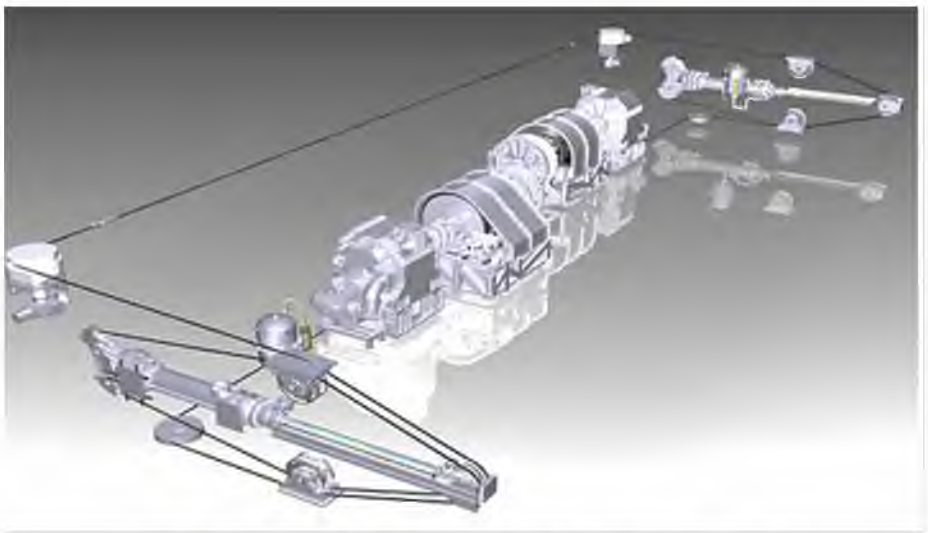
Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-529



Advanced Arresting Gear (AAG)

As of FY 2020 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

Table of Contents

Sensitivity Originator

No originator information is available at this time.

Common Acronyms and Abbreviations for MDAP Programs

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

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

Program Information

Program Name
Advanced Arresting Gear (AAG)

DoD Component
Navy

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References

SAR Baseline (Development Estimate)

Under Secretary of Defense (Acquisition, Technology & Logistics) Approved Acquisition Program Baseline (APB) dated November 17, 2017

Approved APB

Under Secretary of Defense (Acquisition, Technology & Logistics) Approved Acquisition Program Baseline (APB) dated November 17, 2017

Mission and Description

The Advanced Arresting Gear (AAG) program is a system level acquisition for a new arresting gear for the GERALD R. FORD-class (CVN 78) aircraft carrier. AAG is designed to provide total life cycle savings by reducing O&M costs when compared to the NIMITZ-class (CVN 68). AAG provides new operational capabilities required by the GERALD R. FORD-class, which include the ability to safely and efficiently recover both heavier and faster aircraft as well as light weight unmanned air vehicles that will enter the fleet in the future.

Executive Summary

Program Highlights Since Last Report

This is the annual SAR submission for the AAG program.

This SAR includes increased Shipbuilding and Conversion funding for 1 additional AAG shipset for CVN 81. An APB update to reflect the quantity and funding change is in process.

The AAG System Design Development (SDD) contract was re-baselined in August 2018 with an Over Target Baseline/Over Target Schedule. An Estimate at Complete is in process. The SDD re-planning effort incorporated land based dead-load testing and Aircraft Compatibility Testing for the T-45 aircraft and barricade integration/testing. A contract modification to formalize the re-baselined AAG SDD Integrated Master Schedule is in process.

There is one ongoing item remaining from the July 12, 2017 Nunn-McCurdy Certification ADM. The AAG reliablity/availability requirements were assessed utilizing the Carrier Analysis Team Sea-Strike Sea-Basing Aviation Model. Model results are currently being compared with previous analysis and are under PMA 251 review. To date, AAG has conducted 747 F/A-18 E/F arrestments during CVN 78 Independent Steaming Events. PMA 251 plans to conduct as many CVN 78 arrestments following Post Shakedown Availability (PSA) at sea periods as possible. AAG continues to utilize a targeted Failure Analysis and Corrective Action System process, to develop shipboard reliability projections for Post Delivery Tests and Trials during Planned Incremental Availability and deployment workups. Engineering changes are currently in development and/or test to improve reliability for AAG. Data collected during future shipboard operations will be used to better refine the models/methodologies and to correct failures prior to deployment. Additional focus will be on AAG availability with future improvements to Mean Time to Repair and Mean Logistics Delay Time.

The AAG CVN 80 Firm Fixed Price option which was part of the existing CVN 79 production contract was awarded on May 18, 2017. Combining the CVN 79 and CVN 80 shipset procurements provides efficiencies across configuration management, production and obsolescence across both ships and results in an overall reduced workload and cost for both the Prime Contractor (General Atomics) and the Government. It also provides the Government a more robust hardware delivery schedule, minimizing changes to the ship's construction sequence and reducing the ship's overall construction cost. PMA 251 is currently evaluating potential options for procurement of the CVN 81 AAG shipset in support of Program Executive Office (PEO) Carriers CVN 80/81 two ship procurement strategy.

