Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-197

DDG 1000 Zumwalt Class Destroyer (DDG 1000)

As of FY 2020 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

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Sensitivity Originator

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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
DDG 1000 Zumwalt Class Destroyer (DDG 1000)

DoD Component
Navy

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References

SAR Baseline (Development Estimate)

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated November 23, 2005

Approved APB

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated March 25, 2011

Mission and Description

After a comprehensive review of Zumwalt class requirements, the Navy decided in November 2017 to refocus the primary mission of the Zumwalt Class Destroyers from Land Attack to Offensive Surface Strike. This advanced warship will provide credible forward naval presence while operating independently or as an integral part of Naval, Joint, or Combined Expeditionary Strike Forces. Armed with an array of weapons, DDG 1000 will provide offensive, distributed, and precision firepower at long ranges.

Executive Summary

Program Highlights Since Last Report

The Zumwalt program continues to make significant progress in the construction, testing, and activation of the most complex class of surface combatants the Navy has ever constructed. Lessons learned on the first of class DDG 1000 are being fully leveraged to improve performance on the follow ships.

Bath Iron Works (BIW) delivered the Hull, Mechanical, and Electrical (HM&E) Systems for ZUMWALT (DDG 1000) to the Navy on May 20, 2016. In March 2017, DDG 1000 entered into an in-plant availability at the BAE Systems shipyard near Naval Base San Diego. In September 2018, DDG 1000 completed her post delivery Combat Availability, and is currently in a Combat Test period. In support of the Test Program, Zumwalt has completed the first four in a series of at sea periods in which the ship conducted boat handling tests, underway refueling and calm weather maneuverability trials. She is currently underway executing navigation certifications and acoustic pre-tests. Final delivery is planned for September 2019.

In accordance with the split delivery acquisition strategy, the second ship of the class, MICHAEL MONSOOR (DDG 1001), was delivered from BIW with complete HM&E capability on April 24, 2018. Prior to HM&E delivery, DDG 1001 completed Builder's and Acceptance Sea Trials on January 17, 2018 and February 01, 2018, respectively. During sea trials, the ship's key systems and technologies were demonstrated including: Advanced Induction Motor (AIM), Integrated Power System (IPS), boat handling, and auxiliary systems. Michael Monsoor sailed away from BIW on November 9, 2018, arrived in her homeport of San Diego, California on December 7, 2018, and was commissioned on January 26, 2019. The ship is currently in its Combat Availability.

The MT30 turbine found to be damaged after DDG 1001's acceptance trials remains at the Rolls Royce (RR) facility in Bristol U.K. RR has completed a root cause analysis and concluded that the damage was the result of a foreign object in the engine. As such, the issue is considered unique to DDG 1001.

Construction of LYNDON B. JOHNSON (DDG 1002), the third and final ship of the class, is 84% complete in labor hours. Float off occurred December 9, 2018 at BIW shipyard in Bath, Maine. The ship is currently scheduled to complete HM&E delivery in March 2020, though schedule variance accumulated to date forecasts five months of risk to an on-time delivery.

The DDG 1000 program commenced Test and Evaluation Master Plan (TEMP) events on the Self Defense Test Ship (SDTS) in May 2018. Successful initial tracking execution occurred in June and the program is planning for its first missile fire.

After a comprehensive review of Zumwalt class requirements, the Navy decided to redefine the primary mission of the Zumwalt Class Destroyers from Land Attack to Offensive Surface Strike, adding lethal, offensive fires against targets afloat and ashore. These changes include integration of SM-6 capability and Maritime Strike Tomahawk. Additional modifications will be made to upgrade off-board platform communications capability via installation of the Network Tactical Common Data Link (NTCDL) system, and introduce organic cryptologic collection capability via installation of the Spectral System.

A revision to the Operational Requirements Document letter was signed by the Chief of Naval Operations (CNO) and is currently in staffing with the Joint Staff. Test and Evaluation Management Plan (TEMP) was signed by the OSD (DOT&E) August 31, 2018. A follow-on revision to the TEMP is being developed to capture test requirements that support the new mission requirements.

The Navy has decided that the Advanced Gun System (AGS) will not be operated on DDG 1000 Class ships pending identification and development of a suitable and affordable munition. DDG 1000 is a capable and adaptable platform with or without an AGS. A new munition has not been selected and the Navy is considering all options to include development of a round compatible with AGS or repurposing the available space should the gun be removed.

