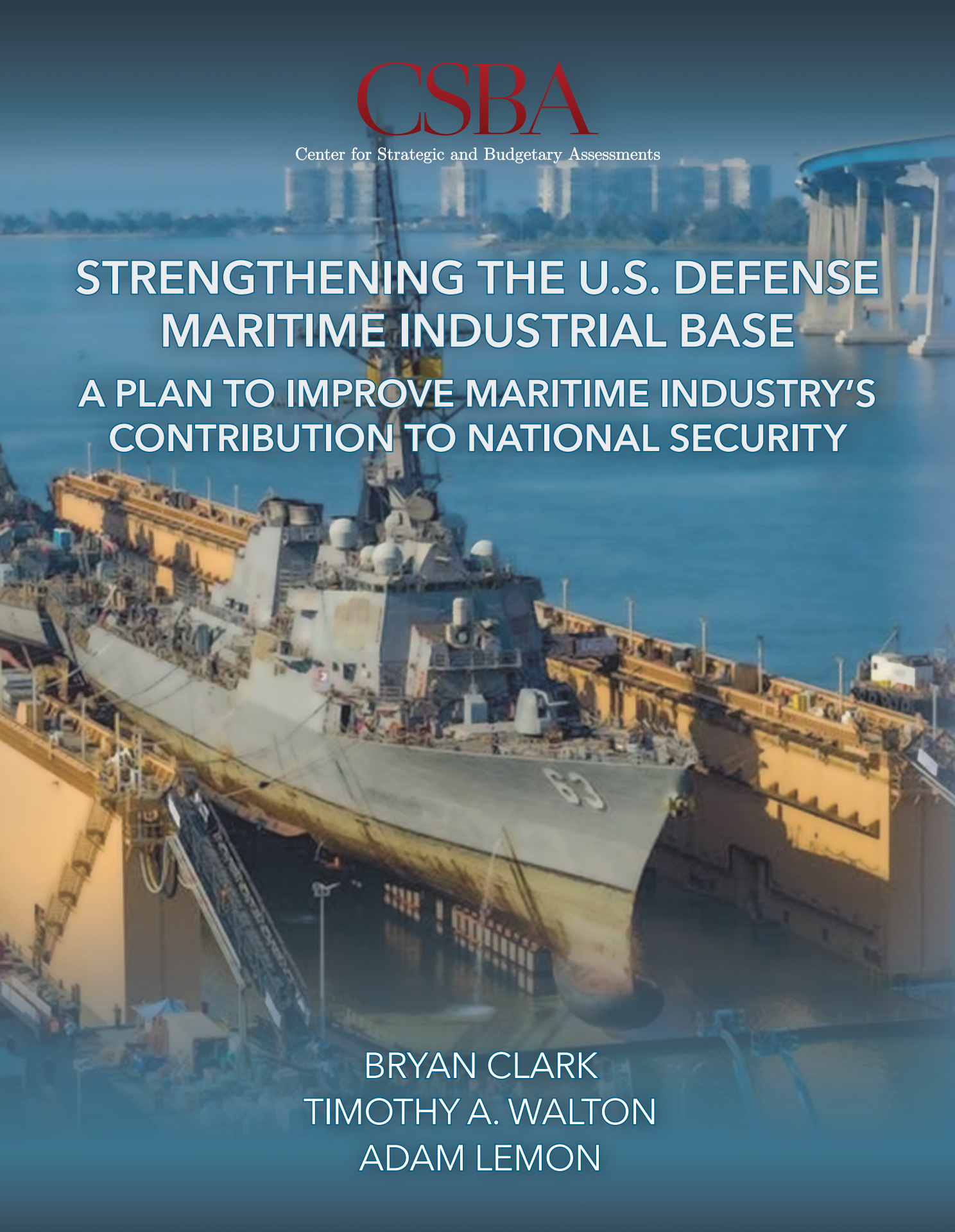

CSBA

Center for Strategic and Budgetary Assessments

STRENGTHENING THE U.S. DEFENSE MARITIME INDUSTRIAL BASE

A PLAN TO IMPROVE MARITIME INDUSTRY'S CONTRIBUTION TO NATIONAL SECURITY

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The Center for Strategic and Budgetary Assessments is an independent, nonpartisan policy research institute established to promote innovative thinking and debate about national security strategy and investment options. CSBA's analysis focuses on key questions related to existing and emerging threats to U.S. national security, and its goal is to enable policymakers to make informed decisions on matters of strategy, security policy, and resource allocation.

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Executive Summary

The U.S. maritime industry is essential to American prosperity and security. Since their nation's founding, Americans have gone to sea for trade, to harvest resources from the oceans, and to advance the country's interests. By building and repairing ships, training mariners, operating shipping networks, and sustaining ports and waterways, the U.S. maritime industry makes possible the economic benefits of access to the sea.

In an era of great power competition, a robust maritime industry, and the policies that support it, are increasingly important to U.S. national security. Private shipyards build and repair U.S. warships, sometimes alongside civilian vessels. U.S. shipping companies and their civilian mariners transport military personnel, equipment, and supplies overseas. And private dredging, salvage, towing, intermodal transport, and harbor services companies ensure the operation of America's military and commercial ports and waterways.

A framework of regulation, law, and government programs governs and shapes the U.S. maritime industry. In the U.S. domestic commercial shipping fleet, the Merchant Marine Act of 1920, also known as the Jones Act, requires ships conducting commerce between U.S. ports to be U.S.-built, U.S., owned, and operated by crews of U.S. citizens or permanent residents. In the international commercial fleet, the Maritime Security Program (MSP) provides stipends to U.S.-flagged ship operators to help cover the higher cost of following U.S. regulations, and Cargo Preference rules require that U.S.-flagged ships carry all DoD and 50 percent of other U.S. government cargoes. Ships participating in MSP are enrolled in the Voluntary Intermodal Sealift Agreement (VISA), which requires participating vessels to be made available for surge sealift operations during wartime or other crises. VISA also includes other vessels from the domestic and international fleets, but they do not receive a stipend.

The maritime industry faces a range of pressures that are not eliminated by support from U.S. government programs and regulations. Uncertain private shipbuilder and repair yard workloads and a competitive recruiting environment raise costs and lower revenues for commercial U.S. maritime businesses. These challenges are exacerbated by high regulatory compliance expenses and subsidized foreign competition to undermine the long-term viability, innovativeness, and capacity of the U.S. maritime industrial base.

To effectively compete, the United States will need to break with maritime strategies that assume commercial and national security contributions of the maritime industry are largely distinct. Instead, the United States should adopt a new approach that recognizes the inherent linkage between the two and fosters a healthier commercial industry that can support U.S. national security. A new comprehensive strategy is all the more important given the growing threat posed by Chinese maritime power, the urgent need for new approaches to shipbuilding and the repair of U.S. government ships, and the need for viable solutions for strategic sealift gaps. In addition to retaining today's framework of regulations such as the Jones Act, MSP, VISA, and Cargo Preference, the U.S. government should pursue the following reforms:

Create and implement a U.S. National Maritime Strategy. The U.S. government should develop, release, and implement a comprehensive national strategy to grow the U.S. maritime industrial base and increase its competitiveness. In contrast to preceding maritime strategies that focused on Navy, Marine Corps, and Coast Guard operations, the national maritime strategy would address how the sea services, shipping companies, shipyards, and broader maritime industry would support U.S. national interests.

Restore the U.S. Merchant Marine. The MSP should be expanded by stabilizing the annual stipend and increasing the number of participating ships to replace aging vessels of the MARAD Ready Reserve Force and MSC Surge Fleet. As part of the expansion, specialized ships and tankers should be brought under U.S. flag via MSP-like programs such as the proposed Tanker Security Program (TSP) or a revision of the current MSP. To support the competitiveness of ships in the MSP, government cargo should be increased by sourcing a greater share of defense fuel from U.S. refineries and better enforcement of existing Cargo Preference regulations.

