

**REPORT TO CONGRESS  
ON  
THE LONG-RANGE PLAN FOR  
MAINTENANCE AND MODERNIZATION  
OF NAVAL VESSELS  
FOR FISCAL YEAR 2020**

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## I. Submission of the Report

This report provides the Department of the Navy (DoN) Long-Range Plan for the Maintenance and Modernization of Naval Vessels for Fiscal Year (FY) 2020. This plan complements the Navy's Annual Long Range Plan for Construction of Naval Vessels for FY 2020 and establishes the framework to effectively sustain our investments in today's fleet.

## II. Key Themes

The *National Defense Strategy* provides the overarching guidance and high-level requirements for sustaining the *Navy the Nation Needs (NNN)*. The FY20 Maintenance and Modernization Plan begins to capture the requirements necessary to maintain the Navy's fleet mission-ready. This plan forms the basis for future industrial base capacity requirements with the following key themes:

- Supports the congressional policy direction for 355 battle force ships in the 2018 National Defense Authorization Act (Public Law 115-91).
- Shows that maintaining and modernizing the fleet requires a sustained and sufficient investment, and a close partnership with the public and private ship repair industrial base.
- Demonstrates that as the Navy grows to 355 battle force ships, the demand on the industrial base must evolve to effectively maintain and modernize a growing and changing fleet. This will require changes to industrial base infrastructure, workforce, and business processes to prepare for the future workload.
- Reaffirms that maintenance and modernizations rely on a robust and highly efficient supply chain to deliver material to the fleet. As the fleet grows in size, complexity and age, the supply chain (including the vendor base) must deliver the material support necessary to achieve the required level of readiness.
- Demonstrates that continued maintenance of ships in accordance with the applicable class maintenance plans is necessary to allow the Navy to achieve the maximum service life of ships and submarines as well as extend the service lives of select classes of ships to achieve a battle force of 355 ships.

This plan describes the Navy's continued challenges with high-tempo operations that has resulted in a maintenance backlog and reduced readiness rates for Navy ships. It is baselined on the current 2019 inventory and PB-2020 data with updates from the FY 2020 Shipbuilding Plan, planned selected service life extensions (SLEs), and projected decommissionings during the next 30 years. As with the FY2020 Shipbuilding Plan, it will address maintenance and modernization required of a fleet growing to 355 ships.

Table 1 shows the desired end state in quantity and fleet mix of the future 355 battle force ships as defined in the 2016 *NNN*.

Type	NNN
Ballistic Missile Submarine	12
Aircraft Carriers	12
Attack Submarines	66
Large, Multi-Mission, Surface Combatants	104
Small, Multi-Role, Surface Combatants	52
Amphibious Warfare Ships	38
Combat Logistic Force (CLF)	32
Command and Support	39
<b>Total</b>	<b>355</b>

**Table 1. The Navy the Nation Needs**

### **III. Overview of Maintenance and Modernization Capability**

Private and public shipyards perform depot-level maintenance and modernization availabilities and are supported by a nationwide network of vendors for materials. Private shipyard work consists primarily of maintenance availabilities on non-nuclear surface ships contracted in accordance with federal acquisition regulations. The four public naval shipyards (NSYs) perform work primarily on nuclear aircraft carrier and submarine availabilities, maintaining some unique core capability on surface ship systems.

#### **A. Private Sector**

The Navy's Regional Maintenance Centers (RMCs) manage, oversee, and contract with private sector shipyards for maintenance work packages within their regions. Award of contracts for out-of-region and multi-ship contracts are managed by Naval Sea Systems Command and administered via the assigned Naval Supervising Activity. Fleet maintenance schedulers from U. S. Fleet Forces Command and Commander, Pacific Fleet continuously balance operational commitments against engineered maintenance periodicity and industrial base constraints to develop an executable maintenance and modernization schedule. The Military Sealift Command (MSC) performs analogous functions to maintain the fleet of combat logistics force (CLF) and fleet support vessels.

Several aspects are considered when describing the industrial base, including quantity and capability of dry docks and regional port work loading. Navy-certified dry docks are required for Navy ships. As laid out in the *Surface Navy Dry Dock Study - Final Report* (February 18, 2016), there are 21 certified dry docks used for private shipyard availabilities that are listed in Table 2.

<b>Fleet</b>	<b>Port</b>	<b>Number of Certified Dry Docks</b>	<b>Homeported Surface Ships</b>
Atlantic	Norfolk, VA <sup>1</sup>	6	34
	Mayport, FL <sup>1</sup>	2	15
	Charleston, SC	3	0
	Pascagoula, MS	1	0
	Great Lakes & Bath	2	0
	Atlantic Total	14	49
Pacific	San Diego, CA <sup>1</sup>	4	45
	Pearl Harbor, HI <sup>1</sup>	1	10
	Seattle (Everett), WA <sup>1</sup>	1	5
	Portland, OR	1	0
	Pacific Total	7	60
	Total	21	109

Note 1: Only includes non-nuclear surface ships.

**Table 2. Private Shipyard Dry Docks Locations**

The ratio of ships to dry-docks present in the Pacific presents a significant challenge that reduces margin for schedule changes and growth. The Navy has conducted a market survey of available/potential dry docks and is developing a long-range plan to increase the number of certified dry docks in the Pacific (and elsewhere if required) to reduce this shortfall.

To meet this challenge, the Navy continually optimizes regional port loading by adjusting ship schedules in order to develop executable availabilities and best use available capacity. The RMCs develop plans that address ship and submarine maintenance programming, budgeting, and execution. These plans forecast private sector workload and show projected capacity of the industrial base, based on input provided by each of the regional ship repair associations. The Navy is continuously reviewing ship maintenance and modernization requirements and private sector port loading, and works to provide a predictable and stable workload to industry. The Navy provides a quarterly port loading assessment to Congress as required by the FY 2017 National Defense Authorization Act (Public Law 114-328).