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**
January 1995	The program achieved Milestone 0 and started the Cost and Operational Effectiveness Analysis for the surface combatant for the twenty-first century (SC 21), comprised of destroyers (DD 21) and cruisers (CG 21). The DD 21 was intended to replace the DDG 51 by providing advanced land attack and multi-mission capabilities.
January 1998	The program achieved Milestone I for DD 21 and proceeded into the Program Definition and Risk Reduction phase. Primary Milestone I risks identified were a ship with a new hull form, several new combat system elements, significantly reduced manning level, very low signatures, and at lower costs than DDG 51. In order to maintain competitive cost pressure and to maintain technical competition, the Navy awarded Phase I and II concept development contracts to two industry teams
November 2001	The DD 21 program was restructured into the DD(X) program.
April 2002	Phase II concept development concluded and the Navy competitively selected and awarded a Design and Development contract to Northrop Grumman (NG) Ship systems (now Huntington Ingalls Shipbuilding – HII). The NG team was subsequently expanded to a DD(X) "national" team that also included BIW, Lockheed Martin, and Boeing. The NG concept required RDT&E increases for many of the new technologies including integrated electric drive, radars, software development, optimized manning, the advanced gun, and munitions. To reduce risk, the Navy contracted for Engineering Development Models (EDMs) for 10 subsystems.
January 2005	The 10 EDMs completed testing and reached sufficient technical maturity to support a Critical Design Review. At that point, DD(X) was programmed to consist of 10 highly automated, reduced signature, reduced manning electric drive ships. DD(X)'s major new systems included Dual Band Radar (DBR), andAGS with a Long Range Land Attack Projectile (LRLAP).
November 2005	The program achieved Milestone B. Major outstanding risks at Milestone B were related to the schedule and cost of software development and the integration and test of Mission Systems, as well as the costs of shipbuilder construction, DBR and AGS.
April 2006	The DD(X) program was renamed DDG 1000 and detail design contracts for the dual lead ships were awarded to BIW and Northrop Grumman Shipbuilding (NGSB) (formerly ISI).
December 2007	The ADM was issued authorizing the Navy to enter Production Phase for DDG 1000.
February 2008	The DoD approved Low Rate Initial Production for seven ships, and lead ship construction contracts were awarded to BIW and NGSB.
July 2008	The Navy provided testimony to the House Armed Services Committee Seapower and Expeditionary forces Subcommittee requesting Congressional support to truncate the DDG 1000 program and restart the DDG 51 program.
February 2010	The PB FY2011 budget submission confirmed the reduction of the DDG 1000 Program to three ships as a result of the Future Surface Combatant Radar Hull Study in which the Navy concluded a modified DDG 51 with an Advanced Missile Defense Radar was the most cost-effective solution to fleet air and missile defense requirements.
February 2010	The Secretary of the Navy notified Congress of a critical DDG 1000 program Nunn-McCurdy breach to the PAUC and APUC. This breach was due to the change in ship procurement quantity, not program performance.
June 2010	The USD (AT&L) certified a restructured three-ship program that included removal of the Volume Search Radar from the ship design, changed the IOC from FY 2015 to FY 2016, and revised test and evaluation requirements
October 2010	Milestone B prime was achieved for the restructured program following the Nunn-McCurdy

	certification.
March 2011	The APB for the restructured DDG 1000 Program was approved.
March 2013	Due to the FY 2013 sequestration impacts commencing during the execution year, the program experienced budget reductions of approximately $70.2M of Shipbuilding and Conversion, Navy (SCN) and $10.3M of RDT&E. The approximate $70.2M FY 2013 SCN sequester prevented the award of a $145M FY 2013 option to Raytheon for remaining Mission Systems Equipment (MSE) efforts for DDG 1000, 1001, and 1002, necessitating restructuring of the FY 2013, FY 2014, and FY 2015 options. A Below Threshold Reprograming for $9.999M of RDT&E was approved to continue LRLAP guided flight tests and combat systems development.
August 2013	The Navy awarded a contract modification for the design and construction of a steel deckhouse, hangar, and Aft Peripheral Vertical Launch System (PVLS) for DDG 1002 to BIW. The award occurred after the DDG 1002 sole source negotiation with HII for the procurement of the DDG 1002 composite deckhouse, composite hangar, and Aft PVLS did not reach an affordable solution and deliveries of these components for DDG 1002 were becoming time critical. The Navy concurrently pursued a steel deckhouse, hangar, and Aft PVLS using limited competition.
April 2014	DDG 1000 was christened at BIW in Bath, ME
December 2015	Raytheon was awarded a contract for remaining DDG 1002 MSE.
April 2016	DDG 1000 completed acceptance trials off the coast of Bath, ME.
May 2016	DDG 1000 delivered to the Navy (HM&E delivery)
June 2016	DDG 1001 was christened at BIW in Bath, ME. DDG 1001 floated off in Bath, ME.
September 2016	DDG 1000 sailed away from BIW en route to its homeport of San Diego, CA.
October 2016	DDG 1000 was commissioned in Baltimore, MD.
November 2016	BAE was awarded the $192 million contract for post-delivery execution yard efforts to install combat systems, as well as to complete Post Shakedown Availabilities on DDG 1000 and DDG 1001. The work will be executed at BAE's San Diego, CA facility near the ships' homeport at Naval Station San Diego and will be overseen by NAVSEA.
December 2016	DDG 1000 arrived at its homeport of San Diego.
January 2017	DDG 1002 keel laid at the BIW facility in Bath, ME.
March 2017	DDG 1000 entered Combat Availability at the BAE shipyard in San Diego, CA.
November 2017	Navy redefined the primary mission of the Zumwalt Class Destroyers from Land Attack to Offensive Surface Strike.
January 2018	DDG 1001 completed builder's trials and acceptance trials off the coast of Bath, ME.
April 2018	DDG 1001 HM&E Delivery
September 2018	DDG 1000 completed Combat Availability and entered Combat Testing.
November 2018	DDG 1001 Sail-away
December 2018	DDG 1000 Class Planning Yard Services contract was awarded to BIW
December 2018	DDG 1001 arrived at its homeport of San Diego, CA.
December 2018	DDG 1002 was launched at BIW
January 2019	DDG 1001 commissioned in San Diego, CA.

