



INSPECTOR GENERAL

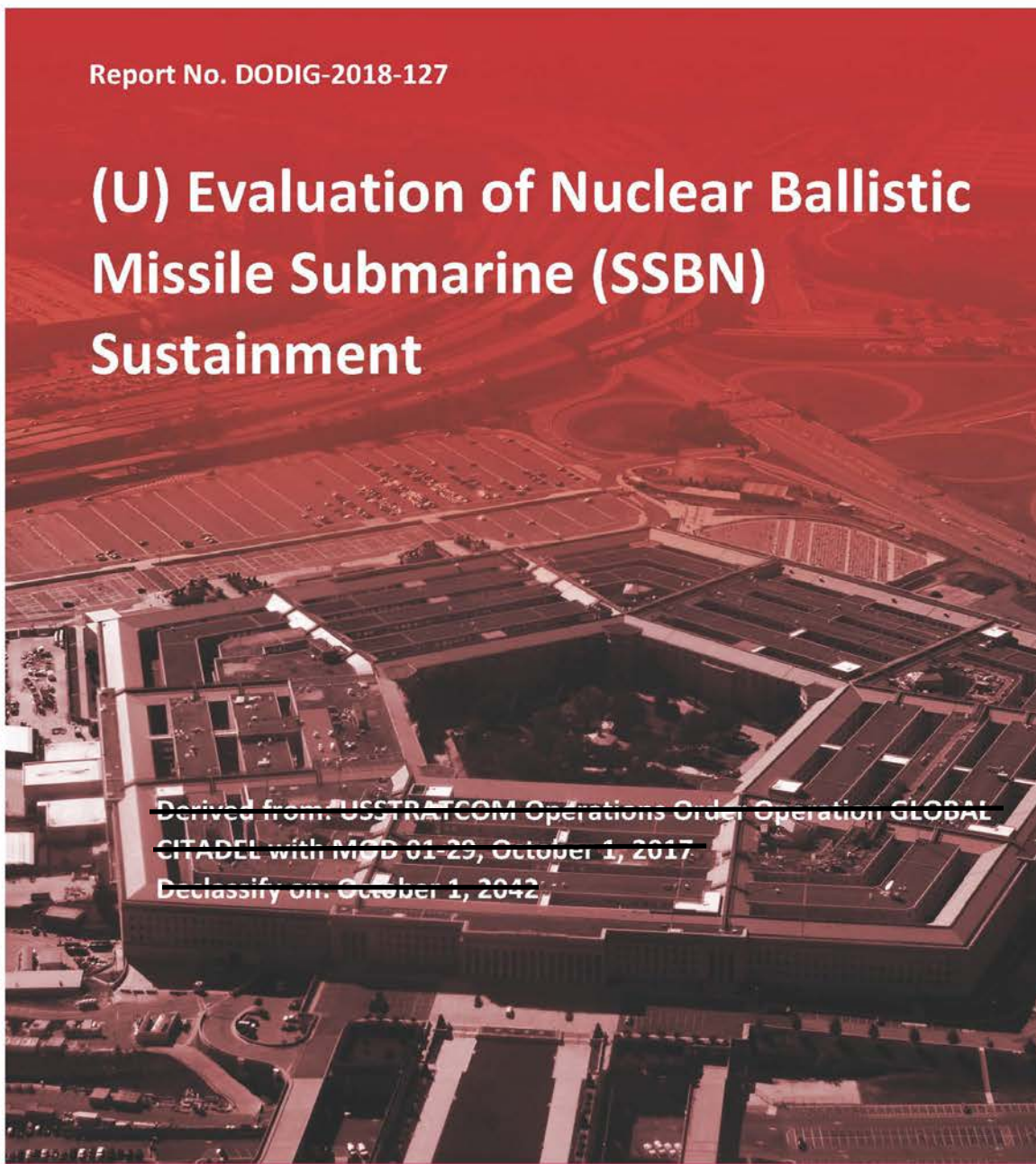
Department of Defense

June 15, 2018



Report No. DODIG-2018-127

(U) Evaluation of Nuclear Ballistic Missile Submarine (SSBN) Sustainment



~~Derived from USSTRATCOM Operations Order Operation GLOBAL
CITADEL with MOD 01-29, October 1, 2017
Declassify on: October 1, 2042~~

INTEGRITY ★ INDEPENDENCE ★ EXCELLENCE

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SECRET



(U) Results in Brief

(U) Evaluation of Nuclear Ballistic Missile Submarine Sustainment

June 15, 2018

(U) Objective

(U) Our objective was to determine whether the Navy can sustain the current *Ohio*-class Nuclear Ballistic Missile Submarines (SSBNs) until the replacement *Columbia*-class SSBNs are fielded.

(U) Background

(U) The United States maintains a nuclear triad consisting of manned bombers, land-based intercontinental ballistic missiles, and ballistic missile submarines capable of delivering nuclear weapons. Our review focused on *Ohio*-class SSBN sustainment.

(S) [REDACTED]

(U) The Navy decided in 1998 to extend the original 30-year service life of the *Ohio*-class to 42 years. The first *Ohio*-class SSBN is scheduled to be retired in 2027; the remaining 13 are scheduled to be retired one per year until 2040.

(U) According to the Navy submarine program office, the first *Columbia*-class SSBN is expected to enter service in 2031. An additional 11 *Columbia*-class SSBNs are scheduled to be delivered approximately one per year until the last two join the fleet by 2042.

(U) Each *Ohio*-class SSBN undergoes three types of maintenance cycles during its service life:

(U) Background (cont'd)

- (U) Incremental Refit. This 35-day maintenance period consists of scheduled repairs, maintenance, and inspections, as well as unscheduled repairs and minor modernization tasks such as sonar, torpedo fire control, and navigation systems.
- (U) Extended Refit Period. This 7- to 8-month maintenance period replaces and refurbishes the major components of the hull and internal systems.
- (U) Engineered Refueling Overhaul (ERO). This 27-month overhaul occurs around the 20-year point for the *Ohio*-class SSBN and includes extensive inspections, structural repairs, and a nuclear reactor refueling to extend the submarines service life.