To date, the AAG system at the Lakehurst based Jet Car Track Site (JCTS) successfully completed in excess of 2300 dead load arrestments, simulating fleet aircraft at various recovery speeds and weights, and the system at Lakehurst's Runway Arrested Landing Site (RALS) successfully completed in excess of 1000 total aircraft arrestments to include F/A-18E/F, E-2C, E-2D and C-2A. In August 2018, AAG completed F/A-18E/F and EA-18G aircraft Performance Testing at JCTS. In December 2018, AAG completed F/A-18E/F and EA-18G aircraft Performance Testing at RALS.

The AAG program is working through developmental software issues as the system is being updated to meet the full range of air wing performance requirements for all Type/Model/Series aircraft. As such, the system's Dynamic Control System and Health Monitoring software are undergoing extensive testing at both JCTS and RALS. Shipboard testing of the current software with F/A-18E/F aircraft continued during available Independent Steaming Event periods with minimal failures or issues. Based on current progress, it is expected that the Aircraft Recovery Bulletins encompassing F/A-18E/F, EA-18G, E-2C, E-2D, and C-2A in support of CVN 78 PSA flight operations will be completed by the end of FY2019.

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 2015	PMA 251 request to re-designate Advanced Arresting Gear (AAG) as an ACAT IC program.
June 2015	ASN request to OSD to reclassify AAG as an ACAT IC program.
July 2015	AAG reclassified as an ACAT IC program.
December 2016	Navy Center for Cost Analysis completed the Component Cost Position for AAG.
December 2016	Section 125 of the National Defense Authorization Act includes a requirement to perform a Nunn-McCurdy review of AAG using the 2009 APB.
May 2017	PMA 251 submitted a Nunn McCurdy SAR in accordance with the NDAA FY 2017 Section 125.
May 2017	AAG CVN 80 Option for the CVN 79 contract was awarded.
July 2017	The Nunn McCurdy review and certification of AAG was completed and documented in the July 12, 2017 Acquisition Decision Memorandum.
November 2017	AAG received an adjusted APB based on the CAPE ICE completed July 2017 for the Nunn McCurdy review. This APB was approved November 2017 and will become the original baseline.
December 2017	Submitted the AAG Software plan addressing software safety and requirements that reflect the operational concept that addresses the AAG Nunn McCurdy Certification ADM.
January 2018	AAG was reclassified as an ACAT IC.
August 2018	AAG completed manned aircraft Performance Testing at JCTS for F/A18E/F and EA-18G.
August 2018	AAG SDD contract Over Target Baseline/Over Target Schedule re-plan complete.
September 2018	Letter of Offer and Acceptance for Technical Assistance Case between the U.S. Navy and France.
December 2018	First Future French Carrier Working Group meeting held.
December 2018	AAG completed manned aircraft Performance Testing at RALS for F/A18E/F and EA-18G.

Threshold Breaches

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

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

Explanation of Breach

Procurement breach caused by an increase in quantity from 3 shipsets to 4. An APB revision is in process.

Schedule

Schedule Events				
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate
Milestone A	Jul 2003	Jul 2003	Jul 2003	Jul 2003
Milestone B	Feb 2005	Feb 2005	Feb 2005	Feb 2005
IT-B3 JCTS complete	Aug 2020	Aug 2020	Feb 2021	Aug 2020
Milestone C	Aug 2021	Aug 2021	Feb 2022	Aug 2021
IOT&E	Aug 2021	Aug 2021	Feb 2022	Aug 2021
IT-B4 RALS complete	Dec 2021	Dec 2021	Jun 2022	Dec 2021
IOC	Mar 2022	Mar 2022	Sep 2022	Mar 2022

Change Explanations

None

Notes

1. In accordance with the Assistant Secretary of the Navy (Research, Development and Acquisition) letter dated December 22, 2016, the AAG System Development & Demonstration Phase Exit Criteria for Milestone C is defined as "Successful generation of the Aircraft Recovery Bulletins for the Carrier Airwing that will conduct the first deployment on CVN 78 and completion of shipboard CVN Operational Test period OT-C I as defined in the CVN 78 Test and Evaluation Master Plan."

2. AAG IOT&E is based on the CVN 78 OT-C1 part of the Aviation Operational Test Period.

3. In accordance with Department of the Navy, Director of Air Warfare (N98) letter dated February 12, 2016, Advanced Arresting Gear Program of Record Requirements Revision, IOC definition is "AAG IOC will occur when the first AAG configured ship is fully operational, logistically supported, and ready to deploy and conduct air operations."

Acronyms and Abbreviations

IOT&E - Integrated Operational Test and Evaluation
IT - Integration Test
JCTS - Jet Car Track Site
OT - Operational Test
RALS - Runway Arrested Landing Site