Threshold Breaches

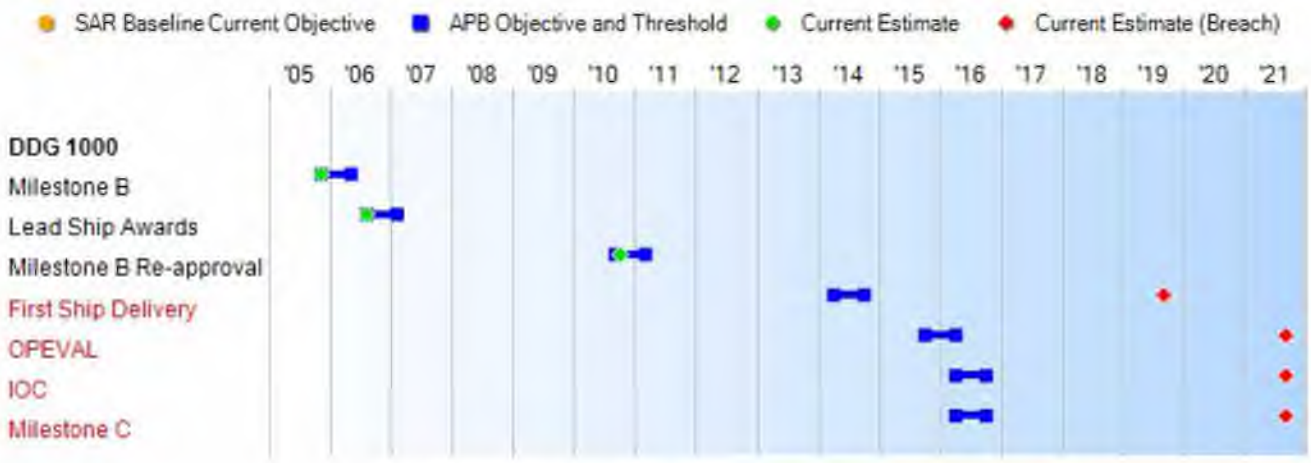
APB Breaches		
Schedule		☑
Performance		☐
Cost	RDT&E	☐
	Procurement	☐
	MILCON	☐
	Acq O&M	☐
O&S Cost		☐
Unit Cost	PAUC	☐
	APUC	☐

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

Explanation of Breach

The schedule breach was first reported in the December 2014 SAR and was due to technical risk, shipyard production and test challenges, and shipyard workforce constraints.

Schedule



Schedule Events					
Events	**SAR Baseline Development Estimate**	**Current APB Development Objective/Threshold**		**Current Estimate**	
Milestone B	Nov 2005	Nov 2005	May 2006	Nov 2005	
Lead Ship Awards	Jan 2006	Aug 2006	Feb 2007	Aug 2006	
Milestone B Re-approval	N/A	Sep 2010	Mar 2011	Oct 2010	
First Ship Delivery	Sep 2012	Apr 2014	Oct 2014	**Sep 2019**[1]	(Ch-1)
OPEVAL	Sep 2013	Oct 2015	Apr 2016	**Sep 2021**[1]	(Ch-2)
IOC	Jan 2014	Apr 2016	Oct 2016	**Sep 2021**[1]	(Ch-2)
Milestone C	Mar 2015	Apr 2016	Oct 2016	**Sep 2021**[1]	(Ch-3)

[1] *APB Breach*

Change Explanations

(Ch-1) DDG 1000 delivery changed from May 2019 to September 2019 due to delays driven by a combination of first-of-class construction challenges, a limited capacity of labor in specialized fields, and the unexpected complexity of completing industrial work while maintaining crew habitability. The delays experience during Combat Availability have impacted the completion dates of subsequent program milestones. The program is proceeding with the approved phased delivery acquisition strategy, and DDG 1000 will reach final ship delivery in September 2019.
(Ch-2) DDG 1000 OPEVAL completion and IOC have changed from September 2020 to September 2021 due to delays driven by a combination of first-of-class construction challenges, a limited capacity of labor in specialized fields, and the unexpected complexity of completing industrial work while maintaining crew habitability. The delays experience during Combat Availability have impacted the completion dates of subsequent program milestones. The program is proceeding with the approved phased delivery acquisition strategy, and DDG 1000 will complete OPEVAL and reach IOC in September 2021.
(Ch-3) Milestone C is not applicable since all three ships of the class are under contract and thus IOC is used as the Milestone C
date.

Notes

First ship HM&E delivery occurred in May 2016 marking completion of DDG 1000 at point of pre-mission systems activation. FY 2017 NDAA language recommended a provision that would require the Secretary of the Navy to deem ship delivery to occur at completion of the final phases of construction.

Since all three ships of the class are under contract, IOC is used as the Milestone C date.