(U) Finding

(U) The Navy has taken action to sustain the *Ohio*-class SSBNs at the minimum USSTRATCOM requirements until the replacement *Columbia*-class SSBNs are fielded.

(U) In order to maintain USSTRATCOM requirements, the Secretary of the Navy designated sustainment of the *Ohio*-class SSBNs as the Navy's highest priority. Accordingly, the Navy has taken several steps to improve sustainment, which include the following.



(U) Results in Brief

(U) Evaluation of Nuclear Ballistic Missile Submarine Sustainment

(U) Finding (cont'd)

- (U) The Navy has placed SSBNs ahead of aircraft carriers in maintenance priority.
 - (U) This shift has reduced the time required for SSBN EROs. For example, the USS Maine completed the first of two ERO phases with a 43-percent reduction in cycle-time in comparison to the last SSBN that completed an ERO.
- (U) Shipyards have direct hiring authority to address maintenance manpower shortages.
 - (U) The workforce size at shipyards now matches the workload. For example, in the past 4 years, Puget Sound Naval Shipyard alone hired more than 6,700 employees.
- (U) The Navy has developed programs to accelerate and improve training of shipyards' new hires.
 - (U) Shipyards use apprenticeships to develop an experienced workforce. In a recent pilot program, the Navy reduced the journeyman training time to repair a particular valve from 24 months to 10 weeks using a task based learning method.

- (U) The Navy has improved SSBN maintenance procedures and schedules.
 - (U) Replicas allow personnel to practice difficult tasks prior to performing the task aboard an SSBN.
 - (U) Personnel deploy as needed to conduct inspections and prepare for Incremental Refit maintenance while the submarine is returning to port.
 - (U) Personnel reduced overdue Preventive Maintenance Requirements due to unavailable parts from 37 to 12 instances over a one-year period.

(U) Recommendation

(U) None.

(U) Recommendations Table

(U) Management	Recommendations Unresolved	Recommendations Resolved	Recommendations Closed
None			

(U) NOTE: The following categories are used to describe agency management’s comments to individual recommendations.

- **(U) Unresolved** – Management has not agreed to implement the recommendation or has not proposed actions that will address the recommendation.
- **(U) Resolved** – Management agreed to implement the recommendation or has proposed actions that will address the underlying finding that generated the recommendation.
- **(U) Closed** – OIG verified that the agreed upon corrective actions were implemented.

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INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
4800 MARK CENTER DRIVE
ALEXANDRIA, VIRGINIA 22350-1500

June 15, 2018

MEMORANDUM FOR SECRETARY OF THE NAVY
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
COMMANDER, U.S. STRATEGIC COMMAND

SUBJECT: (U) Evaluation of Nuclear Ballistic Missile Submarine (SSBN) Sustainment
(Report No. DODIG 2018-127)

(U) We are providing this report for your review. This evaluation determined whether the Navy can sustain the current *Ohio*-class Nuclear Ballistic Missile Submarines (SSBNs) until the replacement *Columbia*-class SSBNs are fielded. We conducted this evaluation in accordance with the Council of the Inspectors General on Integrity and Efficiency Quality Standards for Inspection and Evaluation.

(U) We considered management comments on a discussion draft copy of this report when preparing this final report. We did not make any recommendations; therefore, no management comments are required.

(U) We appreciate the courtesies extended to the staff. Please direct questions to me at michael.roark@dodig.mil or (703) 699-7430 or 9187.

A handwritten signature in blue ink, appearing to read "M. Roark", is positioned above the typed name.

Michael J. Roark
Acting Deputy Inspector General
for Intelligence and Special
Program Assessments

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(U) Contents

(U) Introduction.....	1
(U) Objective.....	1
(U) Background	1
(U) Engineered Refueling Overhaul.....	5
(U) Finding.....	6
(U) The Navy Has Taken Action to Sustain the <i>Ohio</i> -Class SSBNs.....	6
(U) The Navy Designated Strategic Nuclear Deterrence as Its Top Priority.....	6
(U) Shipyard Commanders Made SSBNs Their Top Maintenance Priority	7
(U) Navy Mitigated SSBN Homeport Dry Dock Challenges	8
(U) The Navy Is Training Additional Shipyard and Submarine Base Workers.....	9
(U) The Navy Has Improved Maintenance Procedures and Schedules to Meet SSBN Availability Requirements	11
(U) Conclusion	13
(U) Reasons for No Recommendations	13
(U) Appendix	14
(U) Scope and Methodology	14
(U) Use of Computer-Processed Data.....	15
(U) Prior Coverage	15
(U) Acronyms and Abbreviations.....	16

(U) Introduction

(U) Objective

(U) The objective of this evaluation was to determine whether the Navy can sustain the current *Ohio*-class Nuclear Ballistic Missile Submarine (SSBNs) until the replacement *Columbia*-class SSBNs are fielded. See Appendix for the scope, methodology and prior coverage related to the evaluation objective.

(U) Background

(U) Since the 1960s, the United States has maintained a nuclear triad consisting of manned bombers, land-based intercontinental ballistic missiles, and ballistic missile submarines capable of delivering nuclear weapons. Our review focused on the *Ohio*-class SSBN, which is the current submarine capable of launching ballistic nuclear missiles. Each SSBN is capable of carrying the Trident II sea-launched ballistic missile, which can deliver multiple nuclear warheads.