Performance

Performance Characteristics				
SAR Baseline Development Estimate	**Current APB Development Objective/Threshold**		**Demonstrated Performance**	**Current Estimate**
Aircraft Interoperability				
The hookload limits and G-load limits applicable to each aircraft listed in the Development Threshold plus those listed in Table 2 shall not be exceeded when each aircraft engages the AAG at up to its maximum weight, net applied thrust, and maximum aircraft engaging velocity.	The hookload limits and G-load limits applicable to each aircraft listed in the Development Threshold plus those listed in Table 2 shall not be exceeded when each aircraft engages the AAG at up to its maximum weight, net applied thrust, and maximum aircraft engaging velocity.	The hookload limits and G-load limits applicable to C-2A,E-2 Type/Model/Series (TMS), F/A-18, EA-18 TMS, F-35, and T45 aircraft shall not be exceeded when each aircraft engages the AAG at up to its maximum weight, net applied thrust, and maximum aircraft engaging velocity.	TBD	The hookload limits and G-load limits applicable to each aircraft listed in the Development Threshold plus those listed in Table 2 shall not be exceeded when each aircraft engages the AAG at up to its maximum weight, net applied thrust, and maximum aircraft engaging velocity.
Cycle Time JCTS and RALS demonstration				
30 Seconds	30 Seconds	35 Seconds	TBD	30 Seconds
Operational Availability IOT&E demonstration				
0.988	0.988	0.985	TBD	.985
AAG Operating Envelope				
9,000 to 55,000 lbs.	9,000 to 55,000 lbs.	13,360 to 55,000 lbs.	TBD	13,360 to 55,000 lbs.
Barricade Interoperability				
<1 minute / < 3minutes	<1 minute / < 3minutes	<3 minutes / <10 minutes	TBD	<1 minute / < 3minutes
Manning				
45	45	55	TBD	46
Peak Aircraft Recovery Rate				
Recover 28 aircraft in 21 minutes	Recover 28 aircraft in 21 minutes	(T=O) Recover 28 aircraft in 21 minutes	TBD	Recover 28 aircraft in 21 minutes
Human Systems Integration				
Operable and maintainable by 5th to 95th percentile range of operators/maintainers. operator-system interfaces (e.g., switches, displays) will be operated with	Operable and maintainable by 5th to 95th percentile range of operators/maintainers. operator-system interfaces (e.g., switches, displays) will be operated with	(T=O) Operable and maintainable by 5th to 95th percentile range of operators/maintainers. operator-system interfaces (e.g., switches, displays) will be operated with	TBD	Operable and maintainable by 5th to 95th percentile range of operators/maintainers. operator-system interfaces (e.g., switches, displays) will be operated with

minimal errors.	minimal errors.	minimal errors.		minimal errors.

Requirements Reference

AAG CDD dated July 15, 2008, and the Department of the Navy, Program Executive Officer, Aircraft Carriers, Subject: Transfer of one AAG Engine Set from CVN 78 to CVN 79, dated May 19, 2014, and the Department of the Navy,Director, Air Warfare (N98), Subject: AAG POR Requirements Revision dated February 12, 2016.

Change Explanations

None

Notes

1. Aircraft Interoperability (KPP). Removed Navy-Unmanned Combat Air System requirements in accordance with Director, Air Warfare (N98) direction letter dated February 12, 2016. Table 2 of the AAG CDD delineates Hookload and G-Load KPP objectives.
2. Cycle time JCTS and RALS demonstration (KPP). Separate from the peak recovery rate attribute in Table 3 (AAG Additional Major Attributes) of the AAG CDD.
3. Operation Availability IOT&E demonstration (KPP). These are expected values after system maturity is reached. System maturity is defined as the Navy Support Date plus 25,000 cycles on one ship's system. This should occur not later than CY 2026.
4. AAG Operating Envelope (KSA). Test program prioritized existing MK-7 operating envelope limitations and current airwing Aircraft Recovery Bulletins based on February 12, 2016 letter from Director of Air Warfare (N98).
5. Barricade Interoperability (KSA). Time required to convert an engine from tailhook to barricade operation/convert from barricade to tailhook operation. The times listed are for conditions of daylight, dry deck, and Sea State 1 (i.e., winds 4 to 6 knots and wave heights of 1 to 3 feet).
6. Manning (KSA). Shall be determined by the Navy Total Force Manpower Requirements Handbook (Navy Manpower Analysis Center, April 2000), from a baseline of Operator and Maintenance Workload only.

Acronyms and Abbreviations

IOT&E - Integrated Operational Test and Evaluation
JCTS - Jet Car Track Site
KSA - Key System Attribute
lbs - Pounds
O - Objective
RALS - Runway Arrested Landing Site
T - Threshold

Track to Budget

RDT&E

Appn		BA	PE	
Navy	1319	05	0604512N	
	Project		**Name**	
	2232		CV/CVN Launch	(Shared)
Navy	1319	05	0604530N	
	Project		**Name**	
	2367		Advanced Arresting Gear	

Notes

A separate RDT&E line item, not shared with non-program activities has been established.

Procurement

Appn		BA	PE		
Navy	1611	02	0204112N		
	Line Item		**Name**		
	2001		Carrier Replacement Program	(Shared)	
Navy	1810	03	0204112N		
	Line Item		**Name**		
	4213		Aircraft Support Equipment	(Shared)	
	Notes:		No planned acquisition beyond MS C		
	4216		Aircraft Launch & Recovery Equipment	(Shared)	(Sunk)
	4217		Advanced Arresting Gear (AAG) MDAP 529		
Navy	1810	08	0204112N		
	Line Item		**Name**		
	9020		Spares and Repair Parts	(Shared)	
	Notes:		No planned acquisition beyond MS C		

Notes

The AAG Appropriation for 1611 is also accounted for in the CVN 78 GERALD R. FORD-class SAR.