Shipping operators are reticent to operate under U.S. flag due to higher costs and a resulting lack of competitiveness that reduces cargo throughput. Outdated taxes and regulations—especially related to mariner wages and repair duties—should be reformed to help reduce expenses. To improve efficiency and encourage shipping, the government should also fund enhancements to intermodal links and deter cargo diversion. And because shipping companies will need more sailors to operate a larger U.S.-flagged fleet, merchant marine recruiting and retention should be improved through new initiatives to ease of credentialing and licensing and establishment of a Merchant Marine Reserve.

Strengthen the shipbuilding and repair industry. The U.S. government should promote stability for U.S. shipbuilding and repair by better integrating commercial and government construction and maintenance efforts. The government should coordinate its ship construction with projected commercial orders and return to multi-ship maintenance contracts to provide repair yards more predictability, complemented with loan guarantees and grants to improve private shipyard infrastructure and work processes. The U.S. government should further support the shipbuilding industrial base by identifying and investing in critical shipbuilding suppliers that depend primarily on episodic government orders and lack the resilience to weather procurement gaps or budget uncertainty.

Implement a National Fleet approach to solving strategic sealift gaps. Efforts to implement a maritime strategy, restore the U.S. Merchant Marine, and strengthen the shipbuilding and repair industry coalesce in improving U.S. strategic sealift.

Meeting the Department of Defense's (DoD) strategic sealift requirement of 86 fuel tankers will require a major shift in policy. Instead of hoping sufficient foreign-flagged tankers will be available during a crisis or contingency, the U.S. government should grow the fleet of U.S.-flagged government and commercial tankers by increasing the amount of defense fuel sourced from U.S. refineries and creating the TSP or expanding the existing MSP.

DoD is likely unable to meet its dry cargo and munitions sealift requirements due to low government surge fleet readiness and a shortfall of mariners to operate the ships. The U.S. government should transition to an integrated approach that leverages the best attributes of the government and commercial fleets to meet cargo sealift requirements. This study's proposed new model undertakes four primary changes from the current cargo fleet:

1. Replace the government-owned Military Sealift Command (MSC) Prepositioning Fleet with Maritime Administration (MARAD)-chartered commercial ships;
2. Recapitalize and expand the MSC Surge Fleet with former Prepositioning Fleet ships and new vessels with special capabilities like cranes or petroleum distribution systems;
3. Expand the MSP to replace today's MARAD Ready Reserve Force; and
4. End the MARAD Ready Reserve Force and reassign the MSC Surge Fleet to MARAD.

This approach would better use the overall U.S. commercial and military fleets to support defense strategy while improving the reach and competitiveness of the U.S. maritime industry. It would meet DoD's requirements and provide U.S. shipyards with a stable rate of work to avoid shipbuilding "boom and bust" cycles. This plan would also create needed sealift capacity faster, and with greater reliability and lower costs than current U.S. government approaches.

The nation's strategic sealift challenge is representative of the broader challenges facing the defense industrial base. The U.S. government can continue misallocating increasingly scarce funds on a flawed model. Or, guided by a new national maritime strategy, the nation can adopt a whole-of-society approach to cultivating a vibrant maritime industrial base that spurs innovation and enhances American prosperity and security.

CHAPTER 1

Introduction: Today's U.S. Maritime Industry

The United States has always been a maritime nation. Since their nation's founding, Americans have gone to sea for trade, to harvest resources from the oceans, and to advance the country's interests. A robust domestic maritime industry is essential to support these efforts. By building and repairing ships, training mariners, operating shipping networks, and sustaining ports and waterways, the U.S. maritime industry makes possible the economic benefits of access to the sea.

The U.S. maritime industry is also a key contributor to U.S. national security. Private shipyards build and repair U.S. warships, sometimes alongside civilian vessels. U.S. shipping companies and their civilian mariners transport military personnel, equipment, and supplies overseas. And private dredging, salvage, towing, intermodal transport, and harbor services companies ensure the operation of America's military and commercial ports and waterways. In combination with U.S. government fleets and public shipyards, these commercial organizations form the Defense Maritime Industrial Base (DMIB).

The national security contributions of the DMIB are part of the larger defense industrial base (DIB), comprising the companies, universities, military repair depots, policy research organizations, and government or industry laboratories that develop, assess, and maintain U.S. military capabilities. The U.S. DIB arguably emerged before America's founding with the first domestic weapon and transportation manufacturers. Eventually the DIB created many of the 20th century's most important technologies, including the Internet, satellite navigation, nuclear energy, and jet aircraft.

The DIB and DMIB today face a range of external pressures and internal challenges that undermine their long-term viability, innovativeness, and capacity to support future military operations. Some of these factors, such as unstable government demand or higher regulatory compliance costs, could be addressed with new or revised U.S. government policies and

programs. Others, like subsidized foreign competition or a tight employment market, can only be mitigated by government initiatives. This report describes the DMIB and the challenges experienced by its members, and it proposes solutions to promote the health of the U.S. maritime industrial base so it can continue contributing to U.S. national security.

The DMIB employs hundreds of thousands of mariners, tradespeople, technicians, and laborers across the United States in the following commercial and government sectors:[1]

- The U.S.-flagged domestic fleet that carries goods and materials between U.S. ports and conducts fishing or energy exploration missions in America's territorial waters and Exclusive Economic Zone (EEZ);
- The U.S.-flagged international fleet that transports U.S. commercial, military, and civilian cargoes around the world;
- The U.S. government fleet of active Military Sealift Command (MSC) ships, as well as inactive vessels in the MSC Surge Fleet and MARAD Ready Reserve Force. The Department of Defense (DoD) depends on these ships, combined with appropriate vessels of the U.S. domestic and international fleets, to provide sealift for war or other contingencies;
- Public and private shipbuilding and ship repair yards, their suppliers, and support contractors;
- Towing, salvage, and dredging operators and companies that maintain port infrastructure and navigation aids; and
- Merchant Mariners, their training academies and schools, and the unions that manage and support them.

The U.S. commercial maritime industry is governed by an integrated set of U.S. government laws and regulations that include the Merchant Marine Act of 1920, the Maritime Security Program (MSP), and Cargo Preference requirements.[2] These policies help support elements of the U.S. commercial maritime industry that are needed for U.S. national security, but that may not be able to compete effectively with cheaper foreign alternatives benefitting from government subsidies, non-tariff barriers to trade, and less-stringent regulation. Components of the DMIB and their status are detailed below. The events that led to today's DMIB are described in Chapter 2.

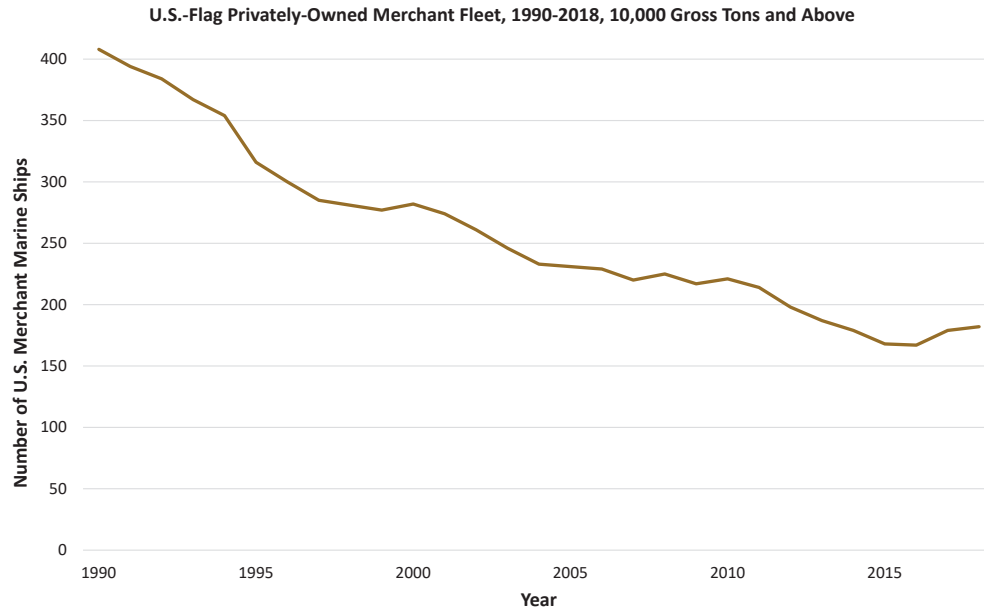
1 U.S. Navy League, *2019-2020 Navy League of the United States Maritime Policy Statement* (Arlington, VA: Navy League of the United States, 2019), p. 33, https://www.navyleague.org/file/programs/legislative-affairs/Maritime-Policy-2019-2020.pdf.

