.8	1509.3	2129.6	3275.6	2984.5	3298.5	11041.6	55071.1
PB 2018 Total	26317.3	4481.6	1477.3	2238.7	3017.6	2434.4	2454.8	488.9	42910.6
Delta	68.9	-35.8	32.0	-109.1	258.0	550.1	843.7	10552.7	12160.5

Quantity Summary										
FY 2019 President's Budget / December 2017 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	2	1	0	0	0	0	1	0	4
PB 2019 Total	0	2	1	0	0	0	0	1	0	4
PB 2018 Total	0	2	1	0	0	0	0	0	0	3
Delta	0	0	0	0	0	0	0	1	0	1

## Funding Summary - EMALS

Appropriation Summary									
FY 2019 President's Budget / December 2017 SAR (TY\$ M)									
Appropriation	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
RDT&E	915.6	26.0	33.1	17.5	17.5	4.2	0.0	0.0	1013.9
Procurement	1253.4	180.3	232.4	122.4	67.6	15.5	192.4	469.3	2533.3
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 2019 Total	2189.7	206.3	265.5	139.9	85.1	19.7	192.4	469.3	3567.9
PB 2018 Total	2198.8	170.5	257.4	120.3	54.5	4.6	18.8	0.0	2824.9
Delta	-9.1	35.8	8.1	19.6	30.6	15.1	173.6	469.3	743.0

Quantity Summary										
FY 2019 President's Budget / December 2017 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	2	1	0	0	0	0	1	0	4
PB 2019 Total	0	2	1	0	0	0	0	1	0	4
PB 2018 Total	0	2	1	0	0	0	0	0	0	3
Delta	0	0	0	0	0	0	0	1	0	1



## 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	--	--	--	--	--	--	101.3
2018	--	--	--	--	--	--	112.1
2019	--	--	--	--	--	--	75.1
2020	--	--	--	--	--	--	86.3
2021	--	--	--	--	--	--	71.6
2022	--	--	--	--	--	--	72.9
2023	--	--	--	--	--	--	86.5
2024	--	--	--	--	--	--	290.2
2025	--	--	--	--	--	--	84.6
2026	--	--	--	--	--	--	24.0
2027	--	--	--	--	--	--	5.0
2028	--	--	--	--	--	--	2.0
Subtotal	--	--	--	--	--	--	4263.4

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	--	--	--	--	--	--	92.8
2016	--	--	--	--	--	--	75.4
2017	--	--	--	--	--	--	74.1
2018	--	--	--	--	--	--	80.6
2019	--	--	--	--	--	--	53.0
2020	--	--	--	--	--	--	59.8
2021	--	--	--	--	--	--	48.6
2022	--	--	--	--	--	--	48.5
2023	--	--	--	--	--	--	56.5
2024	--	--	--	--	--	--	185.7
2025	--	--	--	--	--	--	53.1
2026	--	--	--	--	--	--	14.8
2027	--	--	--	--	--	--	3.0
2028	--	--	--	--	--	--	1.2
Subtotal	--	--	--	--	--	--	3543.1

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	--	884.5	--	253.9	1138.4	--	1138.4
2011	--	1801.4	--	561.7	2363.1	--	2363.1
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	4212.0	--	95.7	4307.7	--	4307.7
2019	--	1319.9	--	97.4	1417.3	--	1417.3
2020	--	1938.9	--	95.2	2034.1	--	2034.1
2021	--	3101.7	--	91.0	3192.7	--	3192.7
2022	--	2849.9	--	51.8	2901.7	--	2901.7
2023	1	3163.8	--	38.1	3201.9	--	3201.9
2024	--	1802.1	--	--	1802.1	--	1802.1
2025	--	2533.4	--	--	2533.4	--	2533.4
2026	--	2737.2	--	--	2737.2	--	2737.2
2027	--	1806.9	--	--	1806.9	--	1806.9
2028	--	1756.2	--	--	1756.2	--	1756.2
Subtotal	4	45962.7	--	4649.1	50611.8	--	50611.8