MILCON

Appn		BA	PE	
Navy	1205	01	0805376N	
	Project		**Name**	
	P251		AAG Land Based Test Sites	(Sunk)

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 2017 $M			BY 2017 $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	1446.7	1446.7	1591.4	1375.9	1438.0	1438.0	1363.3
Procurement	764.2	764.2	840.6	968.5[1]	800.0	800.0	1039.4
Flyaway	--	--	--	968.5	--	--	1039.4
Recurring	--	--	--	968.5	--	--	1039.4
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	16.9	16.9	18.6	16.9	15.4	15.4	15.4
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2227.8	2227.8	N/A	2361.3	2253.4	2253.4	2418.1

[1] *APB Breach*

Current APB Cost Estimate Reference

CAPE ICE dated July 12, 2017

Cost Notes

No cost estimate for the program has been completed in the previous year.

Consistent with OSD CAPE guidance and the July 12, 2017 CAPE ICE, AAG Procurement Appropriation 1611 utilizes Shipbuilding and Conversion, Navy (SCN) OSD indices and not the SCN Naval Sea Systems Command/Bureau of Labor Statistics indices used for CVN 78 GERALD R. FORD-class.

Total Quantity			
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

Appropriation Summary									
FY 2020 President's Budget / December 2018 SAR (TY$ M)									
Appropriation	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
RDT&E	978.9	172.2	123.5	66.0	22.1	0.3	0.3	0.0	1363.3
Procurement	534.8	157.4	61.0	34.8	52.9	49.4	29.1	120.0	1039.4
MILCON	15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2020 Total	1529.1	329.6	184.5	100.8	75.0	49.7	29.4	120.0	2418.1
PB 2019 Total	1554.7	320.0	198.0	117.2	35.3	31.1	0.0	0.0	2256.3
Delta	-25.6	9.6	-13.5	-16.4	39.7	18.6	29.4	120.0	161.8

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

Cost and Funding

Annual Funding By Appropriation

Annual Funding 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
2003	--	--	--	--	--	--	12.3
2004	--	--	--	--	--	--	15.7
2005	--	--	--	--	--	--	24.2
2006	--	--	--	--	--	--	33.5
2007	--	--	--	--	--	--	26.7
2008	--	--	--	--	--	--	34.4
2009	--	--	--	--	--	--	45.5
2010	--	--	--	--	--	--	64.5
2011	--	--	--	--	--	--	65.2
2012	--	--	--	--	--	--	40.4
2013	--	--	--	--	--	--	52.9
2014	--	--	--	--	--	--	72.3
2015	--	--	--	--	--	--	117.5
2016	--	--	--	--	--	--	106.8
2017	--	--	--	--	--	--	100.4
2018	--	--	--	--	--	--	166.6
2019	--	--	--	--	--	--	172.2
2020	--	--	--	--	--	--	123.5
2021	--	--	--	--	--	--	66.0
2022	--	--	--	--	--	--	22.1
2023	--	--	--	--	--	--	0.3
2024	--	--	--	--	--	--	0.3
Subtotal	--	--	--	--	--	--	1363.3

Annual Funding 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	BY 2017 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2003	--	--	--	--	--	--	15.7
2004	--	--	--	--	--	--	19.5
2005	--	--	--	--	--	--	29.3
2006	--	--	--	--	--	--	39.4
2007	--	--	--	--	--	--	30.6
2008	--	--	--	--	--	--	38.8
2009	--	--	--	--	--	--	50.6
2010	--	--	--	--	--	--	70.7
2011	--	--	--	--	--	--	69.8
2012	--	--	--	--	--	--	42.5
2013	--	--	--	--	--	--	55.1
2014	--	--	--	--	--	--	74.3
2015	--	--	--	--	--	--	119.2
2016	--	--	--	--	--	--	106.5
2017	--	--	--	--	--	--	98.3
2018	--	--	--	--	--	--	159.8
2019	--	--	--	--	--	--	162.0
2020	--	--	--	--	--	--	113.9
2021	--	--	--	--	--	--	59.7
2022	--	--	--	--	--	--	19.6
2023	--	--	--	--	--	--	0.3
2024	--	--	--	--	--	--	0.3
Subtotal	--	--	--	--	--	--	1375.9

Annual Funding 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
2012	--	--	1.4	--	1.4	--	1.4
2013	--	--	52.9	--	52.9	--	52.9
2014	--	--	7.1	--	7.1	--	7.1
2015	--	--	16.0	--	16.0	--	16.0
2016	--	--	9.7	--	9.7	--	9.7
2017	--	--	2.2	--	2.2	--	2.2
2018	--	--	10.9	--	10.9	--	10.9
2019	--	--	11.1	--	11.1	--	11.1
2020	--	--	4.7	--	4.7	--	4.7
2021	--	--	3.1	--	3.1	--	3.1
2022	--	--	2.4	--	2.4	--	2.4
2023	--	--	2.5	--	2.5	--	2.5
Subtotal	--	--	124.0	--	124.0	--	124.0