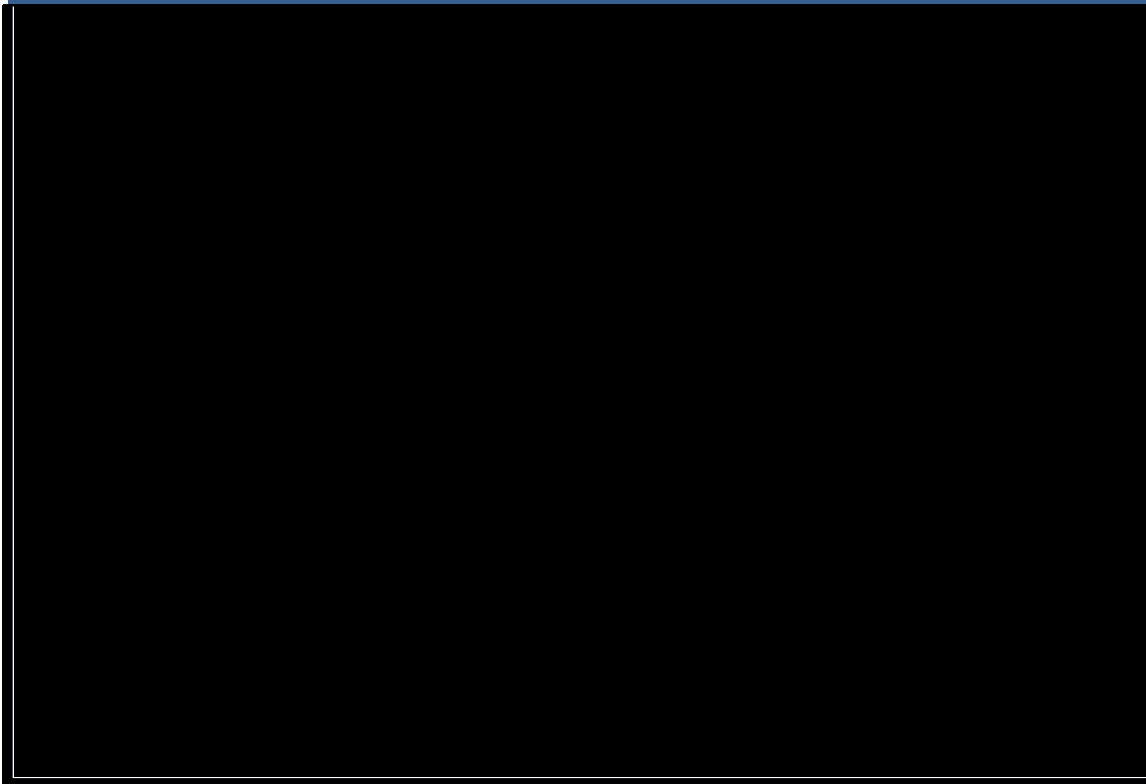
(U) *Ohio*-Class SSBN's Role in the U.S. Nuclear Deterrent Mission

(S) [REDACTED]

(U) According to the Operations Order, the SSBN fleet provides the most survivable leg of the U.S. nuclear triad. The SSBNs' logistic independence provides a reliable and assured second-strike capability. Their stealth makes them difficult to detect and target.

¹ (S) [REDACTED]

(S) [REDACTED]
Secret



Secret

(U) Source: [REDACTED]

(U) *Ohio-Class Submarines*

(U) According to the Naval Sea System Command's USS *Ohio*-class service life update, the Navy maintains 18 *Ohio*-class submarines. The first *Ohio*-class SSBN, the USS *Ohio*, entered service in 1981; the last *Ohio*-class SSBN, the USS *Louisiana*, entered service in 1997.

(U) The Secretary of Defense's 2001 Nuclear Posture Review recommended a reduction from 18 to 14 SSBNs. In 2003, the Navy decreased the SSBN fleet to 14 by converting four *Ohio*-class SSBNs to Guided Missile Nuclear Submarines (SSGNs). SSGNs carry conventional land attack cruise missiles and are used to support special operations. The remaining 14 SSBNs are the focus of this evaluation.

(U) *SSBN Life Extension*

(U) In a 1998 memorandum from the Commander of the Naval Sea Systems Command to the Chief of Naval Operations, the Navy documented its decision to extend the

(U) original 30-year service life of the *Ohio*-class submarines to 42 years. This decision was supported by a Navy-directed study led by the *Ohio*-class manufacturer, General Dynamics Electric Boat Division, which determined that extending the service life of the *Ohio*-class SSBNs to 42 years is technically feasible. EROs began with the USS *Ohio* in November 2002 and are scheduled to conclude with the USS *Louisiana* in May 2021. Subsequently, in a 2017 memorandum from the Commander of the Naval Sea Systems Command to the Program Executive Office for Submarines, the Commander stated that extensions beyond 2042 were not technically feasible. Representatives from the Chief of Naval Operations Staff stated during an interview that the Navy did not have a contingency plan in case the *Columbia*-class SSBN acquisition dates are delayed.

(U) Navy Estimates of Ohio-Class SSBN Retirement

(U) The first of the 14 *Ohio*-class SSBNs is scheduled to be retired from active service in 2027. The remaining *Ohio*-class SSBNs will be retired at a rate of one per year with the last one exiting service in 2040 (see Table 2). According to the Navy submarine program office, the first *Columbia*-class SSBN is expected to enter service in 2031 to replace a retiring *Ohio*-class SSBN. An additional 11 *Columbia*-class SSBNs are scheduled to be delivered approximately one per year until the last two *Columbia*-class SSBNs join the fleet by 2042 (see Figure 1).