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	--	583.5	--	167.5	751.0	--	751.0
2011	--	1151.6	--	359.0	1510.6	--	1510.6
2012	--	283.8	--	63.3	347.1	--	347.1
2013	1	244.9	--	50.8	295.7	--	295.7
2014	--	733.3	--	161.3	894.6	--	894.6
2015	--	979.7	--	55.6	1035.3	--	1035.3
2016	--	1348.9	--	71.4	1420.3	--	1420.3
2017	--	1349.7	--	68.6	1418.3	--	1418.3
2018	1	2367.1	--	53.8	2420.9	--	2420.9
2019	--	727.5	--	53.7	781.2	--	781.2
2020	--	1047.8	--	51.5	1099.3	--	1099.3
2021	--	1643.4	--	48.2	1691.6	--	1691.6
2022	--	1480.3	--	26.9	1507.2	--	1507.2
2023	1	1611.2	--	19.4	1630.6	--	1630.6
2024	--	899.7	--	--	899.7	--	899.7
2025	--	1240.0	--	--	1240.0	--	1240.0
2026	--	1313.5	--	--	1313.5	--	1313.5
2027	--	850.1	--	--	850.1	--	850.1
2028	--	810.0	--	--	810.0	--	810.0
Subtotal	4	26207.6	--	3171.4	29379.0	--	29379.0



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

### **Cost Quantity Information**

The Navy and shipbuilder have made fundamental changes in the manner in which the CVN 79 will be built to incorporate lessons learned from CVN 78 and eliminate the key contributors to cost performance challenges realized in the construction of CVN 78. Further improvements are planned for CVN 80 and have been incorporated into the CVN 80 cost estimates and budgets.

The congressionally mandated cost cap for CVN 79 is \$11.398B and is consistent with the Program Manager's Estimate at Completion (PM EAC). The FY 2018 NDAA set a Congressional cost cap for CVN 80 of \$12.568B and is consistent with the Program Manager's estimate. The CVN 80 funding in this report includes \$12.902B and is expected to be reduced by \$300M with the FY 2018 Congressional adjustment in the enacted appropriations bill. The CVN 80 funding includes \$133M for FORD Class wide spares.

PB 2019 PB introduces a third year of funding in the FYDP for CVN 81, the fourth ship of the CVN 78 Class. CVN 81 Advance Procurement funding was previously reported in the PB 2018 and the December 2016 SAR. PB 2019 and the December 2017 SAR include the CVN 81 whole ship estimate in the funding tables and increase in quantity. Accordingly, this report reflects a quantity increase of one ship from the APB program of record from three ships to four. The CVN 81 full ship estimate is consistent with the PB 2019 CVN 78 Class budget request to Congress, and by adding the CVN 81 full ship cost estimate a procurement cost and operations and support cost APB breach occur. An APB update will be submitted later in 2018 reflecting the addition of CVN 81.

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	6428.0
2009	--	--
2010	--	--
2011	--	--
2012	--	--
2013	1	6105.7
2014	--	--
2015	--	--
2016	--	--
2017	--	--
2018	1	6580.5
2019	--	--
2020	--	--
2021	--	--
2022	--	--
2023	1	7093.4
2024	--	--
2025	--	--
2026	--	--
2027	--	--
2028	--	--
Subtotal	4	26207.6

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	--	--	--	--	--	1.0	1.0
2021	--	--	--	--	--	5.0	5.0
2022	--	--	--	--	--	3.0	3.0
2023	--	--	--	--	--	3.0	3.0
Subtotal	--	--	--	--	--	36.4	36.4



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	--	--	--	--	--	8.6	8.6
2019	--	--	--	--	--	5.5	5.5
2020	--	--	--	--	--	0.7	0.7
2021	--	--	--	--	--	3.4	3.4
2022	--	--	--	--	--	2.0	2.0
2023	--	--	--	--	--	1.9	1.9
Subtotal	--	--	--	--	--	25.4	25.4

Annual Funding - CVN 78 1205   MILCON   Military Construction, Navy and Marine Corps		
Fiscal Year	TY \$M	
	Total Program	
2013		32.8
2014		3.4
Subtotal		36.2