2 Mark Buzby, "Statement Before the Committee On Commerce, Science, and Transportation Subcommittee On Surface Transportation And Merchant Marine Infrastructure, Safety And Security United States Senate," April 24, 2018, available at https://www.commerce.senate.gov/services/files/2826BE9C-03B9-4246-BC96-1E68AAE3985E.

U.S. Commercial Fleets

The U.S.-flagged commercial shipping industry, or Merchant Marine, is composed of vessels in the domestic fleet that operate between U.S. ports and oceangoing ships in the international fleet that move material, passengers, or cargo between the U.S. and other countries. The two fleets support different businesses and maritime operations, which impacts their size and composition. The international fleet is focused on transoceanic shipping and uses mostly large cargo, container, and passenger ships. The domestic fleet includes a much larger proportion of smaller vessels such as fishing trawlers, dredging ships, coastal cargo carriers, barges, and tugboats that operate along the U.S. coast, the Great Lakes, and inland waterways. Due to improving efficiency and competitive pressures, the number of large ships in both fleets declined during past three decades, as shown in Figure 1.

FIGURE 1: NUMBER OF U.S. MERCHANT MARINE SHIPS



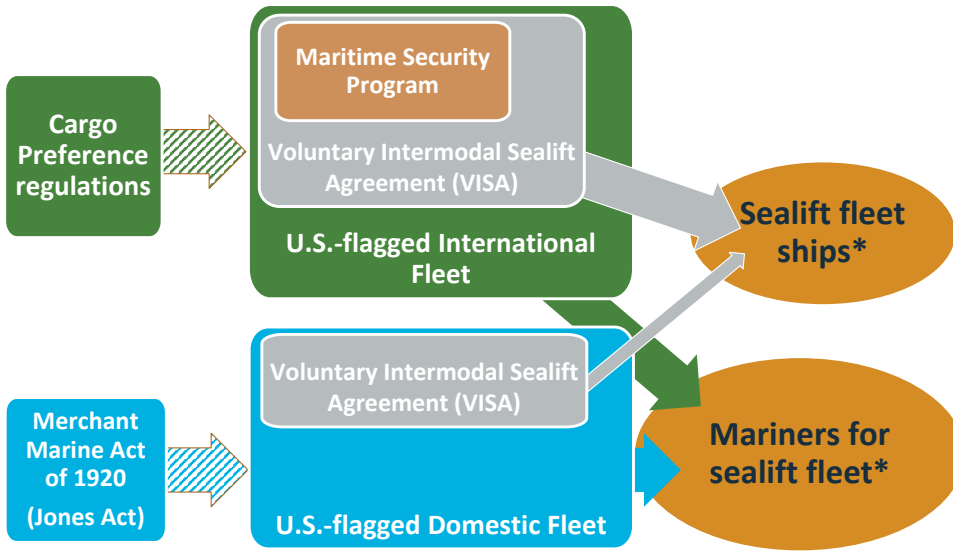
The U.S.-flagged privately owned fleet of large vessels (more than 10,000 gross tons) shrank during the last three decades due to a combination of competition and government policies. U.S. Maritime Transportation System National Advisory Committee (MTSNAC), *Maritime Workforce Working Group Report* (Washington, DC: MARAD, 2017), p.5.

The U.S. domestic and international commercial fleets both support U.S. national security, but in different ways that are shaped by their business models and the regulatory and legal frameworks under which they operate. For example, the U.S.-flagged international fleet provides large, oceangoing ships and crews that could be used to move U.S. military forces, equipment, and supplies during wartime or other contingencies. The Maritime Security Program (MSP) provides a stipend to U.S.-flagged international fleet vessels which, combined with requirements that U.S. government cargo be carried on U.S.-flagged ships, helps offset the higher

cost of operating under U.S. regulations.[3] Ship operators participating in MSP agree to make their vessels available for government service during surge sealift operations through the VISA program. Other ships from the domestic and international fleets participate in VISA, although shipping companies are not compensated for joining the program.[4] The equivalent of VISA for tankers is the Voluntary Tanker Agreement.[5]

The U.S.-flagged domestic fleet is partly a creation of commerce regulations since 1789 and Section 27 of the 1920 Merchant Marine Act, also known as the Jones Act, which mandate that ships operating between U.S. ports be U.S.-flagged, -built, -crewed, and -owned. As it is actively engaged in domestic commercial activities, the domestic fleet mostly provides off-duty mariners that can operate activated government-owned sealift vessels or supplement crews on international fleet ships during wartime or contingency surge sealift operations. Figure 2 shows how the MSP, Cargo Preference regulations, VISA, and Merchant Marine Act contribute to surge sealift operations during contingencies. The national security contributions of both fleets are detailed further below.

FIGURE 2: U.S. MERCHANT MARINE SUPPORT OF U.S. GOVERNMENT SURGE SHIPPING REQUIREMENTS



The U.S. Merchant Marine supports U.S. government surge shipping requirements using ships and mariners from the domestic and international fleets.
*Government-owned sealift ships are normally used for initial surge of shipping for an overseas contingency. Commercial sealift ships are normally used for sustainment of overseas operations because they have longer lead times than government-owned sealift ships. The inability of government-owned ships to quickly activate during recent exercises, however, calls that assumption into question.

3 U.S. Maritime Administration (MARAD), "Maritime Security Program," U.S. Department of Transportation (DOT), August 6, 2019, available at https://www.maritime.dot.gov/national-security/strategic-sealift/maritime-security-program-msp.

4 MARAD, "Voluntary Intermodal Sealift Agreement (VISA)," DOT, available at https://www.maritime.dot.gov/national-security/strategic-sealift/voluntary-intermodal-sealift-agreement-visa.

5 MARAD, "Renewal of the Voluntary Tanker Agreement Program; Agreement Development Proposal," Federal Register, November 1, 2019, available at https://www.federalregister.gov/documents/2019/11/01/2019-23908/renewal-of-the-voluntary-tanker-agreement-program-agreement-development-proposal.

U.S. domestic fleet

Under the Jones Act, commerce between U.S. ports must be conducted by vessels that are U.S.-built and -flagged, owned by U.S. citizens, and crewed by U.S. citizens or permanent residents. Today the Jones Act-compliant U.S. domestic fleet consists of approximately 40,000 vessels, 99 of which are large oceangoing tankers or cargo carriers.[6]

The Jones Act was originally implemented in the wake of the First World War to sustain U.S. shipbuilding and repair capability and ensure that the U.S. merchant fleet was available to carry personnel and material overseas during military conflicts or other emergencies. Shipping capacity had been a challenge for the U.S. government during the war because the U.S.-flagged merchant fleet was small and suffered significant losses to German attacks. Foreign-flagged cargo and passenger ships were unavailable because they returned home at the start of the conflict to support their nation's war effort.[7]

The benefits of the Jones Act evolved over the subsequent years. Today, the domestic fleet provides the largest source of merchant mariners for U.S. surge sealift operations, supports shipbuilders that also construct government vessels, ensures the maintenance of U.S. waterways and shipping lanes, and helps reduce the potential of foreign mariners illegally entering the United States. During a crisis, the domestic fleet would be an important source of container shipping capacity for U.S. military surge sealift via the VISA program. The focus of the fleet, however, would be to continue supporting commercial trade within the U.S. economy, including continuing to move cargo between the Continental United States (CONUS) and U.S. bases across the Pacific Ocean such as Alaska, Hawaii, or Guam.

Providing reserve merchant mariners. The 3,380 mariners that operate large, oceangoing ships in the U.S. domestic fleet constitute about 29 percent of the overall number MARAD estimates would be needed to operate the U.S. surge sealift fleet during wartime or another contingency. Because these sailors generally receive six months of leave a year, there are two to three mariners associated with each seagoing billet. Within the limits of their qualifications, the one to two off-duty mariners per position in the domestic fleet could be recruited to operate inactive U.S. government ships in the MARAD Ready Reserve Force or MSC's prepositioning and surge fleets.[8]

6 MARAD, "Fleet Statistics," https://www.marad.dot.gov/resources/data-statistics/. This number does not include the millions of small recreational and fishing boats registered in the United States.