## **B. Public Sector**

The four public NSYs (see Table 3) – Portsmouth Naval Shipyard (PNS), Norfolk Naval Shipyard (NNSY), Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY & IMF) – are essential elements of U.S. national security. The government-owned and operated naval shipyards repair, modernize, perform submarine refueling, inactivate, conduct emergency repairs and provide for mobilization and national defense contingency situations. Their primary mission is to accomplish depot- and intermediate-level maintenance and modernization work to ensure the Navy’s nuclear aircraft carriers and submarines are available to meet the Nation’s needs.

NSY	Location	FY18 Civilian End Strength	FY18 Total Revenue (\$M)	FY18 Workload (Man-days (K))	Dry docks	Capabilities
PNS	Kittery, ME	6,023	977	897	3	Only East Coast NSY capable of refueling LOS ANGELES Class. Capable of working on LOS ANGELES and VIRGINIA Classes.
NNSY	Portsmouth, VA	11,037	1,675	1,588	4	Only East Coast NSY capable of docking aircraft carriers. Capable of working on all classes of Navy vessels.
PSNS & IMF	Bremerton, WA	13,905	2,175	2,193	7	Primary West Coast NSY for support of aircraft carriers. Only nuclear reactor disposal/recycling site.
PHNSY & IMF	Pearl Harbor, HI	5,549	945	762	4	Largest repair facility between the West Coast and Far East. Capable of working on surface combatants and submarines.

**Table 3. Public Shipyard Overview (Source: PB20 OP-5A)**

In order to complete their primary mission, NSYs are investing in their infrastructure. In 2018, most naval shipyard capital equipment was assessed as beyond effective service life, obsolete, unsupported by original equipment manufacturers, and at operational risk. This aged equipment increases submarine and aircraft carrier depot maintenance costs, schedules and reduced NSY capacity. Modernizing naval shipyard capital equipment is therefore essential to meeting future capacity and capability requirements, and maximizing fleet readiness.

Dry dock investments are needed to support USS GERALD R FORD Class and USS VIRGINIA Class including VIRGINIA Payload Module variants, as well as to implement seismic and flood- protection improvements. The Navy’s *2018 Shipyard Infrastructure Optimization Plan (SIOP)*, discussed below, will restore 67 of 68 NSY availabilities that are at risk over the next 20 years for movement, deferral, or rescheduling due to dry dock capability gaps. Table 4 summarizes the NSY dry dock capability.

#	Dry Dock	Current Capability	Configuration and Condition
1	NNSY Dry Dock 4	All SSN Classes and SSBN/SSGN 726 Class	Requires repairs in FY19 & FY20 (RM12-1896 Phase I &II) for continued certification and use.
2	NNSY Dry Dock 2	SSN 688 Class and SSN and SSN 774 Class without Virginia Payload Module	Not SSN 774 with VIRGINIA Payload Module capable and will require rehabilitation.
3	NNSY Dry Dock3	SSN 688 Class and SSN 774 Class	Requires significant rehabilitation.
4	NNSY Dry Dock 8	CVN 68 Class, SSBN/SSGN 726 Class, and all SSN Classes	Does not support CVN 78 Class
5	PHNSY & IMF Dry Dock 2	SSN 688 Class	Will be obsolete in FY30 after last SSN 688 Class availability.
6	PNS Dry Dock 1	SSN 688 Class with Buoyancy Assist Tanks only	Does not support SSN 774 Class. Currently requires buoyancy assist tanks for SSN 688 Class that reach end of service life in FY21.
7	PSNS & IMF Dry Dock 3	SSN 688 RCDs Only	Will be obsolete after last SSN 688 Class RCD in FY39.
8	PSNS & IMF Dry Dock 6	CVN 68 Class, SSBN/SSGN 726 Class, and all SSN Classes	Does not support CVN 78 Class

**Table 4. Naval Shipyard Dry Dock Capability**

### C. Industrial Base Initiatives

Two governing documents guide the Navy's efforts to improve the effectiveness of the NSYs. First, the Naval Shipyard Development Plan Report to Congress (March of 2018) provides a detailed workforce development plan. Second, the *SIOP* provides the strategy to optimally size, configure, and locate facilities at the four public shipyards to best execute the mission requirements. The *SIOP* includes engineering analysis and strategy for optimal placement of facilities and major equipment at each public shipyard, which will restore badly outdated facilities while simultaneously reducing total personnel and material travel and movement by an average of 65 percent, which equates to recovering 328K man-days per year. The *SIOP* includes a 20-year investment plan for infrastructure needed to ensure the Navy is providing the shipyard capacity and capability the Nation needs. Funding for initial modeling and optimization analysis efforts is included in FY 2020.

For private shipyards, the Navy, in conjunction with the ship repair industry, is developing *Private Shipyard Optimization (PSO)* initiatives for optimal placement of facilities and major equipment in each region. This includes an investment plan for infrastructure needed to support availability maintenance in support of a 355-ship Navy. The *PSO* results are expected in time to support the FY 2021 budget request. Working closely with private shipyards, the Navy is also implementing a *Private Sector Improvement*

(*PSI*) program that addresses workload stability, governance, contracting and process optimization. The goal of the *PSO* and *PSI* initiatives is to identify and eliminate barriers to private sector ship availability throughput to affordably achieve on time delivery of surface ships.

Both public and private plans specifically focus on three major areas of improvement: dry dock capacity and survivability, facility layout and infrastructures optimization, and capital equipment requirements and modernization. This plan focuses on recovering and modernizing the nation's current capability and capacity. In this new era of great power competition, a follow-on plan will focus on potential surge requirements resulting from unplanned increases in operational tempo or battle damage.

#### **IV. Long-Range Plan**

This plan will address lifecycle maintenance and modernization processes for the types of ships delineated in Table 1, examines the national industrial base for ship repair, and looks ahead over the next 30 years as the fleet grows to 355 battle force ships. Projected ship inventories and planned availability induction schedules are provided in Appendix 1, Tables 5-6.