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
Subtotal	27.4



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		14.0
2019		9.0
2020		8.2
2021		6.3
2022		6.9
2023		7.1
Subtotal		123.3

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		30.6
2018		10.2
2019		6.4
2020		5.7
2021		4.3
2022		4.6
2023		4.7
Subtotal		89.3

## 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	--	--	--	--	--	--	26.0
2019	--	--	--	--	--	--	33.1
2020	--	--	--	--	--	--	17.5
2021	--	--	--	--	--	--	17.5
2022	--	--	--	--	--	--	4.2
Subtotal	--	--	--	--	--	--	1013.9



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	--	--	--	--	--	--	--	8.6
2016	--	--	--	--	--	--	--	9.1
2017	--	--	--	--	--	--	--	26.9
2018	--	--	--	--	--	--	--	18.7
2019	--	--	--	--	--	--	--	23.4
2020	--	--	--	--	--	--	--	12.1
2021	--	--	--	--	--	--	--	11.9
2022	--	--	--	--	--	--	--	2.8
Subtotal	--	--	--	--	--	--	--	849.4

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	180.3	--	--	180.3	--	180.3
2019	--	232.4	--	--	232.4	--	232.4
2020	--	122.4	--	--	122.4	--	122.4
2021	--	67.6	--	--	67.6	--	67.6
2022	--	15.5	--	--	15.5	--	15.5
2023	1	192.4	--	--	192.4	--	192.4
2024	--	294.0	--	--	294.0	--	294.0
2025	--	175.3	--	--	175.3	--	175.3
Subtotal	4	2533.3	--	--	2533.3	--	2533.3

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	--	161.0	--	--	161.0	--	161.0
2012	--	--	--	--	--	--	--
2013	1	7.7	--	--	7.7	--	7.7
2014	--	39.4	--	--	39.4	--	39.4
2015	--	122.3	--	--	122.3	--	122.3
2016	--	127.3	--	--	127.3	--	127.3
2017	--	86.9	--	--	86.9	--	86.9
2018	1	101.3	--	--	101.3	--	101.3
2019	--	128.1	--	--	128.1	--	128.1
2020	--	66.1	--	--	66.1	--	66.1
2021	--	35.8	--	--	35.8	--	35.8
2022	--	8.1	--	--	8.1	--	8.1
2023	1	98.0	--	--	98.0	--	98.0
2024	--	146.8	--	--	146.8	--	146.8
2025	--	85.8	--	--	85.8	--	85.8
Subtotal	4	1449.2	--	--	1449.2	--	1449.2



### 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 on the CVN 79.

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	435.0
2009	--	--
2010	--	--
2011	--	--
2012	--	--
2013	1	351.1
2014	--	--
2015	--	--
2016	--	--
2017	--	--
2018	1	333.5
2019	--	--
2020	--	--
2021	--	--
2022	--	--
2023	1	329.6
2024	--	--
2025	--	--
Subtotal	4	1449.2

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
<b>Approval Date</b>	4/26/2004	4/26/2004
<b>Approved Quantity</b>	3	3
<b>Reference</b>	Milestone B ADM	Milestone B ADM
<b>Start Year</b>	2004	2004
<b>End Year</b>	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 (PDR) and APB change request will be submitted in FY 2018 to address this change. An ADM update will be requested to increase the LRIP quantity to four to reflect CVN 81 upon approval of the APB change.

### 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

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#### 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.

In October 2017, the Indian Navy provided a Letter of Request for pricing and availability of design consultancy for their intended second indigenous aircraft carrier (IAC-2). The U.S. Navy is reviewing the feasibility and scope of the request and intends to respond formally in second quarter FY 2018.

### EMALS

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#### 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. The U.S. Navy provided a Pricing and Availability statement for EMALS/AAG and the Indian Navy is reviewing the documentation.

#### Acronyms and Abbreviations

AAG - Advanced Arresting Gear

IAC - Indigenous Aircraft Carrier

## Nuclear Costs

### CVN 78

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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 \$9,298.70M in TY dollars for the CVN 78 Class Aircraft Carriers (CVN 78-81).