7 Transportation Institute, "The History of the Maritime Industry," available at https://transportationinstitute.org/know-our-industry/maritime-history/.

8 U.S. MTSNAC, *Maritime Workforce Working Group Report*, p.28

Sustaining small shipbuilders. The Jones Act's requirement that ships operating between U.S. ports be U.S.-built helps support the U.S. shipbuilding industry and ensures capacity is available for construction of smaller U.S. government ships. As noted above, less than 100 of the 40,000 domestic fleet ships are large, oceangoing ships; therefore, the shipyards supported by the Jones Act are generally those that build smaller commercial vessels.[9]

The shipyards that build small Jones Act fleet ships are not able to build large combatant ships such as submarines, destroyers, and amphibious ships, which are constructed at specialized shipyards that build government vessels almost exclusively.[10] The U.S. government, however, also needs smaller or noncombatant military, research, and law enforcement ships. Unlike warships, which are constructed near-continuously, smaller and noncombatant government ships such as Coast Guard offshore patrol cutters, Navy salvage tugs, or National Oceanographic and Atmospheric Administration (NOAA) research ships are only built episodically. If shipyards specialized in these smaller or noncombatant government ships, they would not have a continuous demand and would be unlikely to stay in business. The Jones Act's requirements provide an additional demand for these shipyards to sustain them between government orders.

Maintaining waterways and shipping lanes. Containers, dry cargoes, and petroleum products are often carried across the United States by ship because it is usually cheaper than the transportation and handling needed to move material by truck or train car. The lower cost of shipping derives in part from the network of navigable coastal waterways and rivers in the United States that reach nearly every significant U.S. population center. These waterways are maintained by dredgers and salvage operators, such as the one shown in Figure 3, that keep clear more than 400 ports and 25,000 miles of navigation channels throughout the United States.[11] A domestic dredging industry prevents the United States from depending on foreign companies to dredge its dozens of naval facilities, potentially opening up opportunities for sabotage or the depositing of underwater surveillance equipment.

9 Of these 40,000 vessels, about 8,000 are unpowered barges. MARAD, Office of Policy and Plans, "Consolidated Fleet Summary and Change List," DOT, January 29, 2019, https://www.maritime.dot.gov/sites/marad.dot.gov/files/oictures/Consolidated%20Summary_20190129.pdf.

10 For the purposes of this study, "combatant ships" are those that are counted as part of the U.S. Navy Battle Force; see Secretary of the Navy, "General Guidance for the Classification of Naval Vessels and Battle Force Ship Counting Procedures," *USNI News*, June 14, 2016; "Large" ships for the purposes of this study are ships larger than approximately 3,000 tons. Of the seven shipyards building Navy combatant ships, only one, General Dynamics, North American Steel and Shipbuilding Company (NASSCO), builds commercial vessels also. Commercial orders form less than about 1/4 of GD-NASSCO's business.

11 U.S. Army Corps of Engineers, "Dredging Operations," *U.S. Army Corps of Engineers Mobile District*, available at https://www.sam.usace.army.mil/Missions/Civil-Works/Navigation/Dredging-Operations/.

FIGURE 3: SHIP DREDGING NORFOLK HARBOR SHIP CHANNEL WITH USS PELELIU (LHA-5) IN BACKGROUND

Photo courtesy of Council for Dredging and Marine Construction Safety.

Reducing threat of illegal entry into United States. Hundreds of foreign-flagged and crewed ships call on large U.S. ports every day and are essential to America's economy. The large ports that move international shipments, however, are designed and staffed to enforce immigration and customs requirements. Smaller ports along U.S. inland lakes and waterways are not generally equipped to enforce these regulations.[12]

The requirement that ships in the domestic fleet be U.S.-flagged and operated by crews of U.S. citizens or permanent residents reduces the likelihood foreign ships and mariners will illegally gain access to America's inland waterways and associated infrastructure. Although geography limits how far inland large foreign-flagged ships would be able to travel, without the Jones Act's requirements, foreign companies could buy domestic carriers that operate smaller vessels and barges that ply U.S. rivers and intercoastal waterways.

Securing U.S. shipping lanes. The Jones Act's requirements also apply to shipping between the contiguous United States and overseas territories and states, including Alaska, Hawaii, and Puerto Rico. Mandating that commercial ships moving between these areas be U.S.-flagged lessens the ability of adversaries to interfere with the integrity of states' and territories' commercial links to CONUS. It guards against the ability of China—with the world's largest merchant marine and global port management system—to take over shipping to U.S. territories and gain local influence during peacetime, only to threaten or deny shipping to CONUS during a crisis or conflict.

12 U.S. Customs and Border Protection. "Locate a Port of Entry," available at https://www.cbp.gov/contact/ports.

U.S. international fleet

The U.S.-flagged international fleet carries commercial cargo and bulk material around the world in competition with foreign-flagged carriers; it also transports most U.S. government cargoes overseas. During emergencies, oceangoing U.S.-flagged ships are essential to transporting U.S. military forces and equipment or supporting disaster response. For example, the U.S. international commercial fleet provided substantial portions of the sealift required to sustain American forces once they had been deployed during the First Gulf War. They also moved the overwhelming majority of dry cargo sustainment sealift for Operations Enduring Freedom and Iraqi Freedom between 2008 and 2011.[13] Today, the U.S.-flagged international fleet comprises 87 ocean-going vessels, considerably fewer than nearly 200 vessels at the end of the Cold War, though relatively similar in terms of total tonnage.[14]

Under current U.S. Cargo Preference regulations, all military cargo and 50 percent of U.S. government civilian cargo are required to be transported on U.S.-flagged vessels, provided a U.S. vessel is available and charges a reasonable rate.[15] The rates paid by the federal government to ship cargo on a U.S. vessel are generally higher than shipping on a foreign vessel, which helps offset the higher expenses associated with operating under U.S. flag. Government cargoes have decreased in volume by more than half since 2004, which has placed downward pressure on the profitability and viability of the U.S.-flagged internationally trading fleet and, by extension, contributed to a decline in its size.[16]

Most ships of the U.S. international fleet are also part of the MSP, which today includes 60 vessels. In exchange for an annual stipend of approximately $5 million per ship, companies participating in MSP ensure DoD has access to U.S.-flagged vessels, their associated intermodal logistics networks, and on- and off-duty mariners.[17] In combination with Cargo Preference rules that provide access to higher-priced government cargoes, the MSP stipend helps offset the higher cost of operating U.S.-flagged ships compared to foreign-flagged vessels that do not have the same safety, tax, labor cost, or regulatory requirements.[18]

13 Marge Holtz, "Sealift for Operation Iraqi Freedom is No Small Thing," Maritime Sealift Command, March 2, 2004, available at https://www.msc.navy.mil/publications/pressrel/press04/press07.htm.

14 DOT, "Number and Size of the U.S. Flag Merchant Fleet and Its Share of the World Fleet," U.S. Bureau of Transportation Statistics, available at https://www.bts.gov/content/number-and-size-us-flag-merchant-fleet-and-its-share-world-fleet, accessed January 27, 2020.

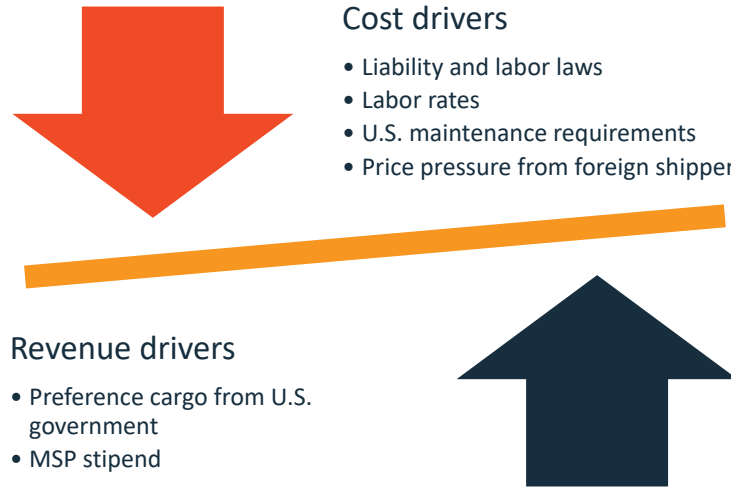
15 DOT, "Cargo Preference: Government Cargo. U.S. Vessels. Security in the International Market," MARAD, December 11, 2019, available at https://www.maritime.dot.gov/ports/cargo-preference/cargo-preference.