Annual Funding 1810 | Procurement | Other Procurement, Navy							
Fiscal Year	Quantity	BY 2017 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2012	--	--	1.5	--	1.5	--	1.5
2013	--	--	54.7	--	54.7	--	54.7
2014	--	--	7.2	--	7.2	--	7.2
2015	--	--	16.1	--	16.1	--	16.1
2016	--	--	9.6	--	9.6	--	9.6
2017	--	--	2.1	--	2.1	--	2.1
2018	--	--	10.4	--	10.4	--	10.4
2019	--	--	10.3	--	10.3	--	10.3
2020	--	--	4.3	--	4.3	--	4.3
2021	--	--	2.8	--	2.8	--	2.8
2022	--	--	2.1	--	2.1	--	2.1
2023	--	--	2.2	--	2.2	--	2.2
Subtotal	--	--	123.3	--	123.3	--	123.3

FY18 through FY23 funding supports water twister effort and continuing system improvements accounted for in the APB. Continuing system improvements FY24 and beyond are captured in the Operation and Support section of the APB and SAR.

Annual Funding 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
2008	--	0.7	--	--	0.7	--	0.7
2009	1	52.4	--	--	52.4	--	52.4
2010	--	36.3	--	--	36.3	--	36.3
2011	--	44.3	--	--	44.3	--	44.3
2012	--	20.3	--	--	20.3	--	20.3
2013	--	7.3	--	--	7.3	--	7.3
2014	1	15.7	--	--	15.7	--	15.7
2015	--	65.0	--	--	65.0	--	65.0
2016	--	62.3	--	--	62.3	--	62.3
2017	1	83.6	--	--	83.6	--	83.6
2018	--	46.7	--	--	46.7	--	46.7
2019	--	146.3	--	--	146.3	--	146.3
2020	--	56.3	--	--	56.3	--	56.3
2021	--	31.7	--	--	31.7	--	31.7
2022	1	50.5	--	--	50.5	--	50.5
2023	--	46.9	--	--	46.9	--	46.9
2024	--	29.1	--	--	29.1	--	29.1
2025	--	30.3	--	--	30.3	--	30.3
2026	--	89.7	--	--	89.7	--	89.7
Subtotal	4	915.4	--	--	915.4	--	915.4

Annual Funding 1611 | Procurement | Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	BY 2017 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2008	--	0.8	--	--	0.8	--	0.8
2009	1	57.0	--	--	57.0	--	57.0
2010	--	38.8	--	--	38.8	--	38.8
2011	--	46.3	--	--	46.3	--	46.3
2012	--	20.9	--	--	20.9	--	20.9
2013	--	7.4	--	--	7.4	--	7.4
2014	1	15.7	--	--	15.7	--	15.7
2015	--	63.8	--	--	63.8	--	63.8
2016	--	60.0	--	--	60.0	--	60.0
2017	1	79.0	--	--	79.0	--	79.0
2018	--	43.2	--	--	43.2	--	43.2
2019	--	132.8	--	--	132.8	--	132.8
2020	--	50.1	--	--	50.1	--	50.1
2021	--	27.7	--	--	27.7	--	27.7
2022	1	43.2	--	--	43.2	--	43.2
2023	--	39.3	--	--	39.3	--	39.3
2024	--	23.9	--	--	23.9	--	23.9
2025	--	24.4	--	--	24.4	--	24.4
2026	--	70.9	--	--	70.9	--	70.9
Subtotal	4	845.2	--	--	845.2	--	845.2

Current Estimate reflects PB 20 GERALD R. FORD-class AAG Budget as provided by Naval Sea Systems Command. Annual funding based on GERALD R. FORD-class appropriated SCN funding for CVN 78, CVN 79 and CVN 80 and CVN 81. The shipset quantity was updated from 3 to 4 and will be reflected in an APB update.

AAG annual SCN funding and quantity are aligned to the AAG system procurements using recently awarded contract pricing and Naval Air Systems Command related support to deliver the AAG system to the GERALD R. FORD-Class as Government furnished equipment.

The AAG Appropriation for 1611 is also accounted for in the CVN 78 GERALD R. FORD-class SAR.

Consistent with OSD CAPE guidance and the July 12, 2017 CAPE ICE, AAG Procurement Appropriation 1611 utilizes Shipbuilding and Conversion, Navy (SCN) OSD indices and not the SCN Naval Sea Systems Command/Bureau of Labor Statistics indices used for CVN 78 GERALD R. FORD-class.

Cost Quantity Information
1611 | Procurement | Shipbuilding and Conversion, Navy

Fiscal Year	Quantity	End Item Recurring Flyaway (Aligned With Quantity) BY 2017 $M
2008	--	--
2009	1	179.3
2010	--	--
2011	--	--
2012	--	--
2013	--	--
2014	1	236.2
2015	--	--
2016	--	--
2017	1	241.7
2018	--	--
2019	--	--
2020	--	--
2021	--	--
2022	1	188.0
2023	--	--
2024	--	--
2025	--	--
2026	--	--
Subtotal	4	845.2

Annual Funding 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	**TY $M** **Total Program**
2009	15.4
Subtotal	15.4

Annual Funding 1205 | MILCON | Military Construction, Navy and Marine Corps	
Fiscal Year	**BY 2017 $M** **Total Program**
2009	16.9
Subtotal	16.9

Low Rate Initial Production

Item	Initial LRIP Decision	Current Total LRIP
Approval Date	2/10/2005	2/10/2005
Approved Quantity	5	5
Reference	Milestone B ADM	Milestone B ADM
Start Year	2005	2005
End Year	2010	2032

The Current Total LRIP Quantity is more than 10% of the total production quantity because the current APB covers the first three ships in the GERALD R. FORD-class.