The Navy will develop a long-range maintenance and modernization requirements based on technical analysis and condition assessment of the fleet driven by the number of ships in the FY 2020 Shipbuilding Plan. The maintenance and modernization processes for all battle force ships are analogous. Maintenance and modernization are performed in the industrial base comprising of both public and private shipyards. Achieving and sustaining 355 battle force ships will require a continuous investment in the public and private industrial capacity and capability. This includes investments in additional infrastructure (e.g., dry docks and piers), training, and manpower. Shipyard capacity and workload leveling challenges will also require all stakeholder's attention to ensure maintenance and modernization can be performed in a timely and efficient manner.

Maintenance and modernization requirements must be fully funded and efficiently executed to reduce deferred maintenance that adds risk to future fleet readiness. Risks to be addressed during the next 30 years include optimizing maintenance and modernization business processes (e.g., availability planning and execution) and adjusting the industrial base capacity and capability as the fleet grows to 355 ships. Finally, the Navy must stabilize the vendor base by forecasting future logistics requirements (material availability) required to maintain fleet reliability and reduce the risk to readiness.

Recognizing these risks, the Navy has embarked on several initiatives to improve business processes and address infrastructure and workforce issues for the public and private shipyards as discussed in section III. C. For example, the *PSO/PSI* initiatives will address appropriate risk sharing, timely repair availability completion, and streamlined business processes at private shipyards and the supporting vendor base.

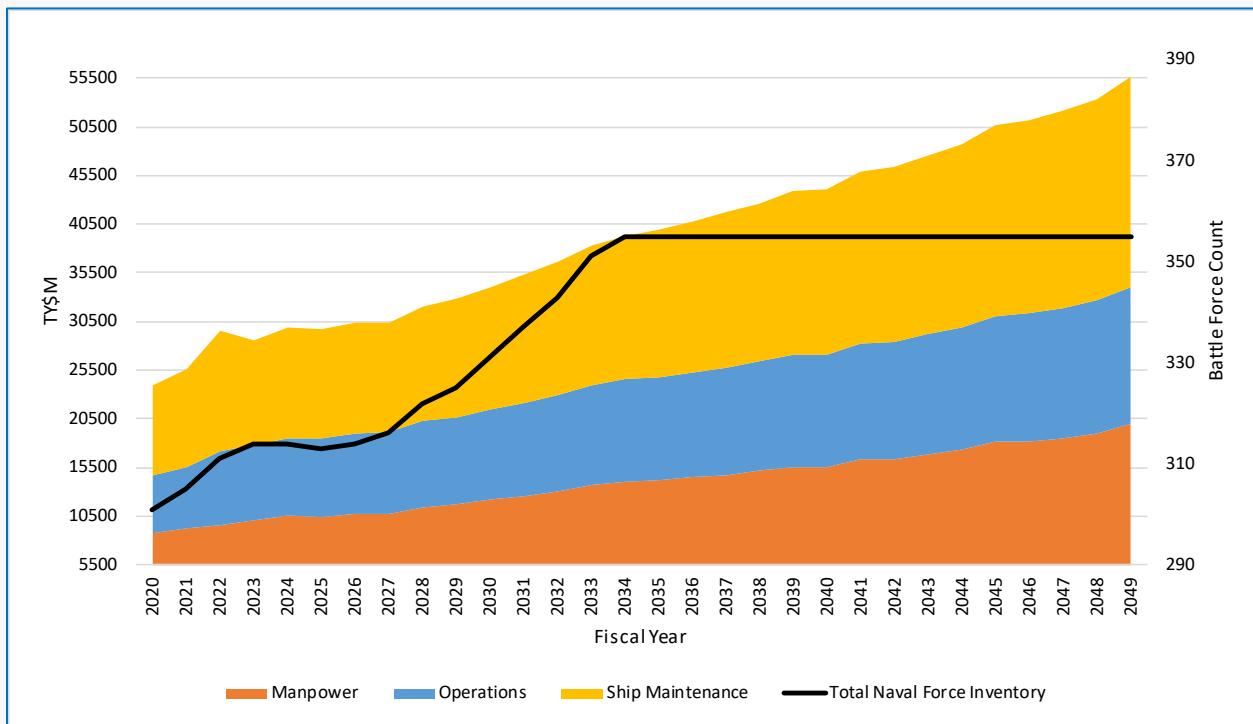
The Navy's three central life-cycle management activities (i.e., Carrier Planning Activity, Surface Maintenance Engineering Planning Program, and Submarine Maintenance Engineering, Planning and Procurement Activity) use similar overall end-to-end processes for planning and programming maintenance outlined in the Joint Fleet Maintenance



Manual (JFMM). MSC follows similar processes to maintain their fleets. These common processes will enable the projection of required maintenance schedules for the next 30-plus years and results in repeatable, defensible, and traceable estimates.

Navy’s modernization processes are guided by the JFMM, Maintenance Policy for United States Navy Ships, and the Navy Modernization Process Management and Operations Manual. The Navy employs a modernization program that captures changing modernization requirements with frequent reviews during the availability planning cycle. Technical maturity and certification status are monitored continuously throughout the maintenance cycle through the Modernization Readiness Assessment process. Modernizations are approved and scheduled based on attributes such as safety and security, survivability, communications and technology, reliability and maintainability, obsolescence, warfighting, cost, and return on investment. Appendix 1, Table 7 lists planned/ongoing major modernizations by class through the Future Years Defense Program (FYDP) and will be used to inform future modernization that is driven by the requirement to pace the threat with new technologies.

Figure 1 provides the sustainment funding from the FY 2020 Shipbuilding Plan. This sustainment estimates includes personnel, planned maintenance and some operations. For maintenance, these estimated cost provide a rough order of magnitude beyond the FYDP and can be helpful in identifying future areas of concern. For budgetary details associated with maintenance in the FYDP, see Appendix 2. For workloads at the private and public shipyards, see Appendix 3.



Notes: Shows personnel, maintenance and operations programmed in the FYDP for ships in the battle force by ship type. Beyond the FYDP, the funding is inflated from FY24, again by projected ship type (mix varies by year).