16 Thomas Melito, *International Food Assistance: Cargo Preference Increased Food Aid Shipping Costs; Benefits Remain Unclear* (Washington, DC: General Accountability Office, 2017), available at https://www.gao.gov/assets/690/687836.pdf.

17 U.S. MTSNAC, *Maritime Workforce Working Group Report*, p.27

18 MARAD, "Maritime Security Program."

FIGURE 4: U.S. INTERNATIONAL FLEET COST AND REVENUE DRIVERS



The U.S. international fleet depends on a combination of MSP stipends and higher-priced U.S. government cargo to offset the higher cost of operating under U.S. Flag.

More than 90 percent of cargo moved by the U.S. Transportation Command during peacetime and crisis travels by sea.[19] The availability of oceangoing U.S.-flagged ships reduces DoD's reliance on foreign ships and crews. During Operation Desert Storm, in which the United States relied heavily on chartering foreign vessels, the crews of 13 foreign-flagged ships refused to go into a war zone and deliver their cargo. Not a single American crew refused.[20] This potential challenge would be exacerbated during a confrontation with China, whose government and corporations own the world's largest commercial shipping fleet.[21]

U.S. Government Fleet

The U.S. government owns and operates thousands of ships and watercraft, mostly within the DoD, Department of Transportation (DOT), Department of Commerce, and Department of Homeland Security. Almost all of these vessels have a direct or indirect national security purpose or contribution. Construction and maintenance of U.S. government vessels are funded and managed by their host agencies, and the work is done by commercial or private shipbuilding and repair yards. The demand for government ship construction and maintenance is often uneven due to the relatively small number of ships procured, their decades-long service lives, and the budget constraints experienced by government agencies.

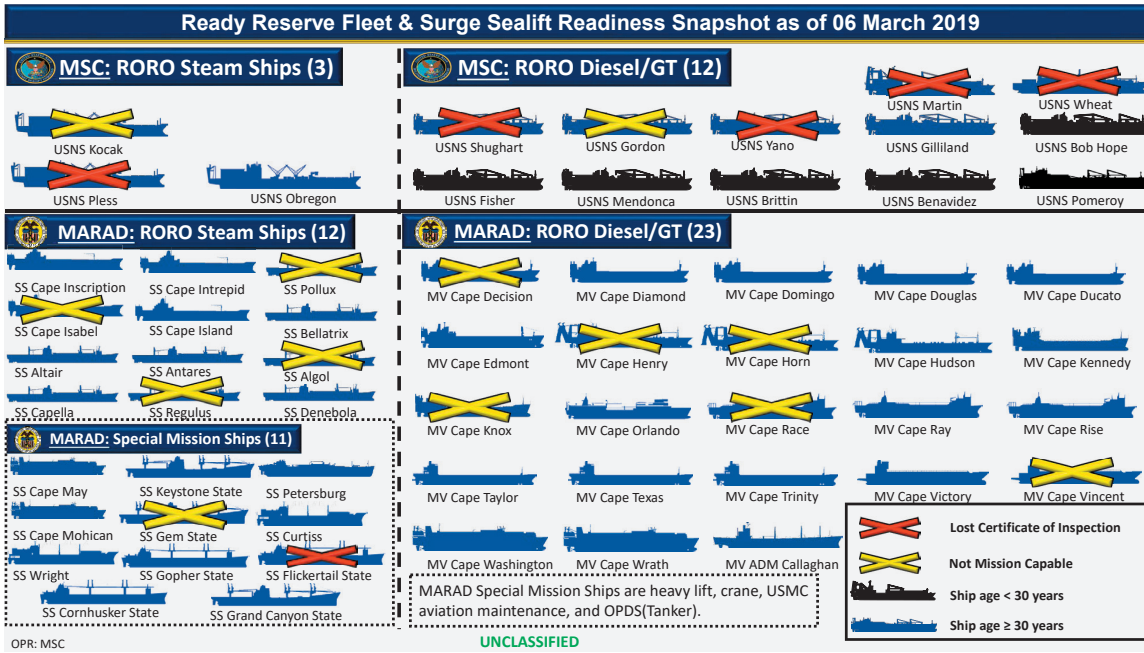
19 David Larter, "Here's every ship activated for TRANSCOM's massive sealift surge, and what they do," *Defense News,* September 21, 2019.

20 Office of Management and Budget, "Maritime Security Program Assessment," Program Code 10002252, 2004, Section 4.4, http://www.whitehouse.gov/omb/expectmore/detail/10002256.2004.html.

21 United Nations Conference on Trade and Development, "Merchant Fleet," UNCTAD 2019 Handbook of Statistics, accessed January 27, 2020, available at https://stats.unctad.org/handbook/MaritimeTransport/MerchantFleet.html.

In addition to creating a demand for commercial construction and repair, U.S. government ships contribute alongside commercial carriers in providing sealift for military operations and other overseas contingencies. DoD tries to utilize commercial U.S.-flagged ships from the international and domestic fleets first for sea transport activities. However, in major contingencies, DoD will mobilize the MARAD Ready Reserve Force's 46 vessels and the 15 vessels of MSC's surge fleet of Fast Sealift (FSS) and Large Medium-Speed Roll-on/Roll-off (LMSR) ships to conduct surge sealift, or the massive initial movement of equipment and supplies into theater. This will be followed by the use of U.S. flag commercial ships to conduct sustainment sealift, or the continuous movement of supplies and equipment to American forces to support ongoing operations. If needed, where sufficient chartered U.S.-flagged ships are unavailable for sustainment sealift, DoD will also charter foreign-flagged ships.[22]

FIGURE 5: THE U.S. GOVERNMENT SEALIFT FLEET IS AGING AND INCREASINGLY UNAVAILABLE FOR SERVICE ON SHORT NOTICE



Salvatore R. Mercogliano, "Suppose There Was a War and the Merchant Marine Didn't Come?" *USNI Proceedings*, January 2020.

U.S. government ships have both advantages and disadvantages compared to their commercial counterparts. Fundamentally, because they are government-owned, MARAD and MSC ships do not have competing commercial demands and should be available for government operations when needed. Being government-owned, however, places the burden of buying and maintaining ships on government agencies that may not be able to afford them—especially as the ships get older and more expensive to maintain.

22 Bradley Martin and Roland Yardley, *Approaches to Strategic Sealift Readiness* (Santa Monica, CA: RAND Corporation, 2019), pp. ix-x.

The ships of today's MARAD Ready Reserve Force are 45 years old on average, including several ships using steam propulsion, which is no longer seen in commercial fleets.[23] The age of today's government fleet contributes to increased maintenance costs, adds to the difficulty in finding crews to operate obsolete technology, and increases the likelihood ships may be unable to mobilize in the required period. Most inactive MARAD and MSC ships are in a reduced operating status from which they should be able to operate within five to ten days, also called ROS-5 or ROS-10. During the most recent Turbo Activation, U.S. Transportation Command found that, of the 61 ships in the government sealift fleet, only 39 were ready for tasking. Of the 32 activated from that group, nine had material deficiencies that would preclude them making a transoceanic transit.[24]

The other major difference between commercial and government ships is crewing. Whereas chartered commercial ships include their crews, MARAD Ready Reserve Force and MSC surge ships are inactive and require mariners from the U.S. domestic and international fleets to operate them. These mariners are often off-duty from their commercial shipping position, which limits how long a surge operation could be sustained. After approximately six months, mariners may need to return to their commercial jobs.[25] In a major conflict, hardship and personnel losses may also require crew rotation or replacement.