(U) Table 2. *Ohio*-Class SSBN Projected Operations Life Expectancy
Unclassified

(U) Name	Hull	Commission	Refueling Overhaul	End of Life ^A
USS Ohio ^B	SSBN-726	Nov 1981	Nov 2002 - Dec 2005	Jan 2026
USS Michigan ^B	SSBN-727	Sep 1982	Mar 2004 - Nov 2006	Dec 2026
USS Florida ^B	SSBN-728	Jun 1983	Aug 2003 - Apr 2006	May 2026
USS Georgia ^B	SSBN-729	Feb 1984	Mar 2005 - Dec 2007	Jan 2028
USS Henry M. Jackson	SSBN-730	Oct 1984	Nov 2004 - Mar 2007	Apr 2027
USS Alabama	SSBN-731	May 1985	Jan 2006 - May 2008	Jun 2028
USS Alaska	SSBN-732	Jan 1986	Nov 2006 - Mar 2009	Apr 2029
USS Nevada	SSBN-733	Aug 1986	Feb 2009 - May 2010	Jun 2030
USS Tennessee	SSBN-734	Dec 1988	Jan 2009 - Aug 2011	Sep 2031

Unclassified

Unclassified

(U) Name	Hull	Commission	Refueling Overhaul	End of Life ^A
USS Pennsylvania	SSBN-735	Sep 1989	Jan 2010 - Sep 2012	Oct 2032
USS West Virginia	SSBN-736	Oct 1990	Mar 2011 - Nov 2013	Dec 2033
USS Kentucky	SSBN-737	Jul 1991	Jan 2012 - Apr 2015	May 2035
USS Maryland	SSBN-738	Jun 1992	Jan 2013 - Feb 2016	Mar 2036
USS Nebraska	SSBN-739	Jul 1993	Feb 2014 - Jun 2017	Jul 2037
USS Rhode Island	SSBN-740	Jul 1994	Feb 2016 - Apr 2018 ^A	May 2037 ^A
USS Maine	SSBN-741	Jul 1995	Oct 2016 - Apr 2019 ^A	Sep 2038 ^A
USS Wyoming	SSBN-742	Jul 1996	Feb 2018 ^A - May 2020 ^A	May 2039 ^A
USS Louisiana	SSBN-743	Sep 1997	Feb 2019 ^A - May 2021	May 2040 ^A

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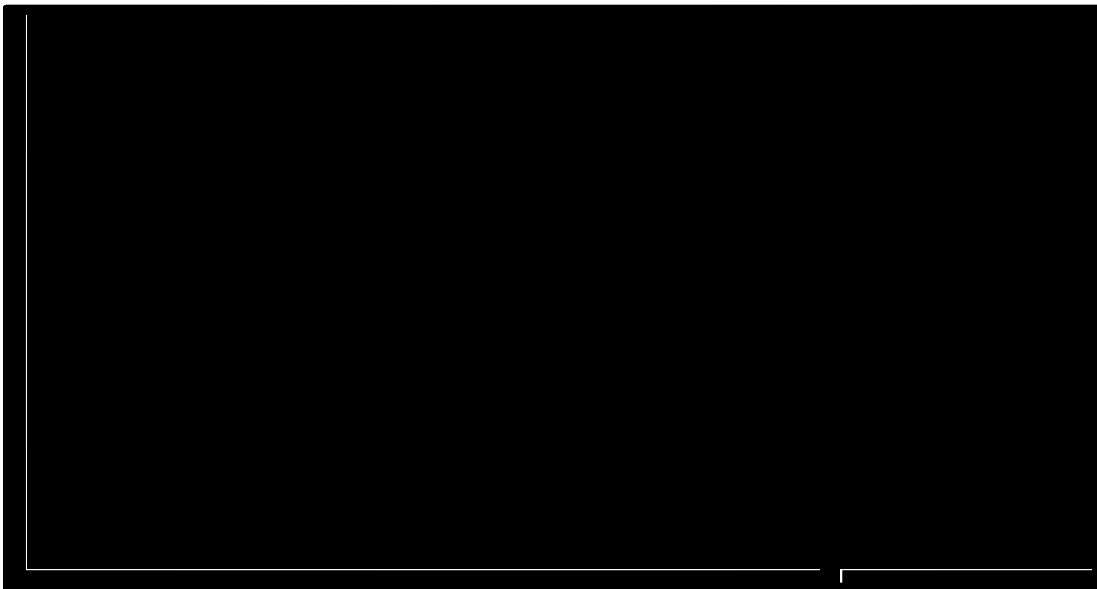
(U) ^A Estimated

(U) ^B Converted To SSGN

(U) Source: Commander, Naval Sea Systems Command, July 18, 2017

(U) Figure 1. Total Ohio-class and Columbia-class SSBNs in Service

For Official Use Only



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(FOUO) Source:

[Redacted Source Information]

(U) Ohio-Class SSBN Maintenance Cycle

(U) The schedulers for the Naval Sea Systems Command's Submarine Maintenance Engineering Planning and Procurement build maintenance and sustainment plans for all submarine refits. The maintenance and sustainment plans include scheduled dry-dock periods to allow work below the submarine's waterline. A typical dry dock is a narrow concrete basin that can be closed at one end by a gate or caisson. Once the submarine is floated into the basin, the gate is closed and the water is pumped out, leaving the vessel supported on a wooden keel, where it can be freely inspected, serviced, and repaired (see Figure 2). Each SSBN undergoes three types of refits during its service life: Incremental Refit, Extended Refit Period (ERP), and ERO.

(U) Incremental Refit

(U) The *Ohio*-class SSBNs operate on a 112-day rotation, consisting of 77 days at sea followed by 35 days in port undergoing maintenance and repair in preparation for the next patrol. The 35-day maintenance period, known as Incremental Refit, consists of scheduled repairs, maintenance, and inspections, as well as unscheduled repairs and minor modernization tasks. Unscheduled repairs are normally a result of issues discovered by the submarine crew while at sea. Minor modernization tasks include upgrades to systems, such as sonar, torpedo fire control, and navigation systems. Incremental Refits are performed at the Trident Refit Facility (TRF) at Naval Submarine Base Kings Bay, Georgia, and the Intermediate Maintenance Facility at Naval Base Kitsap Bangor, Washington.