**Figure 1. Annual Funding for Sustainment (FY2020-2049)**

Going forward, the Navy will refine this report to account for the delivery of new ships, planned SLEs and future modernization in order to project the total requirement for depot level maintenance and modernization at the private and public shipyards. The Navy recognizes that the U.S. ship maintenance and modernization industrial base is a national enterprise that also supports other agencies. Managing all the U.S. industry resources requires significant coordination and the Navy has started an effort to expand this analysis to include ship maintenance and modernization needs by the U.S. Coast Guard, U.S. Maritime Administration, the National Oceanic and Atmospheric Administration, and the U.S. Army.

## **V. Summary of Key Enablers**

There are four key enablers to efficiently maintain and modernize the Navy's growing fleet of battle force ships over the next 30 years. In order to achieve the long-range maintenance and modernization requirements in this plan based on the FY 2020 Shipbuilding Plan, the Navy must address industrial base capacity and capability, shipyard level loading, workforce and facilities investments.

### **A. Industrial Base Capability and Capacity**

As shown in this plan, sustaining 355 battle force ships requires an increase and upgrade of public and private industrial capability and capacity. The Navy regularly engages with industry via the Shipbuilders Council of America and the regional ship repair associations. The next National Ship Repair Industry Conference is scheduled for April 2019. Additionally, quarterly port loading assessments are provided to Industry and to Congress. The *PSO* initiatives for private shipyards and *SIOP* for public shipyards will focus on future requirements for dry docks, facilities and capital equipment modernization. For private shipyards, the Navy conducted a market survey for available and potential commercial dry docks and is developing a long-range plan to increase the number of available certified dry docks. The *PSI* initiatives address industrial base health and workload stability, contracting, change management and availability execution at private shipyards. For example, *PSI* initiatives include a change in how growth and new work items are approved. Small value changes historically account for 70 percent of growth and new work, utilizing pre-priced changes will significantly reduce cycle time for approval. Full implementation of the *SIOP* and *PSO/PSI* initiatives are key to meeting the requirements of this plan.

### **B. Shipyard Level loading**

The Navy is committed to working with private industry to provide them a stable and predictable workload in a competitive environment, so they can hire the workforce and make the investments necessary to maintain and modernize the Navy's growing fleet. This will help ensure the Navy attains the best value for the taxpayer. The Navy continuously works to smooth the workload by addressing identified peaks and valleys in the workload. Like the private shipyards, the public shipyards benefit from a stable and predictable workload enabling them to conduct the work, train the workforce, and maintain their infrastructure.

### **C. Workforce**

Across the U.S., many industries are challenged to fill positions with qualified people. Blue collar employment in fleet concentration areas is a particular challenge. To help address this, the Navy will look for opportunities at the state and federal levels to obtain funding to invest in training programs in order to grow the pool of available workforce. Private shipyards' ability to provide workforce stability is tied to Navy's ability to predict workload as described above. The *PSI* initiatives will provide opportunities for industry to improve efficiency and invest in their workforce. For public shipyards, the Navy achieved 36,100 full time employees in FY 2019, one year ahead of original plan. To bring new hires up to speed more quickly, the public shipyards have developed an improved training model that gets new hires to the waterfront where they can learn hands-on, under the tutelage of experience journeyman, shortening the time from productive contribution for new employees from up to two years to now under six months.

### **D. Facilities Investment**

The *SIOP* initiatives provide a roadmap of future investments to improve facility infrastructure to support maintenance and modernization work in private and public shipyards. Investments in government facilities to support private sector work (piers and access) are also required and the *PSO* will provide a similar roadmap. The FY 2020 funding request includes \$92 million in FY 2020 that supports the completion of the *SIOP* shipyard infrastructure masterplans, industrial analysis, environmental and historical plans/mitigations, and begins the standard facility designs for the optimized shipyard layout. In FY 2020, there is additional funding for military construction and capital equipment.

## **VI. Conclusion**

Sustaining the 355-ship fleet will require changes to both public and private industrial capability and capacity. Current infrastructure will require update and refurbishment to support modern classes of ships and repair. Likewise, additional dry docks will be needed to address the growing fleet size. Navy and industry partners must create work environments where talented Americans will want to work and contribute to the national defense. This includes investments in updating facilities and capital equipment, and as well as providing that workforce training that is both modern and relevant and compensation commensurate with the skill required to repair Navy ships. Finally, we must avoid feast and famine cycles that erode both the repair industrial base and the underlying vendor supply base. Consistent funding matched to steady demand for work will enable the repair base, public and private, to grow to meet the needs of the 355-ship Navy.

## Appendix 1: Battle Force Fleet Inventory, Availability Induction Schedule, and Major Modernizations

### Maintenance

Table 5 (from the FY 2020 Shipbuilding Plan) shows the projected Battle Force Inventory over the next 30 years, reaching 355 ships in FY 2034.

Fiscal Year	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Aircraft Carrier	11	11	11	11	11	10	10	9	10	10	10	10	10	10	10	10	10	10	10	10	9	10	9	9	9	10	9	9	9	10
Large Surface Combatant	94	92	93	95	94	95	96	100	102	104	107	110	112	115	117	114	109	107	108	105	105	104	106	108	109	107	106	107	109	108
Small Surface Combatant	30	33	33	32	35	35	36	38	41	43	45	47	49	50	52	55	57	58	59	61	62	61	60	57	55	55	54	54	51	50
Attack Submarines	52	53	52	51	47	44	44	42	42	44	46	48	49	51	53	54	56	58	57	58	59	59	61	61	62	63	64	65	66	67
Large Payload Submarines	4	4	4	4	4	4	2	1																						
Ballistic Missile Submarines	14	14	14	14	14	14	14	13	13	12	11	11	11	11	11	11	11	10	10	10	10	11	12	12	12	12	12	12	12	12
Amphibious Warfare Ships	33	34	34	35	36	37	38	37	38	36	36	36	36	38	36	34	35	35	35	37	37	37	36	36	36	36	37	35	35	35
Combat Logistics Force	29	30	31	31	32	32	31	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	31
Support Vessels	34	34	39	41	41	42	43	44	44	44	44	43	44	44	44	45	45	45	44	42	41	41	39	39	39	39	39	39	39	39
<b>Total</b>	<b>301</b>	<b>305</b>	<b>311</b>	<b>314</b>	<b>314</b>	<b>313</b>	<b>314</b>	<b>316</b>	<b>322</b>	<b>325</b>	<b>331</b>	<b>337</b>	<b>343</b>	<b>351</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	<b>355</b>	

**Table 5. Naval Battle Force Inventory**

Table 6 lists the 2018 schedule of depot-level maintenance availability inductions.