Meeting surge sealift demands. Even if all the MSC Surge Fleet and MARAD Ready Reserve Force ships are able to activate, DoD may fall short of the cargo capacity it needs for potential conflict scenarios. As shown in Figure 6, DoD may need to charter approximately 500,000 square feet of additional U.S. or foreign-flagged Roll-On/Roll-Off (RO/RO) ship cargo capacity to meet the needs of a future large-scale operation overseas.

DoD's RO/RO capacity deficit is only about 3 percent of the overall requirement. The U.S. military has a much greater shortfall in terms of tanker capacity. DoD only has access to two government-owned MSC tankers, five long-term MSC charters, and two tankers via the Maritime Security Program; these tankers would only address 10 percent of DoD's surge fuel transport requirement.[26] If DoD can access the 46 militarily useful tankers in the domestic fleet and use other U.S.-flagged tankers that are not well-suited for military fuel

23 Mark H. Buzby, "State of the Mobility Enterprise," Maritime Administrator, DOT, MARAD, Statement Before the Committee on Armed Services Subcommittee on Seapower and Projection Forces and Subcommittee on Readiness, U.S. House of Representatives, March 7, 2019, available at https://www.transportation.gov/testimony/state-mobility-enterprise.

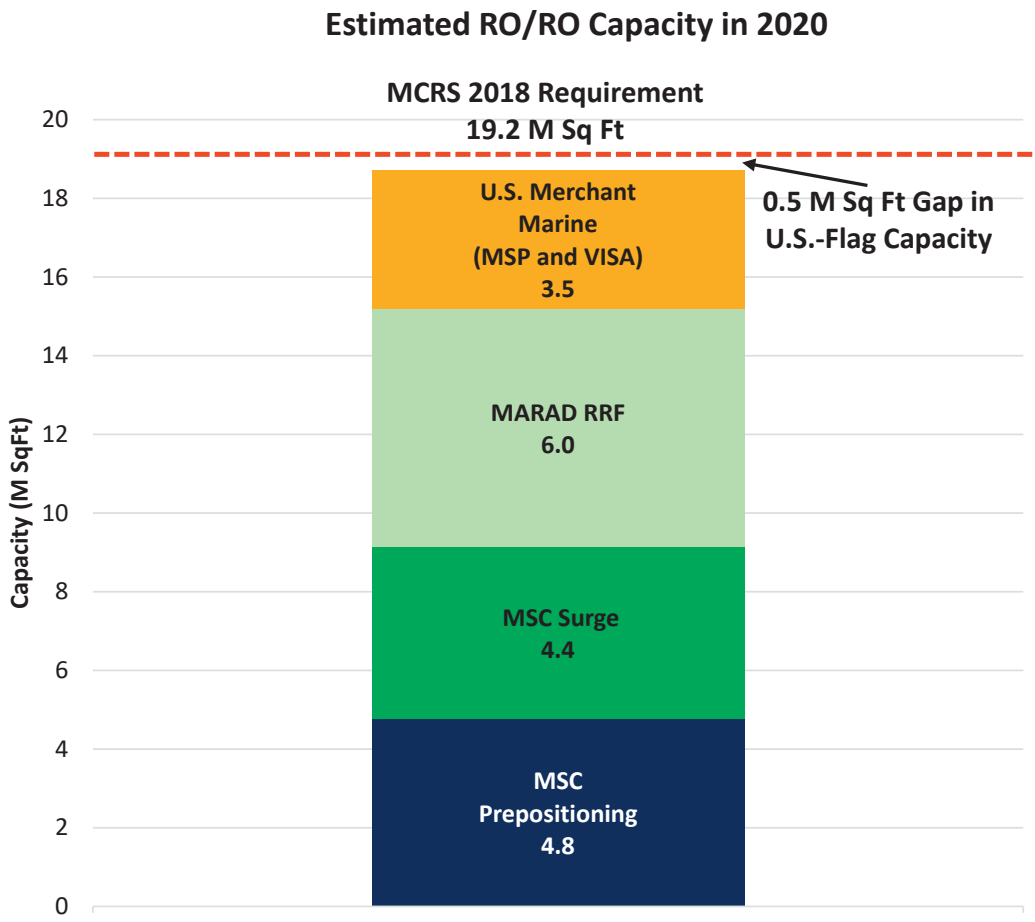
24 U.S. Transportation Command, *Comprehensive Report for TURBO ACTIVATION 19-PLUS* (Scott Air Force Base, IL: DoD, 2019), p. 5, available at https://www.globalsecurity.org/military/library/report/2019/ustranscom_turbo-activation19-plus_aar_20191216.pdf.

25 U.S. MTSNAC, *Maritime Workforce Working Group Report*, p. 27

26 Lieutenant General Stephen Lyons, U.S. Army, Deputy Commander of USTRANSCOM, "Logistics and Sealift Forces," statement before House Armed Services Committee Subcommittee on Seapower and Projection Forces, March 22, 2016, p. 3

transportation, the U.S. military could meet about three-fourths of the anticipated requirement. These additional tankers, however, may be needed to move fuel domestically during wartime.[27]

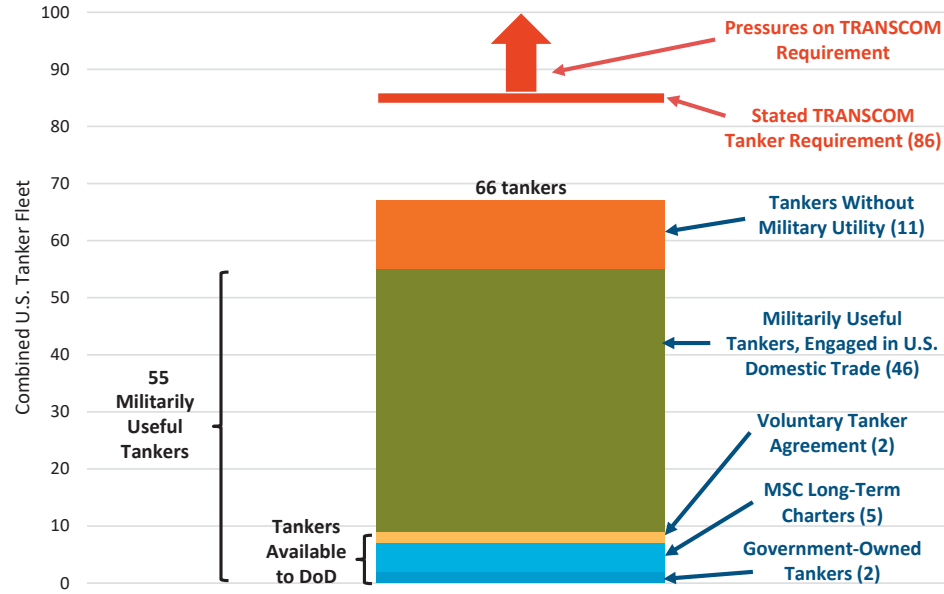
FIGURE 6: COMBINED U.S. COMMERCIAL AND GOVERNMENT FLEETS



The combined U.S. commercial and government fleets *may not* meet projected wartime RO/RO shipping demands of the 2018 Mobility Capability Requirements Study (MCRS). Requirements for shipping from "Mobility Capabilities and Requirements Study (MCRS) 2018 Executive Summary," U.S. Transportation Command, February 8, 2019, available at https://www.airforcemag.com/PDF/DocumentFile/Documents/2019/MobilityCapabilitiesRequirementsStudy2018.pdf. Data for commercial sealift is from "MSP Brochure," MARAD, July 1, 2017, available at www.marad.dot.gov/wp-content/uploads/pdf/MSP- Brochure-7-1-2017.pdf; and Appendix 7 on sealift in Office of the Chief of Naval Operations (CNO), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY 2020* (Washington, DC: DoD, February 2018), pp. 22–23, available at www.secnav.navy.mil/fmc/fmb/ Documents/19pres/LONGRANGE_SHIP_PLAN.pdf. Presented capacity is an estimate of militarily useful capacity.