DDG 1000 Final Delivery - Sep 2019 - OWLD - Dec 2020

DDG 1001 Final Delivery - Sep 2021 - OWLD - Sep 2021

DDG 1002 Final Delivery - Sep 2022 - OWLD - Sep 2023

Acronyms and Abbreviations

HM&E - Hull, Mechanical, and Electrical
NDAA - National Defense Authorizations Act
OPEVAL - Operational Evaluation
OWLD - Obligation Work Limiting Date

Performance

Performance Characteristics				
SAR Baseline Development Estimate	**Current APB Development Objective/Threshold**		**Demonstrated Performance**	**Current Estimate**
Number of Advanced Gun Systems				
2	2	2	N/A	The Navy has decided that the Advanced Gun System will not be operated on DDG 1000 Class ships pending identification and development of a suitable and affordable munition. A revision to the Operational Requirements Document has been signed by CNO and is in Joint Staff staffing
Number of Advanced Vertical Launch Cells				
128	128	80	TBD	80
Total Ship Advanced Gun System Magazine Capacity				
1200 rounds (600 rounds per magazine)	1200 rounds (600 rounds per magazine)	600 rounds total ship magazine capacity	TBD	600 rounds (300 rounds per magazine)
Number of ship's company personnel (helicopter detachment included)				
125	125	175	TBD	175
Operational Availability (Ao) for mission critical systems:				
Ao for 120-day wartime profile				
0.95	0.95	0.90	TBD	0.95
Ao for 18 month extended forward deployment				
0.95	0.95	0.90	TBD	0.95
Interoperability: All top-level IERs will be satisfied to the standards specified in the Threshold and Objective values.				
Achieve 100% of top-level IERs. DD(X) joint tactical battle management and command and control computer programs shall conform to the SIAP System Engineer's Integrated Architecture and	Achieve 100% of top-level IER. DD(X) joint tactical battle management and command and control computer programs shall conform to the SIAP System Engineer's Integrated Architecture and	Achieve 100% top-level IER designated as critical. DD(X) joint tactical battle mangage-ment and command and control computer programs shall conform to the SIAP System Engineer's Integrated Architecture and	TBD	Achieve 100% of interfaces; services; policy-enforcement controls; and data correctness, availability and processing requirements designated as enterprise-level or

Integrated Architecture Behavior Model now being developed. DD(X) will remain in compliance with CJCSI 6212.01 (Series), Inter-operability and Support-ability of IT and NSS, including future updates.	Integrated Architecture Behavior Model now being developed. DD(X) will remain in compliance with CJCSI 6212.01 (Series), Inter-operability and Support-ability of Information Technology and National Security Systems (IT and NSS), including future updates.	Integrated Archi-techture Behavior Model for Track Management now being developed. DD(X) will remain in compliance with CJCSI 6212.0 (Series), Inter-operability and Support-ability of Information Technology and National Security Systems (IT and NSS), Including future updates.		critical in the Joint integrated architecture. This includes the ORD threshold requirements for meeting the IERs which are listed in DDG 1000 ORD Rev 15 (Table B) and the DDG 1000 TEMP Rev D (Table D-3).

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

Requirements Reference

DDX ORD Change 1 dated January 23, 2006

Change Explanations

None

Acronyms and Abbreviations

CJCSI - Chairman of the Joint Chiefs of Staff Instruction
CNO - Chief of Naval Operations
IER - Information Exchange Requirement
IT - Information Technology
NSS - National Security System
Rev - Revision
SIAP - Single Integrated Air Picture
TEMP - Test and Evaluation Master Plan

Track to Budget

RDT&E

Appn		BA	PE		
Navy	1319	05	0204202N		
	Project		**Name**		
	2464		DDG 1000 System Design, Development and Integration		
	4009		Advanced Gun System on DDG 1000		(Sunk)
Navy	1319	04	0603513N		
	Project		**Name**		
	2465		DC Survivability	(Shared)	(Sunk)
	2467		Advanced Gun System	(Shared)	(Sunk)
	2468		Undersea Warfare	(Shared)	(Sunk)
	2469		Open System Architecture	(Shared)	(Sunk)
	2470		Integrated Topside Design	(Shared)	(Sunk)
	2471		Integrated Power System	(Shared)	(Sunk)
	4019		Radar Upgrades	(Shared)	(Sunk)
Navy	1319	05	0604300N		
	Project		**Name**		
	2463		DD(X) Construction	(Shared)	(Sunk)
	2464		DD(X) Sys Design, Dev & Integration	(Shared)	(Sunk)
	2465		DC Survivability	(Shared)	(Sunk)
	2466		MFR Development	(Shared)	(Sunk)
	2735		Volume Search Radar	(Shared)	(Sunk)
	4009		Advanced Gun System	(Shared)	(Sunk)
	4010		Integrated Power System on DD (X)	(Shared)	(Sunk)
Navy	1319	05	0604366N		
	Project		**Name**		
	0439		Standard Missile Improvement: DDG 1000	(Shared)	(Sunk)
Navy	1319	05	0604755N		
	Project		**Name**		
	2735		Volume Search Radar		(Sunk)

Procurement

Appn		BA	PE	
Navy	1611	02	0204202N	
	Line Item		**Name**	
	2119		DDG 1000	
Navy	1611	02	0204228N	
	Line Item		**Name**	
	2119		DDG 1000	(Sunk)
Navy	1611	02	0204222N	

Line Item	Name	
2119	DDG 1000	(Sunk)

Navy 1611 02 0702898N

Line Item	Name
2119	Management Headquarters

Navy 1611 05 0204222N

Line Item	Name	
5110	Outfitting	(Shared)
5300	Destroyers - Missile	(Sunk)