Fiscal Year	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Aircraft Carrier	4	5	3	4	5	3	3	2	6	4	2	7	3	3	5	4	2	4	5	3	5	4	3	5	3	3	6	4	3	6
Large Surface Combatant	42	41	35	39	44	43	46	33	47	43	36	54	37	41	52	41	34	54	42	38	54	38	43	49	41	37	52	39	33	43
Small Surface Combatant	13	12	16	11	14	11	14	14	18	18	20	22	23	25	28	27	32	27	32	30	33	27	30	30	28	28	30	30	25	28
Attack Submarines	7	12	7	7	6	8	11	8	14	6	11	8	10	9	6	7	7	8	7	8	9	8	8	10	10	8	8	10	10	11
Large Payload Submarines	1	1	1	1	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ballistic Missile Submarines	2	1	1	1	1	0	1	1	2	1	2	1	0	1	0	3	1	2	0	1	1	0	0	0	0	0	0	1	0	0
Amphibious Warfare Ships	15	14	13	10	9	10	10	13	11	9	15	13	9	16	12	15	19	13	15	23	16	14	23	21	18	26	22	20	24	21
Combat Logistics Force	29	30	31	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Support Vessels	21	20	21	21	21	22	22	23	23	23	23	22	23	23	23	24	24	24	22	22	21	21	21	21	21	21	21	21	21	21
<b>Total</b>	<b>134</b>	<b>136</b>	<b>128</b>	<b>126</b>	<b>132</b>	<b>129</b>	<b>141</b>	<b>127</b>	<b>154</b>	<b>136</b>	<b>141</b>	<b>159</b>	<b>137</b>	<b>150</b>	<b>158</b>	<b>153</b>	<b>151</b>	<b>164</b>	<b>155</b>	<b>157</b>	<b>171</b>	<b>144</b>	<b>160</b>	<b>168</b>	<b>153</b>	<b>155</b>	<b>171</b>	<b>157</b>	<b>149</b>	<b>162</b>

**Table 6. Depot-Level Availability Induction Schedule for Naval Battle Force**

## Modernization

Table 7 lists planned/ongoing major modernizations by class through FYDP.

Type	System/Equipment	
Ballistic Missile Submarine	<ul style="list-style-type: none"> <li>• CCS TI-16/18</li> <li>• LVA</li> <li>• CANES</li> <li>• LPE</li> </ul>	<ul style="list-style-type: none"> <li>• CSRR Inc 1 V(3) &amp; Inc 1 V(4)</li> <li>• Ship Control System OER</li> <li>• Cyber RMF ATO</li> </ul>
Aircraft Carriers	<ul style="list-style-type: none"> <li>• JSF</li> <li>• MQ-25A</li> <li>• eCASS</li> <li>• MK 38</li> <li>• NGSSR</li> <li>• CANES</li> <li>• NTCDL</li> <li>• DCGS-N</li> <li>• NMT</li> <li>• GPNTS</li> <li>• PCMS</li> </ul>	<ul style="list-style-type: none"> <li>• SSEE Inc F</li> <li>• SPN-50 and SYY-1 (ATC)</li> <li>• Cybersecurity Upgrades</li> <li>• Modular Reefer System</li> <li>• SATCC AN/SSC-13</li> <li>• HYDRA Tech Refresh</li> <li>• Steering Control Systems Upgrades</li> <li>• CRDC Block 1</li> <li>• SPY-6(V)2 EASR</li> <li>• SSDS MK 2 Mod 1C/1E</li> <li>• SLQ-32(V)6 SEWIP Block 2</li> </ul>
Attack Submarines	<ul style="list-style-type: none"> <li>• CCS TI-16/20 &amp; 16/22 &amp; 18</li> <li>• LVA</li> <li>• CANES</li> <li>• LWLCCA</li> <li>• ICCP OER</li> <li>• EW &amp; ISIS TI-16/20 &amp; 18</li> <li>• CSRR Inc 1 V(3) &amp; Inc 1 V(4)</li> <li>• ICS Block 1/2 &amp; Block 3/4</li> </ul>	<ul style="list-style-type: none"> <li>• Acoustic Superiority (Machinery and Treatment)</li> <li>• Ship Control System Processor modernization</li> <li>• SSTG DVR Upgrade</li> <li>• SSTG Governor OER</li> <li>• Forward ABT Power Mod</li> <li>• CKT D Block 1/2 and Block 3/4 OER</li> <li>• Propulsor Upgrade</li> <li>• SSTG Reliability Upgrades</li> <li>• Atmosphere Control</li> <li>• Service Life Extension Modernization</li> <li>• Cyber RMF ATO</li> </ul>
Guided Missile Submarines	<ul style="list-style-type: none"> <li>• CCS TI-16/18</li> <li>• LVA</li> <li>• CANES</li> </ul>	<ul style="list-style-type: none"> <li>• LPE</li> <li>• CSRR Inc 1 V(4)</li> <li>• Cyber RMF ATO</li> </ul>
Large Surface Combatants	<ul style="list-style-type: none"> <li>• Aegis B/L9A</li> <li>• SPQ-9B</li> <li>• BMD (DDGs only)</li> <li>• VLS Upgrades</li> <li>• IBNS</li> <li>• Habitability Mods</li> </ul>	<ul style="list-style-type: none"> <li>• SQQ-89(V)15</li> <li>• Machinery Control Upgrades</li> <li>• CEC</li> <li>• SEWIP Blk 2/3</li> <li>• Cybersecurity Upgrades</li> <li>• AMDR w/Aegis B/L 10 (Ft IIA DDGs only)</li> </ul>
Small Surface Combatants	<ul style="list-style-type: none"> <li>• AMDR – Air and Missile Defense Radar</li> </ul>	<ul style="list-style-type: none"> <li>• AMDR – Air and Missile Defense Radar</li> </ul>
Amphibious Warfare Ships	<ul style="list-style-type: none"> <li>• JSF</li> <li>• SSDS</li> <li>• HM&amp;E</li> <li>• ADNS</li> <li>• CANES</li> </ul>	<ul style="list-style-type: none"> <li>• NDDS</li> <li>• SAP-F</li> <li>• ISMT</li> <li>• Lithium Ion Battery Stowage</li> <li>• Troop &amp; MAGTF Armories</li> </ul>