(U) Extended Refit Period

(U) Each *Ohio*-class SSBN goes through a 7- to 8-month ERP twice, around the 12th and 30th years of the submarine's life. ERPs replace and refurbish the major components of the hull and internal systems. For example, ship alterations and modifications that require several months to complete are accomplished during ERPs. ERPs are performed at the TRF at Naval Submarine Base Kings Bay and the Intermediate Maintenance Facility at Naval Base Kitsap Bangor. Although not currently planned, ERPs can also be conducted at Norfolk Naval Shipyard (NNSY), Virginia, or Puget Sound Naval Shipyard (PSNS), Washington, if the ballistic missiles are removed.

(U) Figure 2. *Ohio*-Class SSBN in Norfolk Naval Shipyard Dry Dock
Unclassified



Unclassified

(U) Source: Provided By Norfolk Naval Shipyard/Audit Liaison

(U) Engineered Refueling Overhaul

(U) Each *Ohio*-class SSBN also goes through a 27-month ERO. EROs are scheduled to be conducted beginning in the 20th year of the submarine's life at NNSY or PSNS, depending on where the submarine is assigned. The nuclear power reactor is refueled to allow the submarine to operate for an additional 20 years (see Table 2 for ERO periods). Before the ERO can begin, the submarine's Trident nuclear missiles must be removed at Naval Submarine Base Kings Bay or Naval Base Kitsap Bangor. This is necessary because the shipyards do not have the level of security required to guard submarines loaded with nuclear weapons.

(U) Finding

(U) The Navy Has Taken Action to Sustain the *Ohio*-Class SSBNs

(U) The Navy has plans and initiatives in place to sustain the *Ohio*-class SSBNs at the minimum USSTRATCOM requirements until the replacement *Columbia*-class SSBNs are fielded. The Secretary of the Navy designated sustainment of the *Ohio*-class SSBNs as the Navy's highest priority. Accordingly, the Navy has implemented extensive plans and initiatives to address shipyard prioritization, overcome submarine homeport dry dock challenges, trained additional shipyard workers, and optimized maintenance procedures and schedules.

(U) The Navy Designated Strategic Nuclear Deterrence as Its Top Priority

(U) The Secretary of the Navy and the Chief of Naval Operations have formally designated strategic nuclear deterrence as the Navy's top priority. The Secretary of the Navy published "A Cooperative Strategy for 21st Century Seapower," March 2015, to describe how the Navy will design, organize, and employ the sea services in support of defense, homeland security, and national strategies. This document also sets Navy priorities for allocating constrained resources, stating, "[T]he Navy's top priority is to ensure that the most survivable leg of our Nation's strategic nuclear triad remains fully resourced and ready through the existing SSBN force and continued development of the *Ohio* Replacement Program."

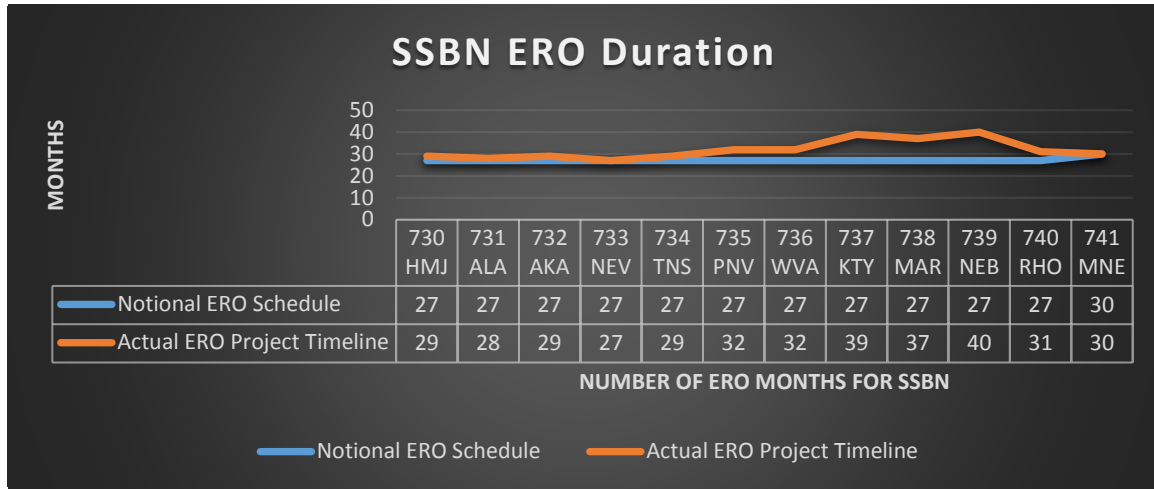
(U) The Chief of Naval Operations echoed the Secretary's direction in the "Chief of Naval Operations Guidance for Development of Program Objective Memorandum 2019 (CNOG-19)," October 12, 2016. The Program Objective Memorandum is the Navy's primary reference for Navy programmers to develop a strategy-based fiscal year 2019 Navy budget submission. The Chief of Naval Operations emphasized in the Program Objective Memorandum that the Navy will maintain SSBN operational availability to support USSTRATCOM's requirements and will ensure that the *Ohio*-class replacement, *Columbia*-class SSBNs, will be delivered on time.

(U) Shipyard Commanders Made SSBNs Their Top Maintenance Priority

(U) Aircraft carriers and *Ohio*-class submarines share the same limited workforce in the shipyards. During our meetings with the Commanders at NNSY and PSNS, they described how they have implemented the strategic nuclear deterrence prioritization. Consistent with the Chief of Naval Operations' guidance, the two shipyard commanders placed *Ohio*-class SSBNs ahead of aircraft carriers in priority for maintenance in order to reduce the time needed to complete an SSBN's mid-life ERO. Before this reprioritization occurred, EROs were gradually extending beyond the 27 months they were supposed to take. Table 3 displays this trend. For example, the USS *Tennessee* (734) ERO took 29 months to complete, ending in 2011, and the USS *Nebraska* (739) ERO took 40 months to complete, ending in 2016.