Navy 1810 01 0204202N

Line Item	Name
0947	DDG 1000 Class Support Equipment

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 2005 $M			BY 2005 $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	8313.2	8994.0	9893.4	9243.9	8483.0	9325.5	9710.8
Procurement	23234.7	10195.3	11214.8	10668.2	27813.3	12497.8	13836.7
Flyaway	--	--	--	10668.2	--	--	13836.7
Recurring	--	--	--	9519.5	--	--	12492.7
Non Recurring	--	--	--	1148.7	--	--	1344.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	0.0	--	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	--	0.0	0.0	0.0	0.0
Total	31547.9	19189.3	N/A	19912.1	36296.3	21823.3	23547.5

Cost Notes

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

Total Quantity			
Quantity	SAR Baseline Development Estimate	Current APB Development	Current Estimate
RDT&E	0	0	0
Procurement	10	3	3
Total	10	3	3

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	9254.0	140.3	111.4	107.9	72.0	15.0	10.2	0.0	9710.8
Procurement	12994.3	373.3	228.8	77.9	44.8	56.0	61.6	0.0	13836.7
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2020 Total	22248.3	513.6	340.2	185.8	116.8	71.0	71.8	0.0	23547.5
PB 2019 Total	22266.2	599.1	217.3	187.1	145.9	76.9	0.0	0.0	23492.5
Delta	-17.9	-85.5	122.9	-1.3	-29.1	-5.9	71.8	0.0	55.0

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	0	0	0	0	3
PB 2020 Total	0	3	0	0	0	0	0	0	0	3
PB 2019 Total	0	3	0	0	0	0	0	0	0	3
Delta	0	0	0	0	0	0	0	0	0	0

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
1995	--	--	--	--	--	--	7.0
1996	--	--	--	--	--	--	10.0
1997	--	--	--	--	--	--	12.0
1998	--	--	--	--	--	--	53.5
1999	--	--	--	--	--	--	215.1
2000	--	--	--	--	--	--	281.2
2001	--	--	--	--	--	--	532.4
2002	--	--	--	--	--	--	490.4
2003	--	--	--	--	--	--	895.4
2004	--	--	--	--	--	--	1002.2
2005	--	--	--	--	--	--	1120.2
2006	--	--	--	--	--	--	1040.6
2007	--	--	--	--	--	--	755.8
2008	--	--	--	--	--	--	516.5
2009	--	--	--	--	--	--	431.2
2010	--	--	--	--	--	--	503.8
2011	--	--	--	--	--	--	347.9
2012	--	--	--	--	--	--	249.8
2013	--	--	--	--	--	--	120.8
2014	--	--	--	--	--	--	189.6
2015	--	--	--	--	--	--	197.0
2016	--	--	--	--	--	--	101.7
2017	--	--	--	--	--	--	45.2
2018	--	--	--	--	--	--	134.7
2019	--	--	--	--	--	--	140.3
2020	--	--	--	--	--	--	111.4
2021	--	--	--	--	--	--	107.9
2022	--	--	--	--	--	--	72.0
2023	--	--	--	--	--	--	15.0
2024	--	--	--	--	--	--	10.2
Subtotal	--	--	--	--	--	--	9710.8

Annual Funding 1319 | RDT&E | Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	BY 2005 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
1995	--	--	--	--	--	--	8.0
1996	--	--	--	--	--	--	11.3
1997	--	--	--	--	--	--	13.4
1998	--	--	--	--	--	--	59.1
1999	--	--	--	--	--	--	234.8
2000	--	--	--	--	--	--	302.6
2001	--	--	--	--	--	--	565.1
2002	--	--	--	--	--	--	515.3
2003	--	--	--	--	--	--	927.3
2004	--	--	--	--	--	--	1009.8
2005	--	--	--	--	--	--	1099.7
2006	--	--	--	--	--	--	990.7
2007	--	--	--	--	--	--	702.4
2008	--	--	--	--	--	--	471.4
2009	--	--	--	--	--	--	388.5
2010	--	--	--	--	--	--	447.2
2011	--	--	--	--	--	--	301.6
2012	--	--	--	--	--	--	213.1
2013	--	--	--	--	--	--	102.0
2014	--	--	--	--	--	--	157.8
2015	--	--	--	--	--	--	161.9
2016	--	--	--	--	--	--	82.1
2017	--	--	--	--	--	--	35.8
2018	--	--	--	--	--	--	104.6
2019	--	--	--	--	--	--	106.9
2020	--	--	--	--	--	--	83.2
2021	--	--	--	--	--	--	79.0
2022	--	--	--	--	--	--	51.7
2023	--	--	--	--	--	--	10.6
2024	--	--	--	--	--	--	7.0
Subtotal	--	--	--	--	--	--	9243.9

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
2005	--	--	--	304.0	304.0	--	304.0
2006	--	--	--	706.2	706.2	--	706.2
2007	2	2587.6	--	--	2587.6	--	2587.6
2008	--	3009.9	--	149.8	3159.7	--	3159.7
2009	1	1504.3	--	--	1504.3	--	1504.3
2010	--	1378.5	--	--	1378.5	--	1378.5
2011	--	247.1	--	--	247.1	--	247.1
2012	--	512.6	--	--	512.6	--	512.6
2013	--	682.9	--	--	682.9	--	682.9
2014	--	311.6	--	--	311.6	--	311.6
2015	--	521.8	--	--	521.8	--	521.8
2016	--	479.0	--	--	479.0	--	479.0
2017	--	309.8	--	--	309.8	--	309.8
2018	--	255.8	--	--	255.8	--	255.8
2019	--	315.6	--	--	315.6	--	315.6
2020	--	218.9	--	--	218.9	--	218.9
2021	--	63.1	--	--	63.1	--	63.1
2022	--	20.3	--	--	20.3	--	20.3
2023	--	34.4	--	--	34.4	--	34.4
2024	--	39.5	--	--	39.5	--	39.5
Subtotal	3	12492.7	--	1160.0	13652.7	--	13652.7