CVN 78, CVN 79 and CVN 80 are the LRIP shipsets for the AAG program of record. CVN 81, the next ship in the FORD class will be added as the 4th LRIP shipset. The delivery date for CVN 81 is 2032 as shown above. All are fully funded in the FYDP.

Foreign Military Sales

Notes

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

The U.S. Navy is in discussions with the French Navy to initiate Foreign Military Sales support for the Future French Aircraft Carrier. A French Ministry of Defence decision is expected in 2020 that will determine if EMALS/AAG are included in the replacement for the aircraft carrier Charles de Gaulle. The U.S. Navy and the French have conducted several face to face meetings and a Letter of Offer and Acceptance for a Technical Assistance Case with a total value of $2M. Funding is on board and the first Future Carrier Working Group meeting was held in December 2018.

Acronyms and Abbreviations

LOA - Letter of Offer and Acceptance

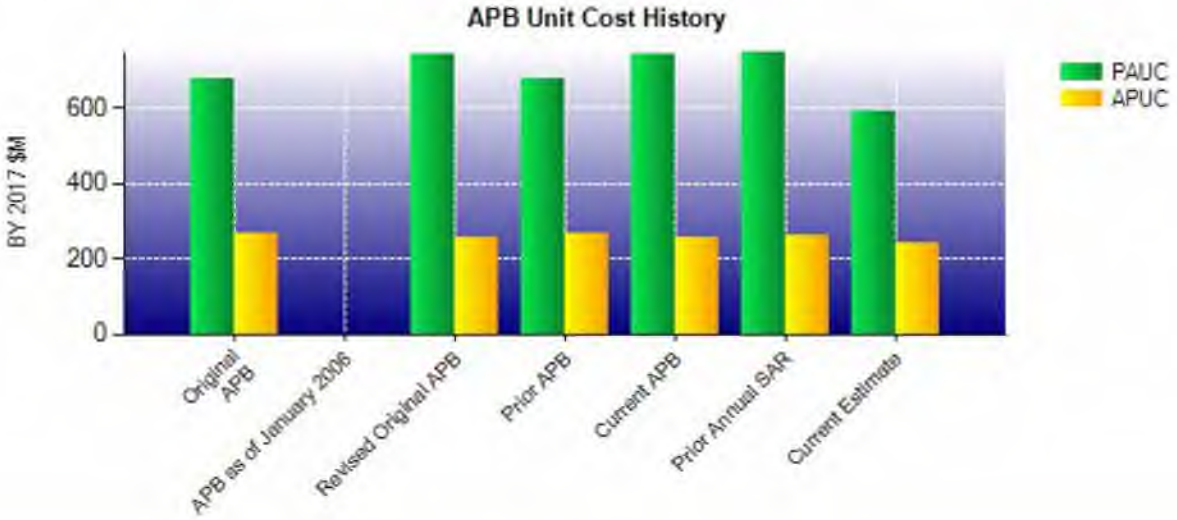
Nuclear Costs

None

Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2017 $M Current UCR Baseline (Nov 2017 APB)	BY 2017 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	2227.8	2361.3	
Quantity	3	4	
Unit Cost	742.600	590.325	-20.51
Average Procurement Unit Cost			
Cost	764.2	968.5	
Quantity	3	4	
Unit Cost	254.733	242.125	-4.95

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2017 $M Revised Original UCR Baseline (Nov 2017 APB)	BY 2017 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	2227.8	2361.3	
Quantity	3	4	
Unit Cost	742.600	590.325	-20.51
Average Procurement Unit Cost			
Cost	764.2	968.5	
Quantity	3	4	
Unit Cost	254.733	242.125	-4.95



APB Unit Cost History					
Item	Date	BY 2017 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	Dec 2016	676.667	264.233	682.033	279.700
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	Nov 2017	742.600	254.733	751.133	266.667
Prior APB	Dec 2016	676.667	264.233	682.033	279.700
Current APB	Nov 2017	742.600	254.733	751.133	266.667
Prior Annual SAR	Dec 2017	748.267	261.600	752.100	269.900
Current Estimate	Dec 2018	590.325	242.125	604.525	259.850

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY $M)									
PAUC Development Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
751.133	1.025	-107.758	0.000	-13.650	-26.225	0.000	0.000	-146.608	604.525

Current SAR Baseline to Current Estimate (TY $M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
266.667	0.350	13.358	0.000	0.000	-20.525	0.000	0.000	-6.817	259.850

SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	Jul 2003	N/A	Jul 2003
Milestone B	N/A	Feb 2005	N/A	Feb 2005
Milestone C	N/A	Aug 2021	N/A	Aug 2021
IOC	N/A	Mar 2022	N/A	Mar 2022
Total Cost (TY $M)	N/A	2253.4	N/A	2418.1
Total Quantity	N/A	3	N/A	4
PAUC	N/A	751.133	N/A	604.525