### EMALS

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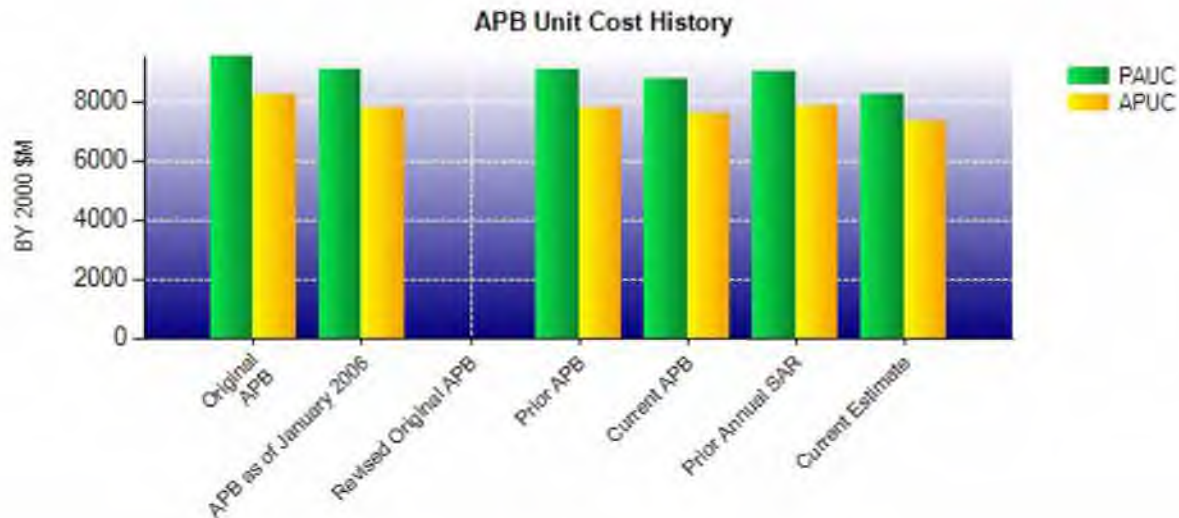
None



**Unit Cost**

CVN 78

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 \$M	BY 2000 \$M	% Change
	Current UCR Baseline (Apr 2013 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	26369.7	33064.2	
Quantity	3	4	
Unit Cost	8789.900	8266.050	-5.96
Average Procurement Unit Cost			
Cost	22764.3	29404.4	
Quantity	3	4	
Unit Cost	7588.100	7351.100	-3.12
Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 \$M	BY 2000 \$M	% Change
	Original UCR Baseline (Apr 2004 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	28701.2	33064.2	
Quantity	3	4	
Unit Cost	9567.067	8266.050	-13.60
Average Procurement Unit Cost			
Cost	24825.9	29404.4	
Quantity	3	4	
Unit Cost	8275.300	7351.100	-11.17



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 2016	8997.533	7852.333	14303.533	12946.700
Current Estimate	Dec 2017	8266.050	7351.100	13767.775	12662.050

### 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	1564.825	227.708	222.450	-20.300	130.475	0.000	9.150	2134.308	13767.775

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	1541.600	554.625	166.850	99.725	-35.700	0.000	9.150	2336.250	12662.050