Type	System/Equipment		
	<ul style="list-style-type: none"> <li>• NAB</li> <li>• SATCC</li> <li>• NMT</li> <li>• GBS</li> <li>• Magazine Sprinkling Detection System</li> <li>• DC and Ballast Upgrades</li> <li>• Machinery Control Upgrades</li> </ul>		
Combat Logistics Force	<ul style="list-style-type: none"> <li>• HM&amp;E</li> <li>• CMWD Piping</li> <li>• Lightering at Sea Capability</li> <li>• Navigation &amp; Comms Upgrades</li> <li>• Machinery Controls Upgrades</li> <li>• STREAM Navy Standard</li> <li>• Transmission Replacement</li> </ul>		
Fleet Support	<ul style="list-style-type: none"> <li>• HM&amp;E</li> <li>• Engine Upgrades</li> </ul>		
<p><b>Acronyms:</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>ABT – Automatic Bus Transfer</p> <p>ADNS – Automated Digital Networks System</p> <p>ALIS – Autonomic Logistics Information System</p> <p>AMDR – Air and Missile Defense Radar</p> <p>ATC – Air Traffic Control</p> <p>ATO – Authority to Operate</p> <p>BMD – Ballistic Missile Defense</p> <p>C2P – Command and Control Processor</p> <p>CANES – Consolidated Afloat Network and Enterprise Services</p> <p>CCS – Combat Control System</p> <p>CKT - Circuit</p> <p>CMWD - Countermeasure Washdown</p> <p>Comms – Communications</p> <p>CRDC – Close-In Weapon System (CIWS)/Rolling Airframe Missile (RAM) Defensive Capability</p> <p>CSRR – Common Submarine Radio Room</p> <p>DC – Damage Control</p> <p>DCGS-N – Distributed Common Ground System - Navy</p> <p>DVR- Digital Voltage Regulator</p> <p>EASR – Enterprise Air Surveillance Radar</p> <p>eCASS – Electronic Consolidated Automated Support System</p> <p>GBS – Global Broadcast System</p> <p>GPNTS – Global Positioning, Navigation, and Timing Service</p> <p>HM&amp;E – Hull, Mechanical and Electrical</p> <p>HYDRA – Hierarchical Yet Dynamically Reprogrammable Architecture</p> <p>ICCP – Impressed Current Cathodic Protection</p> </td> <td style="width: 50%; vertical-align: top;"> <p>ICS – Integrated Communications System</p> <p>Inc – Increment</p> <p>ISMT – Indoor Simulated Marksmanship Trainer</p> <p>JSF – Joint Strike Fighter</p> <p>ISIS – Integrated Submarine Imaging System</p> <p>LPE – Low Pressure Electrolyzer</p> <p>LVA – Large Vertical Array</p> <p>LWLCCA – Light Weight Low Cost Conformal Array</p> <p>MAGTF – Marine Air-Ground Task Force</p> <p>Mod – Modification</p> <p>MST – Maritime Surface Terminal</p> <p>NAB – Naval Amphibious Baseline</p> <p>NDDS – Navigation Data Distribution System</p> <p>NGSSR – Next Generation Surface Search Radar</p> <p>NMT – Navy Multiband Terminal</p> <p>NTCDL – Network Tactical Common Data Link</p> <p>OER – Over Excitation Regulator</p> <p>PCMS – Passive Countermeasures System</p> <p>RMF – Risk Management Framework</p> <p>SAP-F – Special Access Program Facility</p> <p>SATCC – Shipboard Air Traffic Control Communications</p> <p>SEWIP – Surface Electronic Warfare Improvement Program</p> <p>SSDS – Ship Self Defense System</p> <p>SSES – Ship’s Signals Exploitation Equipment</p> <p>SSTG – Ship Service Turbine Generator</p> <p>STREAM – Standard Replenishment Alongside Method</p> <p>TI – Technical Insertion</p> <p>(V) – Version</p> </td> </tr> </table>		<p>ABT – Automatic Bus Transfer</p> <p>ADNS – Automated Digital Networks System</p> <p>ALIS – Autonomic Logistics Information System</p> <p>AMDR – Air and Missile Defense Radar</p> <p>ATC – Air Traffic Control</p> <p>ATO – Authority to Operate</p> <p>BMD – Ballistic Missile Defense</p> <p>C2P – Command and Control Processor</p> <p>CANES – Consolidated Afloat Network and Enterprise Services</p> <p>CCS – Combat Control System</p> <p>CKT - Circuit</p> <p>CMWD - Countermeasure Washdown</p> <p>Comms – Communications</p> <p>CRDC – Close-In Weapon System (CIWS)/Rolling Airframe Missile (RAM) Defensive Capability</p> <p>CSRR – Common Submarine Radio Room</p> <p>DC – Damage Control</p> <p>DCGS-N – Distributed Common Ground System - Navy</p> <p>DVR- Digital Voltage Regulator</p> <p>EASR – Enterprise Air Surveillance Radar</p> <p>eCASS – Electronic Consolidated Automated Support System</p> <p>GBS – Global Broadcast System</p> <p>GPNTS – Global Positioning, Navigation, and Timing Service</p> <p>HM&amp;E – Hull, Mechanical and Electrical</p> <p>HYDRA – Hierarchical Yet Dynamically Reprogrammable Architecture</p> <p>ICCP – Impressed Current Cathodic Protection</p>	<p>ICS – Integrated Communications System</p> <p>Inc – Increment</p> <p>ISMT – Indoor Simulated Marksmanship Trainer</p> <p>JSF – Joint Strike Fighter</p> <p>ISIS – Integrated Submarine Imaging System</p> <p>LPE – Low Pressure Electrolyzer</p> <p>LVA – Large Vertical Array</p> <p>LWLCCA – Light Weight Low Cost Conformal Array</p> <p>MAGTF – Marine Air-Ground Task Force</p> <p>Mod – Modification</p> <p>MST – Maritime Surface Terminal</p> <p>NAB – Naval Amphibious Baseline</p> <p>NDDS – Navigation Data Distribution System</p> <p>NGSSR – Next Generation Surface Search Radar</p> <p>NMT – Navy Multiband Terminal</p> <p>NTCDL – Network Tactical Common Data Link</p> <p>OER – Over Excitation Regulator</p> <p>PCMS – Passive Countermeasures System</p> <p>RMF – Risk Management Framework</p> <p>SAP-F – Special Access Program Facility</p> <p>SATCC – Shipboard Air Traffic Control Communications</p> <p>SEWIP – Surface Electronic Warfare Improvement Program</p> <p>SSDS – Ship Self Defense System</p> <p>SSES – Ship’s Signals Exploitation Equipment</p> <p>SSTG – Ship Service Turbine Generator</p> <p>STREAM – Standard Replenishment Alongside Method</p> <p>TI – Technical Insertion</p> <p>(V) – Version</p>
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**Table 7. Battle Force Inventory Major Modernizations by Type Planned for FY20-FY24**