Cost Variance

Summary TY $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1438.0	800.0	15.4	2253.4
Previous Changes				
Economic	-2.6	-3.1	--	-5.7
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-4.2	+12.8	--	+8.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-6.8	+9.7	--	+2.9
Current Changes				
Economic	+5.3	+4.5	--	+9.8
Quantity	--	+320.1	--	+320.1
Schedule	--	--	--	--
Engineering	-54.6	--	--	-54.6
Estimating	-18.6	-94.9	--	-113.5
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-67.9	+229.7	--	+161.8
Total Changes	-74.7	+239.4	--	+164.7
CE - Cost Variance	1363.3	1039.4	15.4	2418.1
CE - Cost & Funding	1363.3	1039.4	15.4	2418.1

Summary BY 2017 $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1446.7	764.2	16.9	2227.8
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-3.6	+20.6	--	+17.0
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-3.6	+20.6	--	+17.0
Current Changes				
Economic	--	--	--	--
Quantity	--	+273.8	--	+273.8
Schedule	--	--	--	--
Engineering	-49.6	--	--	-49.6
Estimating	-17.6	-90.1	--	-107.7
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-67.2	+183.7	--	+116.5
Total Changes	-70.8	+204.3	--	+133.5
CE - Cost Variance	1375.9	968.5	16.9	2361.3
CE - Cost & Funding	1375.9	968.5	16.9	2361.3

Previous Estimate: June 2018

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+5.3
Deferral of Full Envelope Testing and 3-Engine NRE requirements from program baseline. (Engineering)	-49.6	-54.6
Reduction of formal training estimate. (Estimating)	-11.1	-11.9
Programming and budgeting add with no identified program requirement. (Estimating)	+0.3	+0.3
Adjustment of FY18 actuals (Estimating)	-3.8	-3.9
Adjustment for current and prior escalation. (Estimating)	-3.0	-3.1
RDT&E Subtotal	-67.2	-67.9

Procurement	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+4.5
Quantity variance resulting from an increase of 1 AAG from 3 to 4 (Navy). (Quantity)	+273.8	+320.1
CVN 79 adjustment for FY19 actuals (Estimating)	-0.2	-0.2
Reprogramming of funds to adjust for inflation (Estimating)	-0.1	-0.1
Addition of CVN 78 FY20 post delivery funding. (Estimating)	+0.6	+0.7
CVN 79 Post Delivery removal of funding (Estimating)	-4.0	-4.7
CVN 80 Post delivery funding addition (Estimating)	+4.0	+4.7
CVN 80 Production funding rephasing (Estimating)	-0.2	0.0
Adjustment for current and prior escalation. (Estimating)	-3.3	-3.4
Revised estimate due to a change in estimating assumptions as a result of the increase of 1 shipset relating to the CVN 81. (Estimating) (QR)	-86.9	-91.9
Procurement Subtotal	+183.7	+229.7

(QR) Quantity Related

Contracts

Contract Identification

Appropriation: RDT&E
Contract Name: Services and Material for AAG SDD
Contractor: General Atomics
Contractor Location: 3550 General Atomics Court
San Diego, CA 92121
Contract Number: N68335-03-C-0205
Contract Type: Cost Plus Award Fee (CPAF)
Award Date: February 17, 2005
Definitization Date: February 17, 2005

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
95.8	N/A	1	108.5	N/A	1	875.2	874.9

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to modifications to the contract to increase scope.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (1/29/2019)	-2.4	-8.1
Previous Cumulative Variances	-115.2	-20.9
Net Change	+112.8	+12.8

Cost and Schedule Variance Explanations

The favorable net change in the cost variance is due to Over Target Baseline/Over Target Schedule rebaseline completed in August 2018.

The favorable net change in the schedule variance is due to Over Target Baseline/Over Target Schedule rebaseline completed in August 2018.

Notes

PM Estimated Price and PM Estimated Ceiling Price reflect the 2016, AIR 4.2 Estimate at Completion (EAC) plus the total amount of Award Fee paid to the contractor ($1.5M).

The cost section of this report only represents the values for CLIN 0003 AAG System Design and Development (SDD) Option. It does not reflect the total contract.

The AAG SDD contract completed and OTB/OTS re-plan effort in August 2018 and resumed monthly CPR/IMS reporting in EVM/CR with the August 2018 month end report submission on September 25, 2018.

Contract Identification

Appropriation: Procurement
Contract Name: AAG / Electromagnetic Launch System (EMALS) CVN 79/CVN 80 Production
Contractor: General Atomics
Contractor Location: 3550 General Atomics Court
San Diego, CA 92121
Contract Number: N00019-14-C-0037/1
Contract Type: Firm Fixed Price (FFP)
Award Date: May 08, 2014
Definitization Date: May 18, 2017

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
180.5	N/A	N/A	180.5	N/A	N/A	389.9	389.9

Cost and Schedule Variance Explanations

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

Notes

Contract number N00019-14-C-0037 is a combined EMALS and AAG CVN79/CVN 80 Production contract with a total contract value of $1,466.4M. This contract was initially awarded for the production of CVN 79 ship set hardware only with an initial price of $180.5M for the AAG specific CVN 79 ship set. During negotiations, options were added for the CVN 80 ship set hardware for both EMALS and AAG. The contract value has increased from $1,449.8M to $1,466.4M, based on modifications for EMALS schedule incentives and the the procurement of an AAG 1/2 engine. Current prices for EMALS and AAG, per ship set, are as follows:

CVN 79

AAG = $183.5

EMALS = $543.9M

CVN 80

AAG = $195.2M

EMALS = $532.6M

Deliveries and Expenditures

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	2418.1	Years Appropriated	17
Expended to Date	1259.3	Percent Years Appropriated	70.83%
Percent Expended	52.08%	Appropriated to Date	1858.7
Total Funding Years	24	Percent Appropriated	76.87%

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

Operating and Support Cost

Cost Estimate Details

Date of Estimate:	July 12, 2017
Source of Estimate:	CAPE ICE
Quantity to Sustain:	3
Unit of Measure:	System
Service Life per Unit:	50.00 Years
Fiscal Years in Service:	FY 2018 - FY 2077

AAG shipboard units, included in quantity to sustain, are based on the GERALD R. FORD-class Unit Quantities and Program of Record as of December 1, 2016 (CVN 78, CVN 79 and CVN 80). The fourth ship set for CVN 81 will be added to the program baseline in the forthcoming APB update.

AAG system service life is based on an equivalent 50 year carrier service life.

Fiscal year placed in service identifies the year CVN 78 delivers with an AAG shipboard unit installed and operating.

Fiscal year retired identifies the planned year CVN 80, with an AAG shipboard unit installed and operating, is decommissioned.

O&S costs identified for AAG are included in the CVN 78 SAR.

Sustainment Strategy

AAG is currently in operation onboard the CVN 78. The maintenance concept for AAG utilizes a three level strategy (O, I, D). O-level repairs will be performed by the fleet while minimal I-level repairs will be performed by the ship's Aircraft Intermediate Maintenance Department as well as the Carrier and Field Service Unit. Organic vs. contractor Depot to be determined by future business case analysis scheduled to be conducted in FY 2020-2021. The depot facility is currently scheduled for stand up in 2nd quarter (QTR) FY 2023. Until the Navy takes over configuration control of AAG, depot level repairs will be performed by the original equipment manufacturer (OEM). The software support concept is planned to transition to an organic Software Support Activity (SSA) at Naval Air Warfare Center Aviation Division, Lakehurst, NJ. Until standup of the organic SSA occurs in 1st Quarter FY 2021, software support will be provided by the OEM. On Board Repair Parts (OBRPs) are currently provided for CVN 78 through 3rd QTR FY 2019. Interim Spares will be procured to support replenishment of OBRPs and support AAG until Material Support Date (MSD) in 3rd QTR FY 2020. A Repair of Repairables contract was awarded in FY 2017 for repair of AAG Depot Level Repairables. Initial and interim training has been and will be provided to the fleet by the OEM until the formal follow-on training curriculum and training schoolhouse is stood up in 4th QTR FY 2022.

Antecedent Information

No antecedent

Annual O&S Costs BY2017 $M		
Cost Element	**AAG Average Annual Cost Per System**	**No Antecedent (Antecedent) Other**
Unit-Level Manpower	3.912	--
Unit Operations	0.000	--
Maintenance	6.103	--
Sustaining Support	2.656	--
Continuing System Improvements	3.391	--
Indirect Support	2.560	--
Other	0.000	--
Total	18.622	--

Average and total O&S costs are sensitive to carrier schedule and ships operating with the AAG system.

Item	Total O&S Cost $M			
	AAG			No Antecedent (Antecedent)
	Current Development APB Objective/Threshold		Current Estimate	
Base Year	2793.1	3072.4	2793.1	N/A
Then Year	5519.1	N/A	5523.4	N/A

The June 2018 SAR for the CVN 78 FORD Class reports a quantity of four ships. AAG total reported O&S cost reflects a program of record of 3 AAG systems. Since the CVN 78 SAR O&S Cost includes O&S costs for AAG, the AAG Program Office extrapolated the current O&S cost estimate to 4 ships, baselined the value to BY 2000, and provided this O&S Cost to the CVN 78 Program Office for inclusion in the June 2018 CVN 78 SAR.

Notional total O&S cost 4 ships = $17.618M * 4 * 50 = $3,523.6M BY 2017

Sharing of fixed costs results in the lower average operation and support cost per ship when hull quantity increases from 3 to 4.

An equivalent calculation in BY 2000 dollars was provided to the CVN 78 Program Office for reporting in the FORD Class SAR.

Notional total O&S cost 4 ships = $12.276M * 4 * 50 = $2,455.2M BY 2000

Equation to Translate Annual Cost to Total Cost

Total Cost = Average Annual cost Per Shipset * Number of Shipsets * Service Life = $18.622M * 3 * 50 = $2,793.1M

O&S Cost Variance

Category	BY 2017 $M	Change Explanations
Prior SAR Total O&S Estimates - Jun 2018 SAR	2793.1	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	
Total Changes	0.0	
Current Estimate	2793.1	

Disposal Estimate Details

Date of Estimate:

Source of Estimate:

Disposal/Demilitarization Total Cost (BY 2017 $M):

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