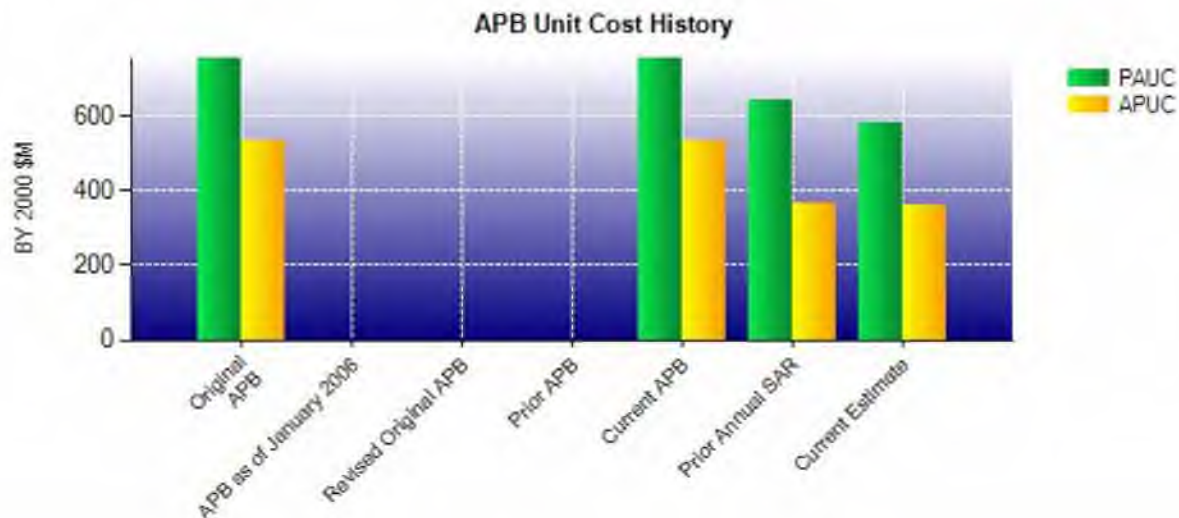
SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone I	N/A	N/A	N/A	N/A
Milestone B	N/A	Apr 2004	N/A	Apr 2004
Milestone C	N/A	Mar 2017	N/A	Mar 2020
IOC	N/A	Sep 2015	N/A	Apr 2019
Total Cost (TY \$M)	N/A	34900.4	N/A	55071.1
Total Quantity	N/A	3	N/A	4
PAUC	N/A	11633.467	N/A	13767.775



**EMALS**

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 \$M	BY 2000 \$M	% Change
	Current UCR Baseline (Apr 2013 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	2263.4	2317.4	
Quantity	3	4	
Unit Cost	754.467	579.350	-23.21
Average Procurement Unit Cost			
Cost	1593.4	1449.2	
Quantity	3	4	
Unit Cost	531.133	362.300	-31.79

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2000 \$M	BY 2000 \$M	% Change
	Original UCR Baseline (Apr 2013 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	2263.4	2317.4	
Quantity	3	4	
Unit Cost	754.467	579.350	-23.21
Average Procurement Unit Cost			
Cost	1593.4	1449.2	
Quantity	3	4	
Unit Cost	531.133	362.300	-31.79



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 2016	642.867	366.333	941.633	615.233
Current Estimate	Dec 2017	579.350	362.300	891.975	633.325

### 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	121.750	-165.275	0.000	0.000	541.600	0.000	0.000	498.075	891.975

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	115.400	-131.075	0.000	0.000	391.900	0.000	0.000	376.225	633.325

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	Apr 2019
Total Cost (TY \$M)	N/A	1181.7	N/A	3567.9
Total Quantity	N/A	3	N/A	4
PAUC	N/A	393.900	N/A	891.975



**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	+98.3	+6361.2	+0.2	-1.1	+6458.6
Quantity	--	--	--	--	--
Schedule	+172.1	+667.4	--	+21.0	+860.5
Engineering	-480.1	+398.9	--	--	-81.2
Estimating	+209.9	+401.5	+36.0	+91.2	+738.6
Other	--	--	--	--	--
Support	--	+33.7	--	--	+33.7
Subtotal	+0.2	+7862.7	+36.2	+111.1	+8010.2
Current Changes					
Economic	-4.2	-194.8	--	-0.3	-199.3
Quantity	--	+12544.3	--	--	+12544.3
Schedule	+26.3	--	--	+3.0	+29.3
Engineering	--	--	--	--	--
Estimating	+318.1	-544.3	--	+9.5	-216.7
Other	--	--	--	--	--
Support	--	+2.9	--	--	+2.9
Subtotal	+340.2	+11808.1	--	+12.2	+12160.5
Total Changes	+340.4	+19670.8	+36.2	+123.3	+20170.7
Current Estimate	4263.4	50648.2	36.2	123.3	55071.1