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## Appendix 2: PB-20 Maintenance Funding

Table 8 shows the PB-20 maintenance funding.

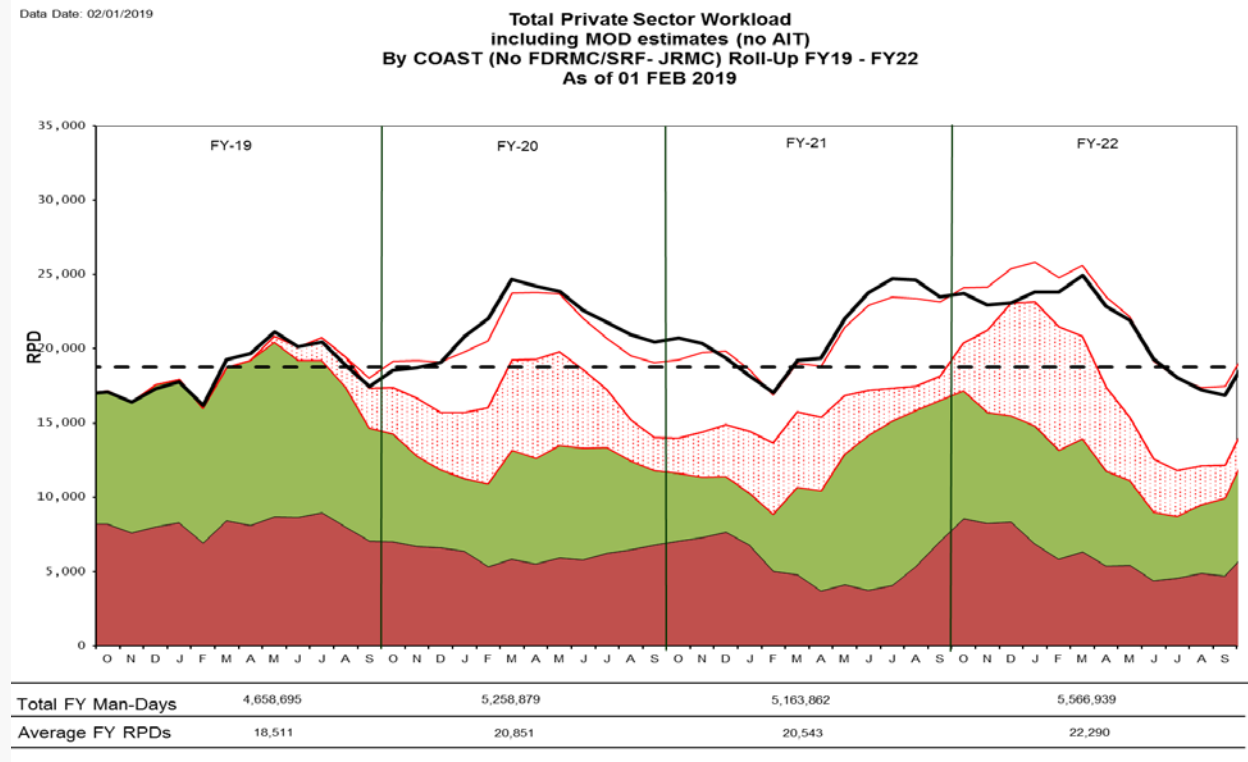
	<b>FY20</b>	<b>FY21</b>	<b>FY22</b>	<b>FY23</b>	<b>FY24</b>	<b>FYDP</b>
<b>Combatant Type</b>	<b>(\$M)</b>	<b>(\$M)</b>	<b>(\$M)</b>	<b>(\$M)</b>	<b>(\$M)</b>	<b>(\$M)</b>
Ballistic Missile Submarine	864.4	650.6	535.5	517.6	535.5	3103.7
Aircraft Carriers	2029.7	1703.2	2040.6	2240.7	2110.5	10124.7
Submarines	3297.8	3232.9	3057.2	3078.3	3077.7	15743.8
Large Surface Combatants	2003.3	1811.9	1650.1	1766.6	2095.6	9327.5
Small Surface Combatants	683.9	791.0	992.5	931.1	1020.2	4418.6
Amphibious Warfare Ships	1380.8	1180.1	1438.7	1434.4	1603.3	7037.3
Mine Warfare	145.8	104.9	79.1	45.8	33.6	409.3
Combat Logistics	360.2	370.3	439.1	436.2	353.3	1959.2
Fleet Support	2.7	2.5	2.6	2.7	2.7	13.4
<b>Total (\$M)</b>	<b>10768.6</b>	<b>9847.4</b>	<b>10235.4</b>	<b>10453.4</b>	<b>10832.4</b>	<b>52137.5</b>