(U) The USS *Rhode Island* (740) is the first SSBN to undergo an ERO since the change in priority. The ERO was scheduled to be completed in 27 months; however, testing identified the need for rework, which will increase the ERO duration to 31 months. During this additional rework period, the NNSY is taking advantage of this opportunity to accomplish additional work that would have been done later. Despite this delay to the USS *Rhode Island* (740) ERO completion, the prioritization of SSBN maintenance is expected to reduce the duration of the ERO by nine months compared with the ERO on the USS *Nebraska* (739). The second ERO to start since the change in prioritization is the USS *Maine* (741). It is scheduled for a 30-month ERO to complete additional modernization work added to the schedule. The first of two ERO phases were completed with a 43-percent reduction in cycle-time compared to the last SSBN that completed an ERO before the reprioritization. As of April 2018, the 30-month ERO is still on time.

(U) Table 3. *Ohio*-Class SSBN ERO Duration Chart
Unclassified



Unclassified

(U) Source: Derived from Naval Sea Systems Command USS *Ohio* (SSBN/SSGN 726) Class Service Life Update Memorandum provided by OPNAV N97

(U) Navy Mitigated SSBN Homeport Dry Dock Challenges

(U) Naval Base Kitsap Bangor

(U) The amount of maintenance in dry dock required for SSBNs increases with the submarine’s age. The Naval Base Kitsap Bangor has only one dry dock to sustain eight SSBNs, and is the only base on the West Coast authorized to perform maintenance on SSBNs loaded with missiles. The out-of-water maintenance time required to sustain eight SSBNs and two SSGNs exceeded the scheduling capacity of the single dry dock. To overcome this challenge, the Navy performs SSGN dry dock maintenance activities at PSNS. Limiting the Naval Base Kitsap Bangor dry dock to SSBNs ensured enough capacity with only one dry dock.

(U) Naval Submarine Base Kings Bay

(U) The Naval Submarine Base Kings Bay also has only one dry dock. The base, which must sustain six SSBNs and two SSGNs, faces an additional challenge because the dry dock requires its own maintenance overhaul, which could take 12 to 18 months to complete. During the overhaul, certain repairs, such as to the dry dock roof, must be completed without a submarine in the dry dock. The dry dock is the only one on the East Coast authorized to perform maintenance on SSBNs loaded with missiles.

(U) The Navy has taken steps to overcome dry dock availability issues. The Commander of the Naval Submarine Base Kings Bay TRF, which includes the dry dock, described how staff developed procedures to perform some SSBN maintenance activities normally done in the dry dock at pier side. For example, on two occasions maintenance crews replaced a submarine's 100,000-pound propeller at pier side, to leave the dry dock available for other work. If such mitigation strategies are not sufficient to accommodate both submarine and dry dock maintenance, the schedulers acknowledged that the Navy could send the two SSGNs to the NNSY dry dock for maintenance. Maximizing efficient use of the single dry dock at the Naval Submarine Base Kings Bay should help the Navy meet USSTRATCOM requirements.

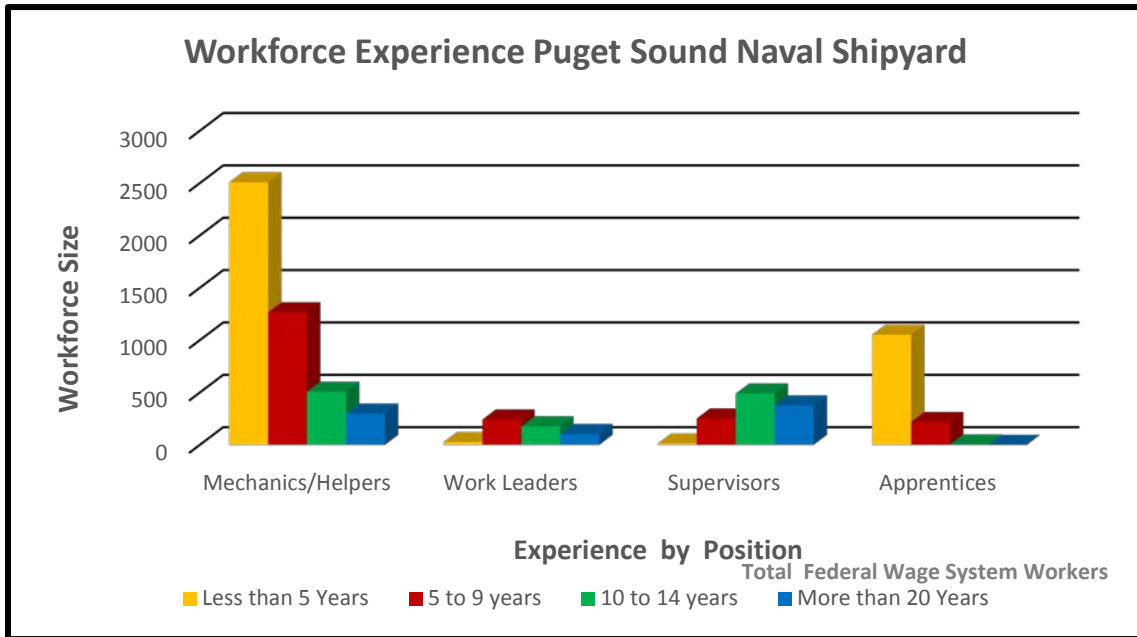
(U) The Navy Is Training Additional Shipyard and Submarine Base Workers

(U) A personnel shortage caused by the Budget Control Act, Public Law 112-25, August 2, 2011, created a maintenance backlog. The Commander of the PSNS stated that the Act resulted in hiring freezes in 2011 and another in 2016 that contributed to a labor shortage. The Commander explained that the total labor shortage amounted to more than 928,000 worker-days of lost productivity being carried into the following FYs. The shortage pushed work into successive years.