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	--	--	--	--	--
Schedule	+119.9	--	--	+15.4	+135.3
Engineering	-352.4	+187.7	--	--	-164.7
Estimating	+69.6	-889.2	+27.4	+65.1	-727.1
Other	--	--	--	--	--
Support	--	+23.5	--	--	+23.5
Subtotal	-162.9	-678.0	+27.4	+80.5	-733.0
Current Changes					
Economic	--	--	--	--	--
Quantity	--	+6091.1	--	--	+6091.1
Schedule	+12.2	--	--	+2.2	+14.4
Engineering	--	--	--	--	--
Estimating	+203.2	-245.6	--	+6.6	-35.8
Other	--	--	--	--	--
Support	--	+1.9	--	--	+1.9
Subtotal	+215.4	+5847.4	--	+8.8	+6071.6
Total Changes	+52.5	+5169.4	+27.4	+89.3	+5338.6
Current Estimate	3543.1	29404.4	27.4	89.3	33064.2

Previous Estimate: December 2016



RDT&E		\$M	
Current Change Explanations		Base Year	Then Year
Revised escalation indices. (Economic)		N/A	-4.2
Schedule variance due to potential shift of Full Ship Shock Trial from CVN 78 to CVN 79. (Schedule)		+12.2	+26.3
Revised estimate to CVN 78 Class due to miscellaneous adjustments. (Estimating)		-3.3	-4.4
Revised estimate to CVN 78 Class due to supporting the Office of Management and Budget (OMB) directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government. (Estimating)		-1.9	-2.8
Revised estimate for CVN 78 Class for Small Business Innovative Research (SBIR). (Estimating)		-1.9	-2.5
Revised estimate to CVN 78 Class due to department wide adjustments. (Estimating)		-1.0	-1.5
Additional funding for CVN 80 Integrated Digital Shipbuilding efforts. (Estimating)		+176.2	+275.8
Revised estimates to support CVN 78 Class Follow-On Test & Evaluation efforts. (Estimating)		+21.7	+33.2
Revised estimates in the out years for CVN 79 Phase II total ship integration efforts. (Estimating)		+10.5	+16.1
Revised estimate due to application of new out year escalation indices. (Estimating)		+2.2	+3.2
Adjustment for current and prior escalation. (Estimating)		+0.7	+1.0
RDT&E Subtotal		+215.4	+340.2

Procurement		\$M	
Current Change Explanations		Base Year	Then Year
Revised escalation indices. (Economic)		N/A	-194.8
Quantity variance resulting from an increase of one ship from three to four to reflect actual funding adjustments supporting CVN 81. (Quantity)		+6432.8	+12631.9
Additional quantity variance reflects actual funding adjustments associated with the increase of one ship in FY 2023. (Quantity)		-341.7	-87.6
Re-allocation of funds to EMALS from CVN 78. (Estimating)		-0.1	-0.1
Re-allocation of funds from EMALS to CVN 79. (Estimating)		+0.3	0.0
Re-allocation of funds to EMALS from CVN 80. (Estimating)		-0.1	0.0
Re-allocation of funds to EMALS from CVN 81. (Estimating)		-329.8	-659.4
Re-phasing to support Outfitting and Post Delivery requirements. (Estimating)		-0.5	0.0
Revised estimate to CVN 80 due to realized efficiencies. (Estimating)		-14.1	-25.0
Revised estimate to CVN 80 due to supporting the OMB directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government. (Estimating)		-12.6	-23.7
Revised estimate to CVN 81 due to supporting the OMB directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government. (Estimating)		-6.5	-12.6
Revised estimate to CVN 80 due to service-wide adjustments. (Estimating)		-27.4	-75.0
Revised estimate to CVN 81 due to service-wide adjustments (Estimating)		-17.6	-34.0
Revised estimate for CVN 78 due to extended shipboard and integration testing and complexity of Trial Card deficiencies. (Estimating)		+37.6	+57.0
Revised estimate for CVN 78 Post Delivery. (Estimating)		+18.7	+33.9
Revised estimate due to application of new out year escalation indices. (Estimating)		+57.4	+109.1