**Table 8. PB-20 Maintenance Funding**

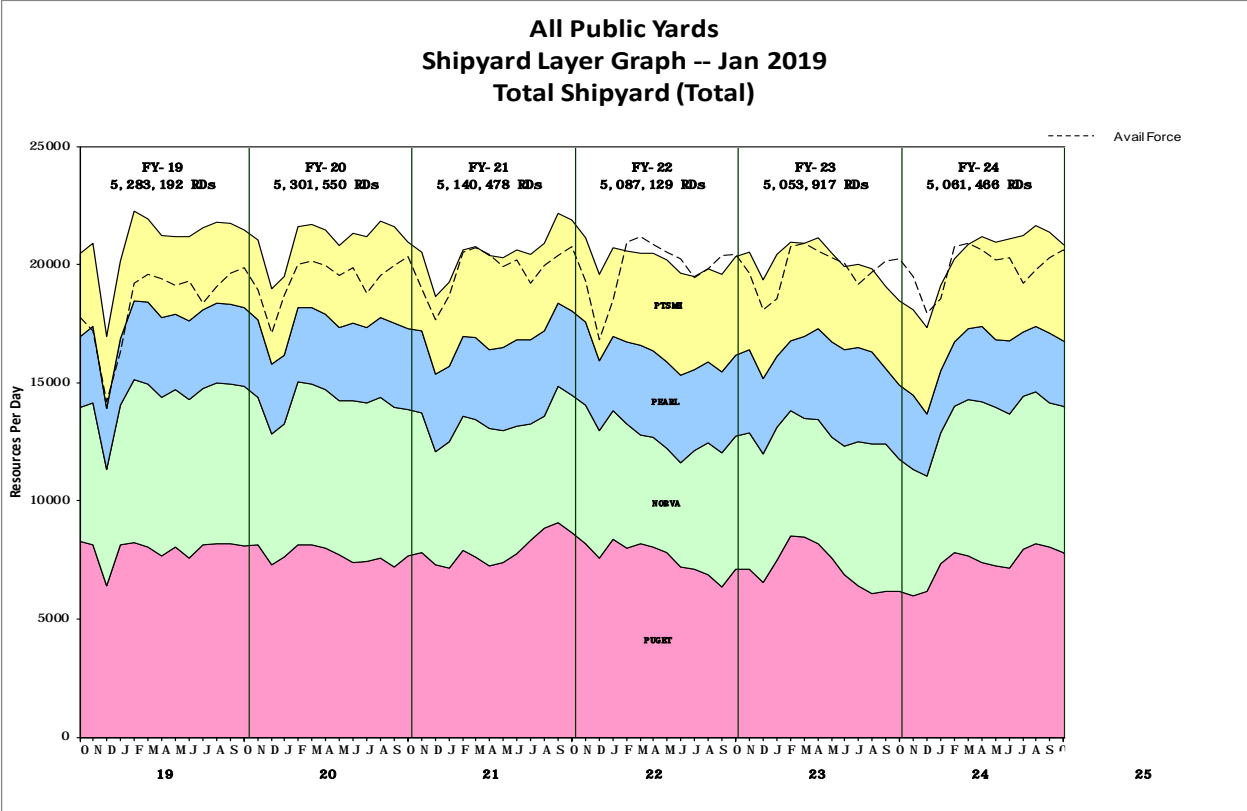


### Appendix 3: Workload at the Private and Public Shipyards

Table 9 and 10 provides private shipyards surface workloads and public shipyard workloads.



**Table 9. Private Shipyard Surface Workload**



**Table 10. Public Shipyard Workload**

## Appendix 4: Acronym List

CG	Guided Missile Cruiser
COMSC	Commander, Military Sealift Command
CONUS	Continental United States
CVN	Multi-purpose Aircraft Carrier, Nuclear-powered
DDG	Guided Missile Destroyer
DoD	Department of Defense
DoN	Department of the Navy
FAST	Fleet Availability Scheduling Team
FY	Fiscal Year
FYDP	Future Years Defense Program
GAO	Government Accountability Office
IMF	Intermediate Maintenance Facility
JFMM	Joint Fleet Maintenance Manual
LCC	Command Ship
LCS	Littoral Combat Ship
LHA	Amphibious Assault Ship (general purpose)
LHD	Amphibious Assault Ship (multi-purpose)
LPD	Amphibious Transport Dock
MCM	Mine Countermeasures Ship
MSC	Military Sealift Command
NAVSEA	Naval Sea Systems Command
NNN	Navy the Nation Needs
NNSY	Norfolk Naval Shipyard
NSY	Naval Shipyard
OSD	Office of the Secretary of Defense
OMN	Operation and Maintenance, Navy
OPNAV	Office of the Chief of Naval Operations
PHNSY	Pearl Harbor Naval Shipyard
PNS	Portsmouth Naval Shipyard
POM	Program Objective Memorandum
PSI	Private Sector Implementation

PSNS	Puget Sound Naval Shipyard
PSO	Private Sector Optimization
RCD	Reactor Compartment Disposal
RMC	Regional Maintenance Center
SIOP	Shipyards Infrastructure Optimization Plan
SLE	Service Life Extension
SSBN	Ballistic Missile Submarine (nuclear-powered)
SSGN	Guided Missile Submarine (nuclear-powered)
SSN	Submarine (nuclear-powered)
SSXN	Large Payload Submarine (nuclear-powered)
T-AGOS	Surveillance Ship
T-AKE	Dry Cargo and Ammunition Ship
T-AO	Fleet Replenishment Oiler
T-AOE	Fast Combat Support Ship
T-ARS	Salvage Ship
T-ATF	Fleet Ocean Tug
T-ATS	Towing, Salvage, and Rescue Ship
T-EPF	Expeditionary Fast Transport
T-ESB	Expeditionary Sea Base
T-ESD	Expeditionary Transfer Dock
TFP	Technical Foundation Paper
USNS	United States Naval Ship
USS	United States Ship