(U) To overcome this problem, the Navy approved direct-hire authority for Naval Submarine Base Kings Bay, Naval Base Kitsap Bangor, NNSY, and PSNS. For example, in the past 4 years, PSNS alone hired more than 6,700 employees, most of them entry-level workers. As a result, PSNS reduced the unfinished work overflow over one year by 96,600 worker days. Specifically, the unfinished work overflow from FY 2016 to FY 2017 was 301,700 worker days. From FY 2017 to FY 2018, PSNS reduced the unfinished work overflow by 32 percent to 205,100 worker days.

(U) The PSNS Commander briefed the evaluation team that the workforce size matches the workload for FY 2018, and the new employees are completing training and gaining experience towards performing at full capacity. Figure 3 illustrates PSNS worker experience levels.

(U) Figure 3. Puget Sound Naval Shipyard Workforce Bar Graph
Unclassified



Unclassified

(U) Source: Puget Sound Naval Shipyard

(U) The PSNS Commander is focused on offsetting the reduced experience levels by accelerating and improving training and workforce development processes. The Commander initiated an apprenticeship program, a continuous training and development program, and a competency mapping initiative. The goals of these programs and initiatives are to improve workforce capability and decrease the time needed to train the entry-level workers. The development of workforce competencies through optimized training programs should help PSNS to ensure a productive and qualified workforce. The instructors provided examples of the type of skills being developed that can allow workers to quickly contribute to completing the existing and future workload. In a recent pilot program, instead of completing a full 24-month Journeyman's program, a mechanic was trained on repairing a particular type of valve in 10-weeks using a task based learning method. This task-based training allowed the mechanic to contribute to the mission after 10-weeks while continuing the overall training program.

(U) The Navy Has Improved Maintenance Procedures and Schedules to Meet SSBN Availability Requirements

(U) Extending the service life of an SSBN from 30 to 42 years means the submarines will require more maintenance. The Navy has adopted procedures to improve scheduling and maintenance within the 35-day Incremental Refit periods in order to meet the USSTRATCOM demand for SSBN availability.

(U) Improved Maintenance Procedures

(U) During our site visit to Naval Submarine Base Kings Bay, the TRF Commander explained two approaches used to address maintenance while a submarine is still at sea. First, submarine crews alert the base to any unscheduled repairs that are needed, so the maintenance personnel have more time to prepare. Maintenance personnel coordinate with Submarine Maintenance Engineering Planning and Procurement to incorporate the additional work into the scheduled refit. Second, the Navy deploys maintenance personnel to conduct inspections and begin maintenance preparation tasks while the submarine is heading into port. These practices maximize efficient use of the refit time.

(U) Another innovative technique to improve maintenance efficiency was presented at PSNS. During our site visit, the shipyard Commander demonstrated exact replicas of submarine machinery used for training. Maintenance personnel use these replicas to practice tasks in confined spaces simulating the workspace aboard an SSBN. This practice allows personnel to increase their efficiency and identify issues before encountering them aboard an active submarine. In some instances, a problem has been identified at sea and relayed to the homeport in time for the maintenance personnel to set up and practice a particular repair before the submarine arrived in port.

(U) Our evaluation team also observed an innovative maintenance procedure that allows PSNS to repair parts when replacement parts are not readily available. Personnel use an advanced robotic gas welder to add thickness to tubing, pipes, and steel plates that have been worn due to use or exposure to salt water. The PSNS Commander stated that this process has reduced maintenance time and addressed the challenge of obtaining parts.

(U) Improved Maintenance Schedules

(U) The Director of Submarine Maintenance Engineering Planning and Procurement stated that the Navy relies on highly specific maintenance schedules customized for each submarine to ensure that planned and unplanned work can be completed in the required timeframe. Each SSBN's plan identifies parts and components to be inspected or replaced during each post-patrol refit or when the SSBN is in the Extended Refit Period. The Submarine Maintenance Engineering Planning and Procurement representatives demonstrated how these plans are living documents that are updated with submarine-specific information. For instance, a submarine's maintenance schedule can be modified based on an emerging issue involving other SSBNs, such as a part that must be replaced sooner than planned. Such adaptations proactively manage maintenance tasks for the SSBN's entire service life.

(U) The Navy's Trident Planned Equipment Replacement program provides a supply of components ready to be installed when a submarine needs maintenance. Exchanging a part rather than waiting for it to be repaired or overhauled means the submarine spends less time in maintenance. The Trident Planned Equipment Replacement program consists of extra sets of designated *Ohio*-class SSBN components that are maintained on a rotating basis to ensure that vital parts are available on a scheduled or contingency basis.

(U) In addition to the Trident Planned Equipment Replacement Program, the Navy maintains a Trident Load List that tracks parts maintained at the base level at Kings Bay and Intermediate Maintenance Facility Bangor. The Commander of Intermediate Maintenance Facility Bangor provided data showing improvement in parts related deferrals. For example, from September 2016 to September 2017, the Intermediate Maintenance Facility Bangor had reduced the total overdue Preventive Maintenance Requirements due to unavailable parts from 37 to 12, and reduced maintenance deferrals due to unavailable parts from 101 to 23.

(U) Our evaluation team observed how individualized schedules for both short- and long-term maintenance were adjusted to help sustain each SSBN. We reviewed both pier side and dry dock maintenance refit schedules for several SSBNs. The example of the USS *West Virginia* provided by its Executive Officer indicates how carefully the Navy choreographs SSBN maintenance to maximize use of the submarine's time in port. The maintenance plan includes a strict schedule for the first 100 hours in port, broken down into 30-minute intervals.

(U) The Commanders of the Norfolk and Puget Sound Naval Shipyards provided us with copies of maintenance plans and schedules for EROs. The plans, updated weekly, include projected and actual maintenance task completion times, critical paths, and risk level assessments. For example, the USS *Rhode Island* ERO Risk Level Assessment shows that NNSY had identified 50 risk areas at the beginning of the ERO. On November 1, 2017, the assessment reflected that 48 of the risk areas were already eliminated. Additionally, these risk areas are tracked to measure the key performance areas of the shipyard's ERO maintenance and management. In November 2017, NNSY representatives stated that the ERO for the USS *Wyoming*, which will begin in March 2018, had already acquired 60 percent of the parts necessary to complete the ERO. NNSY representatives also stated that lists of Trident Planned Equipment Replacement assets and other critical parts are already developed to show requirements with need-by dates throughout the entire ERO.