Adjustment for current and prior escalation. (Estimating)	+49.1	+85.5
Adjustment for current and prior escalation. (Support)	+0.1	+0.1
Increase in Other Support to procure CVN 78 Class Ready for Life Cycle Training Solutions and Technical Training Equipment to support the baseline configuration for CVN 79 Phase II delivery. (Support)	+1.8	+2.8
Procurement Subtotal	+5847.4	+11808.1

Acq O&M	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-0.3
Schedule variance to support CVN 78 to cover repair, maintenance, and support costs incurred to provide a safe and habitable ship environment to the 2,500 plus crew members due to delay in ship delivery of additional month. (Schedule)	+2.2	+3.0
Revised estimate to CVN 78 due to supporting the OMB directed reforms for Efficiency and Effectiveness that include a lean, accountable, more efficient government. (Estimating)	-0.5	-0.5
Revised estimate due to department wide adjustments. (Estimating)	-0.4	-0.4
Revised estimate for continued In-Service Engineering Agents training and familiarization of the CVN 78 Class and FORD Class Data Environment support. (Estimating)	+7.4	+10.7
Revised estimate due to application of new out year escalation indices. (Estimating)	+0.2	+0.2
Revised estimate due to miscellaneous adjustments. (Estimating)	-0.2	-0.6
Adjustment for current and prior escalation. (Estimating)	+0.1	+0.1
Acq O&M Subtotal	+8.8	+12.2

**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	+25.8	+470.7	--	+496.5
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+522.3	+603.7	+20.7	+1146.7
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+548.1	+1074.4	+20.7	+1643.2
Current Changes				
Economic	-0.4	-9.1	--	-9.5
Quantity	--	-267.2	--	-267.2
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+55.8	+963.9	--	+1019.7
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+55.4	+687.6	--	+743.0
Total Changes	+603.5	+1762.0	+20.7	+2386.2
Current Estimate	1013.9	2533.3	20.7	3567.9

Summary BY 2000 \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	384.7	590.9	--	975.6
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+426.1	+508.1	+18.8	+953.0
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+426.1	+508.1	+18.8	+953.0
Current Changes				
Economic	--	--	--	--
Quantity	--	-136.1	--	-136.1
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+38.6	+486.3	--	+524.9
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+38.6	+350.2	--	+388.8
Total Changes	+464.7	+858.3	+18.8	+1341.8
Current Estimate	849.4	1449.2	18.8	2317.4

Previous Estimate: December 2016



RDT&E	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-0.4
Revised estimate due to department wide adjustments. (Estimating)	-0.1	-0.1
Revised estimate for SBIR. (Estimating)	-0.7	-0.9
Additional funding for CVN 78 Class EMALS Depot Planning. (Estimating)	+39.0	+56.4
Adjustment for current and prior escalation. (Estimating)	+0.3	+0.3
Revised estimate due to application of new out year escalation indices. (Estimating)	+0.1	+0.1
RDT&E Subtotal	+38.6	+55.4

Procurement	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-9.1
Total Quantity variance resulting from an increase of one ship from three to four. (Subtotal)	+287.8	+565.1
Quantity variance resulting from an increase of one ship from three to four. (Quantity)	(+151.7)	(+297.9)
Allocation to Estimating resulting from Quantity change. (Estimating) (QR)	(+136.1)	(+267.2)
Additional quantity variance reflects actual funding adjustments associated with the increase of one ship in FY 2023. (Quantity)	-287.8	-565.1
Re-allocation of funds to EMALS from CVN 78. (Estimating)	+0.1	+0.1
Re-allocation of funds from EMALS to CVN 79. (Estimating)	-0.3	0.0
Re-allocation of funds to EMALS from CVN 80. (Estimating)	-0.3	0.0
Re-allocation of funds to EMALS from CVN 81. (Estimating)	+329.8	+659.4
Additional funding for CVN 78 Class EMALS Interim Spares. (Estimating)	+15.8	+28.1
Revised estimate due to application of new out year escalation indices. (Estimating)	+2.3	+4.3
Adjustment for current and prior escalation. (Estimating)	+2.8	+4.8
Procurement Subtotal	+350.2	+687.6

(QR) Quantity Related

~~(U//FOUO)~~ Contracts~~(U//FOUO)~~ 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	4240.2	N/A	N/A	4345.4	4347.6

## 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.

Contract Variance		
Item	Cost Variance	Schedule Variance
[ (b)(4) ]		

## Cost and Schedule Variance Explanations

(b)(4)

## Notes

As of January 21, 2018 the Construction Preparation contract is 83.3% complete based on dollars.