Annual Funding 1611 | Procurement | Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	BY 2005 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2005	--	--	--	275.1	275.1	--	275.1
2006	--	--	--	617.3	617.3	--	617.3
2007	2	2162.4	--	--	2162.4	--	2162.4
2008	--	2432.5	--	121.0	2553.5	--	2553.5
2009	1	1179.6	--	--	1179.6	--	1179.6
2010	--	1044.7	--	--	1044.7	--	1044.7
2011	--	181.3	--	--	181.3	--	181.3
2012	--	367.8	--	--	367.8	--	367.8
2013	--	480.2	--	--	480.2	--	480.2
2014	--	215.0	--	--	215.0	--	215.0
2015	--	352.7	--	--	352.7	--	352.7
2016	--	317.2	--	--	317.2	--	317.2
2017	--	201.0	--	--	201.0	--	201.0
2018	--	162.7	--	--	162.7	--	162.7
2019	--	196.8	--	--	196.8	--	196.8
2020	--	133.8	--	--	133.8	--	133.8
2021	--	37.8	--	--	37.8	--	37.8
2022	--	11.9	--	--	11.9	--	11.9
2023	--	19.8	--	--	19.8	--	19.8
2024	--	22.3	--	--	22.3	--	22.3
Subtotal	3	9519.5	--	1013.4	10532.9	--	10532.9

Cost Quantity Information 1611 | Procurement | Shipbuilding and Conversion, Navy		
Fiscal Year	**Quantity**	**End Item Recurring Flyaway (Aligned With Quantity) BY 2005 $M**
2005	--	--
2006	--	--
2007	2	6758.8
2008	--	--
2009	1	2760.7
2010	--	--
2011	--	--
2012	--	--
2013	--	--
2014	--	--
2015	--	--
2016	--	--
2017	--	--
2018	--	--
2019	--	--
2020	--	--
2021	--	--
2022	--	--
2023	--	--
2024	--	--
Subtotal	3	9519.5

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
2017	--	--	--	33.4	33.4	--	33.4
2018	--	--	--	--	--	--	--
2019	--	--	--	57.7	57.7	--	57.7
2020	--	--	--	9.9	9.9	--	9.9
2021	--	--	--	14.8	14.8	--	14.8
2022	--	--	--	24.5	24.5	--	24.5
2023	--	--	--	21.6	21.6	--	21.6
2024	--	--	--	22.1	22.1	--	22.1
Subtotal	--	--	--	184.0	184.0	--	184.0

Annual Funding 1810 | Procurement | Other Procurement, Navy							
Fiscal Year	Quantity	BY 2005 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2017	--	--	--	26.2	26.2	--	26.2
2018	--	--	--	--	--	--	--
2019	--	--	--	43.5	43.5	--	43.5
2020	--	--	--	7.3	7.3	--	7.3
2021	--	--	--	10.7	10.7	--	10.7
2022	--	--	--	17.4	17.4	--	17.4
2023	--	--	--	15.1	15.1	--	15.1
2024	--	--	--	15.1	15.1	--	15.1
Subtotal	--	--	--	135.3	135.3	--	135.3

Low Rate Initial Production

Item	Initial LRIP Decision	Current Total LRIP
Approval Date	11/22/2005	10/8/2010
Approved Quantity	8	3
Reference	Milestone B ADM	Milestone B ADM
Start Year	2007	2007
End Year	2014	2009

The Current Total LRIP Quantity is more than 10% of the total production quantity due to the revised Milestone B ADM of October 8, 2010 reducing the LRIP quantity to three ships, which represents the total quantity of the program.