27 Data from DOT, "Number and Size of the U.S. Flag Merchant Fleet and Its Share of the World Fleet," U.S. Bureau of Transportation Statistics, available at https://www.bts.gov/content/number-and-size-us-flag-merchant-fleet-and-its-share-world-fleet, accessed January 27, 2020; Lieutenant General Stephen Lyons, U.S. Army, Deputy Commander of USTRANSCOM, "Logistics and Sealift Forces," statement before House Armed Services Committee Subcommittee on Seapower and Projection Forces, March 22, 2016, p. 3; and Thomas Keane, *Analysis Of Fuel Tanker Vessels Available In A Dual Multi-Theater War (MTW)* (Monterey, CA: U.S. Naval Postgraduate School, 2000).

FIGURE 7: U.S. COMMERCIAL AND GOVERNMENT TANKER CAPACITY FALLS WELL SHORT OF THE PROJECTED WARTIME REQUIREMENT



Data from DOT, "Number and Size of the U.S. Flag Merchant Fleet and Its Share of the World Fleet," U.S. Bureau of Transportation Statistics, accessed January 27, 2020, available at https://www.bts.gov/content/number-and-size-us-flag-merchant-fleet-and-its-share-world-fleet; Lieutenant General Stephen Lyons, U.S. Army, Deputy Commander of USTRANSCOM, "Logistics and Sealift Forces," statement before House Armed Services Committee Subcommittee on Seapower and Projection Forces, March 22, 2016, p. 3; and Thomas Keane, *Analysis Of Fuel Tanker Vessels Available In A Dual Multi-Theater War (MTW)* (Monterey, CA: U.S. Naval Postgraduate School, 2000).

DoD's sealift capacity gaps will likely only worsen. Most government sealift ships will need to be retired during the next decade, and DoD's fuel requirement is expected to grow as military services adopt operational concepts that rely on distributed forces and maneuver to improve survivability and lethality.[28] The gap in cargo and tanker capacity will require either recapitalizing and expanding the MSC and MARAD surge sealift fleets or bringing more oceangoing commercial ships under U.S. flag.

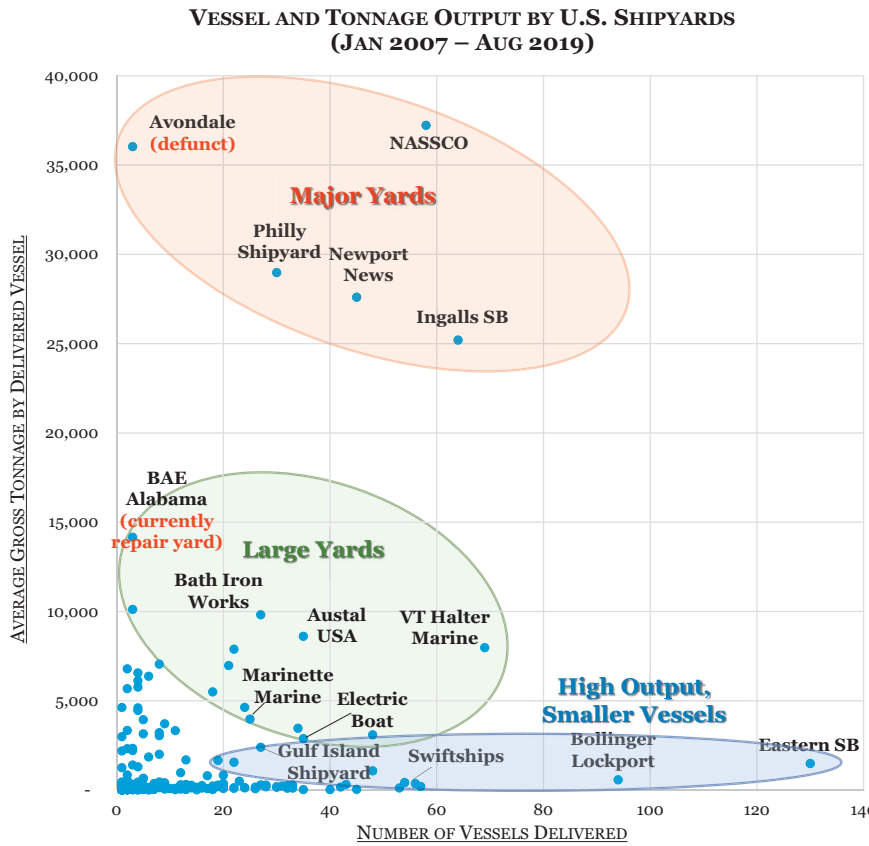
Ship Construction and Repair

The U.S. shipbuilding and ship repair industry is a major component of the DMIB. It enables the United States to field and sustain one of the world's largest navies, a coast guard that protects thousands of miles of U.S. coastline, and the domestic commercial fleet. Construction and repair shipyards also provide a critical backstop to American seapower, ensuring that the United States retains the capability to expand or recapitalize its Navy or Coast Guard without relying on other nations.

28 These new concepts are described in: Navy Warfare Development Command, "CNO Visits Navy Warfare Development Command," *Navy News Service*, April 13 2017; and Christopher H. Popa et al., *Distributed Maritime Operations and Unmanned Systems Tactical Employment* (Monterey, CA: Naval Postgraduate School, 2018), available at https://apps.dtic.mil/docs/citations/AD1060065; U.S. Army Training and Doctrine Command, *The Army in Multi-Domain Operations 2028* (Ft. Eustis, VA: U.S. Army, 2018), pp. 32-44, available at https://www.tradoc.army.mil/Portals/14/Documents/MDO/TP525-3-1_30Nov2018.pdf; and U.S. Marine Corps, "Expeditionary Advanced Base Operations," Marine Concepts and Programs, available at https://www.candp.marines.mil/Concepts/Subordinate-Operating-Concepts/Expeditionary-Advanced-Base-Operations/.

As with U.S. shipping fleets, the U.S. shipbuilding and repair industry includes government and commercial components. The government does not build ships, but it owns and operates four repair shipyards at Portsmouth, NH; Norfolk, VA; Bremerton, WA; and Pearl Harbor, HI. These shipyards are almost entirely devoted to maintaining and decommissioning nuclear-powered submarines and aircraft carriers; non-nuclear ships are maintained by commercial ship repair yards.[29] Together, the commercial and government-operated shipbuilding and repair industries account for nearly 134,000 jobs nationwide and contribute an estimated $60 billion to the U.S. economy annually.[30]

FIGURE 8: U.S. SHIPYARDS CAN BE CATEGORIZED IN TERMS OF THE NUMBER AND SIZE OF THE SHIPS THEY BUILD



DOT, "Table 7-1 U.S. Private Shipyards Major Shipbuilding and Repair Base," U.S. Bureau of Transportation Statistics, available at https://www.bts.gov/archive/publications/maritime_trade_and_transportation/2007/table_07_01 (accessed January 27, 2020); Tim Colton, "U.S. Builders of Large Ships," *shipbuildinghistory.com*, database, accessed February 20, 2019, http://www.shipbuildinghistory.com/shipyards/large.htm.

29 General Accountability Office, *Key Actions Remain to Improve Infrastructure to Better Support Navy Operations* (Washington, DC: GAO, 2019), p. 6, available at https://www.gao.gov/products/GAO-20-64.

30 U.S. Bureau of Labor Statistics, "May 2017 National Industry-Specific Occupational Employment and Wage Estimates, NAICS 336600 – Ship and Boat Building," March 30, 2018, https://www.bls.gov/oes/2017/may/naics4_336600.htm; MARAD, The Economic Importance of the U.S. Shipbuilding and Repairing Industry, Report, November 2015, https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/resources/3641/maradeconstudyfinalreport2015.pdf.

Today, the U.S. shipbuilding industry includes approximately 125 active shipyards across the country. Of these, 20 are large shipbuilders capable of building large, deep-draft vessels like U.S. Navy surface combatants, submarines, Coast Guard cutters, and large commercial ocean-going ships.[31] As shown in Figure 8, half of these shipyards can build very large ships such as aircraft carriers or oil tankers. The distribution of shipyard deliveries also suggests shipyards building large vessels depend on a small number of orders per year, which makes their workload highly variable.

Among shipyards building smaller ships, only a few, such as Eastern Shipbuilding or Bollinger, construct a large number of vessels per year. This likely makes them better able to manage their workload and scale their workforce to meet small variations in the number of orders.