(U) Conclusion

~~(S)~~ The Navy has taken action to sustain *Ohio*-class Nuclear Ballistic Missile Submarines until they are replaced. The Navy designated strategic nuclear deterrence as its top priority in order to meet the minimum USSTRATCOM requirements. The Navy has prioritized SSBNs ahead of aircraft carriers at the naval shipyards, overcome submarine homeport dry dock challenges, trained additional shipyard workers, and optimized maintenance procedures and schedules. [REDACTED]

[REDACTED]

[REDACTED]

(U) Reasons for No Recommendations

(U) We are not providing recommendations because we concluded that the Navy was taking action to address sustainment challenges for the *Ohio*-class SSBNs. The Navy's 2015 decision to make *Ohio*-class SSBN sustainment its number one priority resulted in the implementation of plans and initiatives to help ensure that the required sustainment is achieved by the submarine bases and shipyards. Successes included reducing time to complete EROs and hiring and training initiatives that meet *Ohio*-class SSBN maintenance demands.

(U) Appendix

(U) Scope and Methodology

(U) We conducted this evaluation from September 2017 through April 2018 in accordance with the Council of the Inspectors General on Integrity and Efficiency Quality Standards for Inspection and Evaluation. These standards require that we plan and perform the evaluation to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our evaluation objective. We did not include the timing of the *Columbia*-class acquisition as part of our scope because GAO is conducting an audit of that program.

(U) We believe that the evidence obtained provides a reasonable basis for our findings and conclusions that led to no recommendations based on our review.

(U) We conducted interviews with representatives from the Office of the Secretary of Defense, the Secretary of Navy, the Joint Staff, USSTRATCOM, Headquarters U.S. Navy, U.S. Navy Submarine Force Atlantic Fleet, U.S. Navy Submarine Force Pacific Fleet, Naval Sea Systems Command, Commander Submarine Group Nine, Commander Submarine Group Ten, NNSY, PSNS, Naval Submarine Base Kings Bay TRF, Naval Base Kitsap Bangor Intermediate Maintenance Facility, and Submarine Maintenance Engineering Planning and Procurement Activity.

(U) We conducted site visits at: NNSY and Naval Station Norfolk, Virginia; Naval Submarine Base Kings Bay, Georgia; Naval Base Kitsap Bangor, Washington and Puget Sound Naval Shipyard Bremerton, Washington. We also toured the USS *Rhode Island* (740) undergoing an ERO at NNSY, the USS *West Virginia* (736) undergoing an Incremental Refit at Naval Submarine Base Kings Bay, and the USS *Louisiana* (743) undergoing a repair at Naval Base Kitsap Bangor.

(U) We reviewed Presidential Directives and DoD, Joint Staff, and Navy requirements to identify authorities and responsibilities for the SSBN mission. We reviewed OPNAVINST 4700.7L “Maintenance Policy for United States Navy Ships” May 25, 2010; OPNAVINST 4000.57G “Logistics Support of the Trident System” January 19, 2012; OPNAVINST 4710.31A “Trident Planned Equipment Replacement Program” November 29, 2012; and the Memorandum from the Commander, Naval Sea Systems Command “USS *Ohio* Class Service Life Update” July 18, 2017. We also evaluated the SSBN Operational Availability Schedule for FY2018-FY2027, and compared it with

(U) dry dock schedules from both Naval Base Kitsap Bangor and the Naval Submarine Base Kings Bay. We reviewed examples of weekly metrics and risk assessment briefings for ongoing EROs, and reviewed an example of the weekly planning metrics for the preparation of the next SSBN to start an ERO. Finally, we reviewed unit-level Incremental Refit schedules and viewed demonstrations of the scheduling software that is used to track all required inspections and periodic maintenance.

(U) Use of Computer-Processed Data

(U) This evaluation did not use computer-processed data, databases, or computer programs as part of its analysis or reporting.

(U) Prior Coverage

(U) GAO

(U) GAO-17-548, "NAVAL SHIPYARDS, Actions Needed to Improve Poor Conditions That Affect Operations," September 2017.

(U) The GAO evaluated (1) the state of the naval shipyards' capital facilities and equipment, (2) the extent to which shipyard capital facilities and equipment support the Navy's operational needs, and (3) the extent to which the Navy's capital investment plans for facilities and equipment are addressing shipyard challenges. GAO recommends that the Navy develop a comprehensive plan to guide shipyard capital investment, conduct regular management reviews, and report to Congress on progress in addressing the shipyards' needs.

(U) GAO 18-158, "*COLUMBIA*-CLASS SUBMARINE, Immature Technologies Present Risks to Achieving Cost, Schedule, and Performance Goals," December 2017.

(U) The GAO reviewed the Navy's technology readiness assessment, technology development plan, and the status of key prototyping efforts, and compared efforts with GAO's identified best practices for shipbuilding programs and technology readiness assessments. GAO also assessed the status of design maturity and the Navy's acquisition strategy and interviewed relevant officials. GAO had suggested a matter for congressional consideration related to additional reporting on the *Columbia*-class technologies, but removed it because of recent legislation that implements this requirement.

(U) Acronyms and Abbreviations

ERO	Engineered Refueling Overhaul
ERP	Extended Refit Period
NNSY	Norfolk Naval Shipyard
PSNS	Puget Sound Naval Shipyard
SSBN	Nuclear Ballistic Missile Submarine
SSGN	Guided Missile Nuclear Submarine
TRF	Trident Refit Facility
USSTRATCOM	U.S. Strategic Command

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