Foreign Military Sales

None

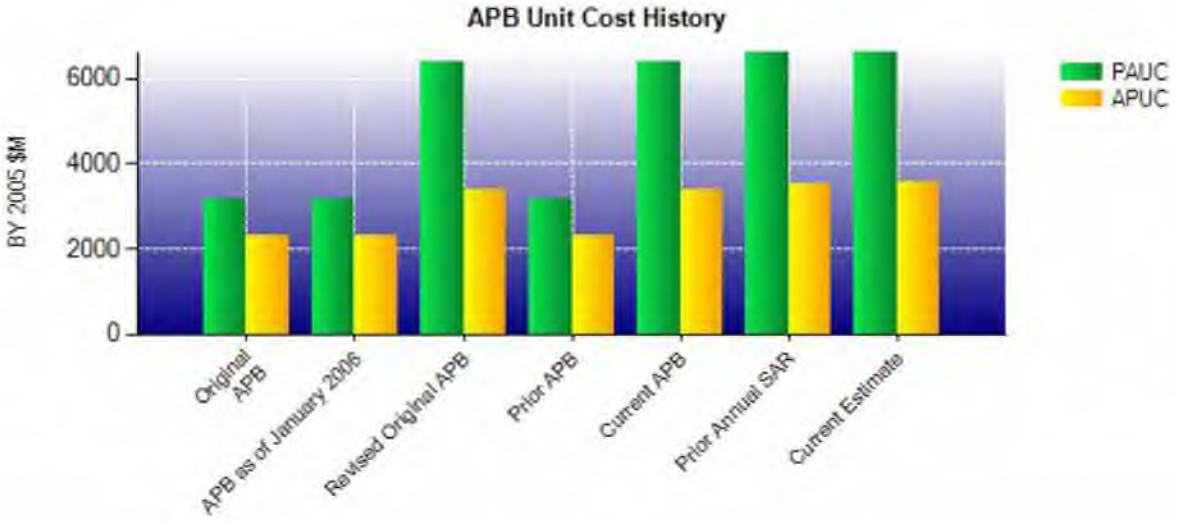
Nuclear Costs

None

Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2005 $M Current UCR Baseline (Mar 2011 APB)	BY 2005 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	19189.3	19912.1	
Quantity	3	3	
Unit Cost	6396.433	6637.367	+3.77
Average Procurement Unit Cost			
Cost	10195.3	10668.2	
Quantity	3	3	
Unit Cost	3398.433	3556.067	+4.64

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2005 $M Revised Original UCR Baseline (Mar 2011 APB)	BY 2005 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	19189.3	19912.1	
Quantity	3	3	
Unit Cost	6396.433	6637.367	+3.77
Average Procurement Unit Cost			
Cost	10195.3	10668.2	
Quantity	3	3	
Unit Cost	3398.433	3556.067	+4.64



APB Unit Cost History					
Item	Date	BY 2005 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	Nov 2005	3154.790	2323.470	3629.620	2781.320
APB as of January 2006	Nov 2005	3154.790	2323.470	3629.620	2781.320
Revised Original APB	Mar 2011	6396.433	3398.433	7274.433	4165.933
Prior APB	Nov 2005	3154.790	2323.470	3629.620	2781.320
Current APB	Mar 2011	6396.433	3398.433	7274.433	4165.933
Prior Annual SAR	Dec 2017	6640.267	3537.267	7830.833	4566.700
Current Estimate	Dec 2018	6637.367	3556.067	7849.167	4612.233

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	
3629.630	615.967	2104.836	17.767	184.067	1296.900	0.000	0.000	4219.537	7849.167

Current SAR Baseline to Current Estimate (TY $M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
2781.330	611.833	125.470	24.767	-105.200	1174.033	0.000	0.000	1830.903	4612.233

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	Nov 2005	Nov 2005	N/A	Nov 2005
Milestone C	Mar 2015	Mar 2015	N/A	Sep 2021
IOC	Jan 2014	Jan 2014	N/A	Sep 2021
Total Cost (TY $M)	36296.2	36296.3	N/A	23547.5
Total Quantity	10	10	N/A	3
PAUC	3629.620	3629.630	N/A	7849.167

Cost Variance

Summary TY $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	8483.0	27813.3	--	36296.3
Previous Changes				
Economic	+7.2	+1803.0	--	+1810.2
Quantity	--	-19092.9	--	-19092.9
Schedule	+2.8	+111.5	--	+114.3
Engineering	+867.8	-315.6	--	+552.2
Estimating	+431.6	+3380.8	--	+3812.4
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+1309.4	-14113.2	--	-12803.8
Current Changes				
Economic	+5.2	+32.5	--	+37.7
Quantity	--	--	--	--
Schedule	-23.8	-37.2	--	-61.0
Engineering	--	--	--	--
Estimating	-63.0	+141.3	--	+78.3
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-81.6	+136.6	--	+55.0
Total Changes	+1227.8	-13976.6	--	-12748.8
CE - Cost Variance	9710.8	13836.7	--	23547.5
CE - Cost & Funding	9710.8	13836.7	--	23547.5

Summary BY 2005 $M				
Item	**RDT&E**	**Procurement**	**MILCON**	**Total**
SAR Baseline (Development Estimate)	8313.2	23234.7	--	31547.9
Previous Changes				
Economic	--	--	--	--
Quantity	--	-14646.0	--	-14646.0
Schedule	+1.7	+100.2	--	+101.9
Engineering	+698.6	-323.5	--	+375.1
Estimating	+295.5	+2246.4	--	+2541.9
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+995.8	-12622.9	--	-11627.1
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	-18.2	-23.3	--	-41.5
Engineering	--	--	--	--
Estimating	-46.9	+79.7	--	+32.8
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-65.1	+56.4	--	-8.7
Total Changes	+930.7	-12566.5	--	-11635.8
CE - Cost Variance	9243.9	10668.2	--	19912.1
CE - Cost & Funding	9243.9	10668.2	--	19912.1

Previous Estimate: June 2018

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+5.2
Schedule variance due to a shift in Acquisition/Testing Strategies for new mission requirements determined early-to-need. (Schedule)	-18.2	-23.8
Revised estimate for Small Business Innovation Research adjustment. (Estimating)	-3.4	-4.3
Adjustment for current and prior escalation. (Estimating)	-1.8	-2.3
Revised estimate to properly price Maritime Targeting Cell-Afloat (MTC-A). (Estimating)	-64.9	-87.1
Revised estimate for DDG1000 TEMP events. (Estimating)	+30.4	+40.7
Revised estimate for contract services adjustments. (Estimating)	-7.2	-10.0
RDT&E Subtotal	-65.1	-81.6