**(b)(4) 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	3360.5	3482.9	1	3457.1	3443.1

**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.

**Contract Variance**

Item	Cost Variance	Schedule Variance
(b)(4)		

**Cost and Schedule Variance Explanations**

(b)(4)

**Notes**

The Navy awarded a FPIF contract in the amount of \$3.35B for the CVN 79 Detail Design & Construction effort. As of January 21, 2018 the DD&C contract is 18.4% complete based on dollars.



**Contract Identification**

**Appropriation:** Procurement  
**Contract Name:** CVN 80 Advanced Procurement (AP)  
**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:** Cost Plus Fixed Fee (CPFF)  
**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	391.6	N/A	1	391.6	391.6

**Target Price Change Explanation**

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the award of a undefinitized contract action that added Main Reduction Gears, Main Turbine Generators, and Long Lead Time Material (first increment).

**Cost and Schedule Variance Explanations**

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

**General Contract Variance Explanation**

Cost and Schedule Variance reporting is not required on this contract. This contract currently supports level of effort engineering support and long lead time material procurement and does not yet require EVM reporting.

**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 \$1,466.5M. The current awarded prices for each ship set are as follows:

CVN 79

AAG = \$183.6M

EMALS = \$543.9M

CVN 80

AAG = \$195.2M

EMALS = \$532.6M

In November 2017 a modification was executed to add an additional CLIN for \$11.2M for an additional AAG half engine funded with RDT&E. The AAG program will also submit a SAR this year that includes 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	55071.1	Years Appropriated	22
Expended to Date	22374.4	Percent Years Appropriated	68.75%
Percent Expended	40.63%	Appropriated to Date	30832.0
Total Funding Years	32	Percent Appropriated	55.99%

The above data is current as of February 12, 2018.

### 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	3567.9	Years Appropriated	19
Expended to Date	1807.5	Percent Years Appropriated	73.08%
Percent Expended	50.66%	Appropriated to Date	2396.0
Total Funding Years	26	Percent Appropriated	67.15%

The above data is current as of February 12, 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 this SAR. 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 (Newport News 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 2017 SAR for the AAG program reports a quantity of three units. 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 2017 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 <sup>1</sup>	244789.7
Then Year	251600.0	N/A	252653.4	N/A

<sup>1</sup> APB O&S Cost Breach

Total O&S cost for 11 ships would be \$214,410.9M BY 2000 dollars/\$1,018,259.0M 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 - Dec 2016 SAR	58670.4	
Programmatic/Planning Factors	19456.8	Updated ship quantity to reflect O&S for 4 ships.
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	19456.8
Current Estimate	78127.2

#### Disposal Estimate Details

**Date of Estimate:** February 05, 2018  
**Source of Estimate:** POE  
**Disposal/Demilitarization Total Cost (BY 2000 \$M):** Total costs for disposal of all Ship are 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**

<b>Date of Estimate:</b>	February 05, 2018
<b>Source of Estimate:</b>	POE
<b>Quantity to Sustain:</b>	4
<b>Unit of Measure:</b>	Ship
<b>Service Life per Unit:</b>	50.00 Years
<b>Fiscal Years in Service:</b>	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 this SAR. 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 <sup>1</sup>
Then Year	6422.6	N/A	9789.8

<sup>1</sup> 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 - Dec 2016 SAR	2696.2	
Programmatic/Planning Factors	655.6	Updated ship quantity to reflect O&S for EMALS systems for 4 ships. The December 2016 SAR reflected an EMALS Average Annual Cost per ship based on 3 ships. The December 2017 SAR reflects a lower EMALS Average Annual Cost per ship based on 4 ships.
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	655.6
Current Estimate	3351.8

**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.