Procurement	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+32.5
Revised estimate for Outfitting-Post Delivery early-to-need. (Shipbuilding and Conversion, Navy (SCN)). (Schedule)	-23.3	-37.2
Additional funding budgeted to properly resource the DDG 1001 & 1002 combat system availability and testing period (SCN). (Estimating)	+113.8	+189.3
Revised Estimate for Total Ship Computing Environment cost growth (SCN). (Estimating)	-4.4	-7.0
Revised estimate for DDG 1000 Class Product Improvement (OPN). (Estimating)	+13.7	+20.2
Adjustment for current and prior escalation. (Estimating)	-19.3	-29.2
Revised estimate for DDG 1002 Data Center early-to-need (Other Procurement, Navy (OPN)). (Estimating)	-24.1	-32.0
Procurement Subtotal	+56.4	+136.6

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Deliveries and Expenditures

Deliveries				
Delivered to Date	**Planned to Date**	**Actual to Date**	**Total Quantity**	**Percent Delivered**
Development	0	0	0	--
Production	0	0	3	0.00%
Total Program Quantity Delivered	0	0	3	0.00%

Expended and Appropriated (TY $M)			
Total Acquisition Cost	23547.5	Years Appropriated	25
Expended to Date	21749.5	Percent Years Appropriated	83.33%
Percent Expended	92.36%	Appropriated to Date	22761.9
Total Funding Years	30	Percent Appropriated	96.66%

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

Operating and Support Cost

Cost Estimate Details

Date of Estimate:	June 02, 2015
Source of Estimate:	Service ICE
Quantity to Sustain:	3
Unit of Measure:	Ship
Service Life per Unit:	35.00 Years
Fiscal Years in Service:	FY 2016 - FY 2051

O&S cost estimates are based on the 2015 Gate 6 Review of DDG 1000 Class. Costs are shown in BY 2005 dollars. The estimate is based on an average unit cost of three ships with an average 35 year service life. The estimate includes separately priced mission system equipment sustainment cost. Mid-life modernization is not included.

The O&S costs are provided in revised cost elements based on the CAPE 2014 O&S Cost-Estimating Guide. NAVSEA Cost & Estimating group reported no changes to DDG 1000 O&S costs associated with the current schedule and with the redefinition of the Zumwalt Class Destroyer primary mission from Land Attack to Offensive Surface Strike.

Sustainment Strategy

DDG 1000 maintenance is apportioned to either the ship or a land-based facility. There are two levels of maintenance planned for the DDG 1000 ship class: "on-ship" - accomplished by ship's force and "off-ship" - accomplished through maintenance support contracts in addition to the legacy Navy maintenance infrastructure. Maintenance support contracts similar to legacy Multi Ship/Multi Option contracting strategy for repairs and overhauls are planned. The DDG 1000 program provides Integrated Logistics Support oversight and guidance to Participating Acquisition Resource Managers that develop various sustainment approaches for combat systems and Communications, Command, Control, Computers, and Intelligence.

Antecedent Information

The Antecedent System is the DDG 51 ship class. The DDG 1000 and DDG 51 ships differ in various aspects that make comparison difficult. Considerations include new technologies, size difference, and an all electric ship design.

The 2018 unit cost of the DDG 51 (Antecedent) is derived using the Naval Visibility and Management of Operating and Support Costs database and is shown in BY 2005 $M. DDG 51 estimates are based on a service life of 35 years for the 28 Flight I and Flight II ships and 40 years for the 54 Flight IIA and Flight III ships. The DDG 51 costs shown in this SAR are identical to those in the DDG 51 December 2018 SAR converted into BY 2005 $M.

Annual O&S Costs BY2005 $M		
Cost Element	**DDG 1000 Average Annual Cost Per Ship**	**DDG 51 (Antecedent) Average Annual Cost Per Ship**
Unit-Level Manpower	12.776	18.889
Unit Operations	8.603	6.696
Maintenance	22.197	11.485
Sustaining Support	8.131	2.202
Continuing System Improvements	15.368	7.191
Indirect Support	6.623	11.469
Other	0.000	0.000
Total	73.698	57.932

Item	Total O&S Cost $M			
	DDG 1000			DDG 51 (Antecedent)
	Current Development APB Objective/Threshold		Current Estimate	
Base Year	7744.4	8518.8	7738.3	216667.7
Then Year	15245.3	N/A	14946.0	N/A

Disposal Cost is included in the Operating and Support Cost of the current APB objective and threshold for this program.

Equation to Translate Annual Cost to Total Cost

The equation that links the unitized cost to the total cost for DDG 1000 is Total Cost = average annual cost per ship * number of ships * service life = $73.7M per Ship x 3 Ships x 35 year (service life) = $7,738.3M (BY 2005)

O&S Cost Variance		
Category	**BY 2005 $M**	**Change Explanations**
Prior SAR Total O&S Estimates - Jun 2018 SAR	7738.3	
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	7738.3	

Disposal Estimate Details

Date of Estimate: June 02, 2015

Source of Estimate:	Service ICE
Disposal/Demilitarization Total Cost (BY 2005 $M):	53.7

O&S Baseline data is from Milestone B recertification Program Life Cycle Cost Estimates.