Construction of government ships

The U.S. government procures a wide range of vessels, from 70-foot tugboats to 100,000-ton aircraft carriers. Of these, larger military ships receive the most attention, because they are more expensive, consume more man-hours, and are the majority of deep-draft vessels constructed in the United States. During the past decade, the U.S. Navy accounted for 44 percent of deep-draft ocean vessels produced by U.S. shipyards; the Coast Guard accounted for another 22 percent.[32]

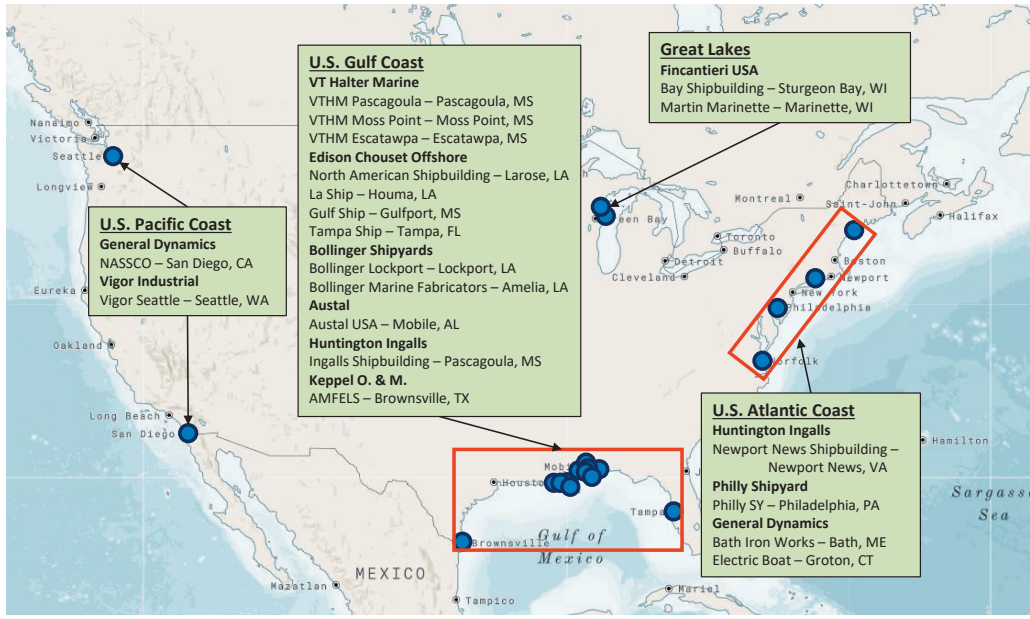
The seven shipyards that construct large or deep-draft Navy and Coast Guard ships became increasingly specialized after the Cold War. General Dynamics-Electric Boat (GDEB) builds nuclear-powered submarines; General Dynamics-Bath Iron Works (GDBIW) builds only surface combatants; Huntington Ingalls Industries-Newport News (HII-NN) builds nuclear-powered submarines and aircraft carriers; and Huntington Ingalls Industries-Ingalls Shipbuilding (HII-I) builds amphibious ships, surface combatants, and National Security Cutters. Marinette Marine builds Littoral Combat Ships (LCS), and Austal USA builds LCS and Expeditionary Fast Transports. Only one shipyard, General Dynamics-National Steel and Ship Company (GD-NASSCO) builds large government and commercial vessels, focused on cargo ships, tankers, and naval auxiliaries.

Specialization has helped each government-oriented shipyard optimize its infrastructure and workforce development to produce particular types of ships, which arguably improves performance and cost for the government. Specialization, however, also makes each shipyard's workload more fragile and dependent on changes in government shipbuilding plans. Changes in Navy strategy or force structure requirements could dramatically impact the viability of some shipyards.

31 For the purposes of this study, "large" is more than 3000 tons and "deep-draft" is more than 10 feet. Tim Colton, "U.S. Builders of Large Ships," *shipbuildinghistory.com*, database, accessed February 20, 2019, http://www.shipbuildinghistory.com/shipyards/large.htm.

32 DoD, *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States*, Interagency Task Force in Fulfillment of Executive Order 13806, Report to the President, September 2018, p. 78; Tim Colton, "Deliveries of Ships, Boats and Oceangoing Barges in 2018," *shipbuildinghistory.com*, database, accessed February 20, 2019, http://www.shipbuildinghistory.com/statistics/activity2018.htm.

FIGURE 9: CONSTRUCTION OF U.S. GOVERNMENT SHIPS IS CONCENTRATED ON THE U.S. EAST AND GULF COASTS

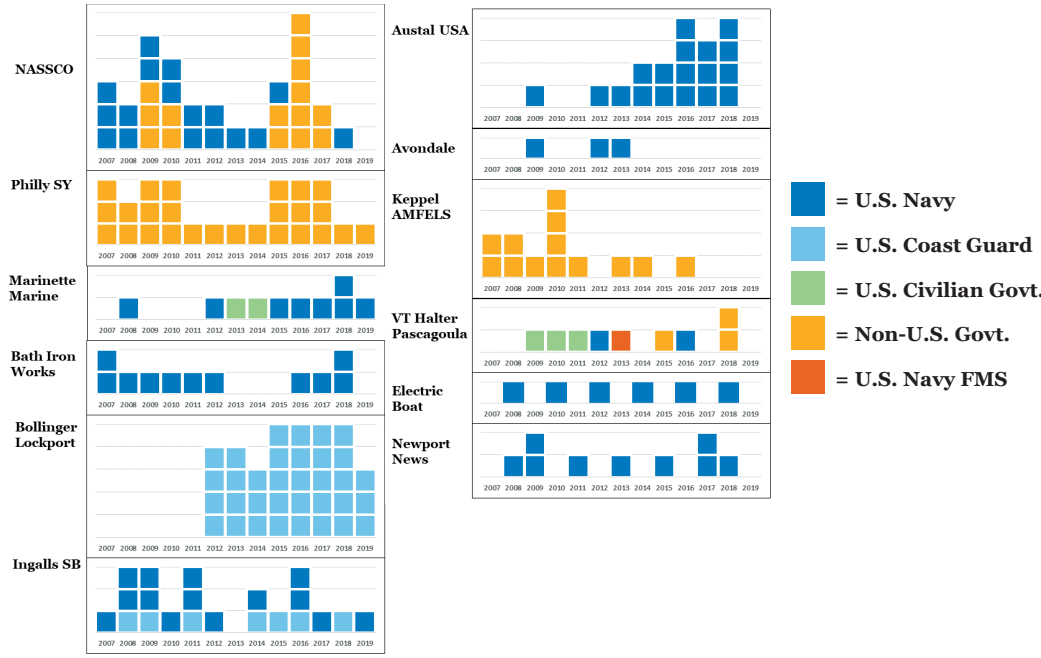


DoD, *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States*, Interagency Task Force in Fulfillment of Executive Order 13806, Report to the President, September 2018, p. 78; Colton, "Deliveries of Ships, Boats and Oceangoing Barges in 2018."

In contrast to large military ships, smaller government vessels, such as Navy oceanographic survey ships, Littoral Combat Ships, Coast Guard Offshore Patrol Vessels, and NOAA research ships, are often constructed at shipyards that also build commercial ships. These government ship classes are not built continuously and are generally only recapitalized after 20 to 30 years of service. Without the work that comes from the domestic shipping industry, these shipbuilders would likely not remain in business to build smaller government ships when needed.

For example, Figure 10 depicts the number of ships constructed at a selection of shipyards for which data could be publicly obtained. As the figure shows, for some shipyards there are years in which no government orders are received, and commercial work keeps the shipyard operating. Without the Jones Act's requirements for ships operating between U.S. ports be U.S.-built, it is likely the U.S. government would have few, if any, shipyards available to episodically recapitalize its smaller vessels.

FIGURE 10: COMMERCIAL SHIP ORDERS KEEP SMALL-SHIP CONSTRUCTION YARDS OPERATING BETWEEN GOVERNMENT ORDERS



DOT, "Table 7-1 U.S. Private Shipyards Major Shipbuilding and Repair Base"; Colton, "U.S. Builders of Large Ships".

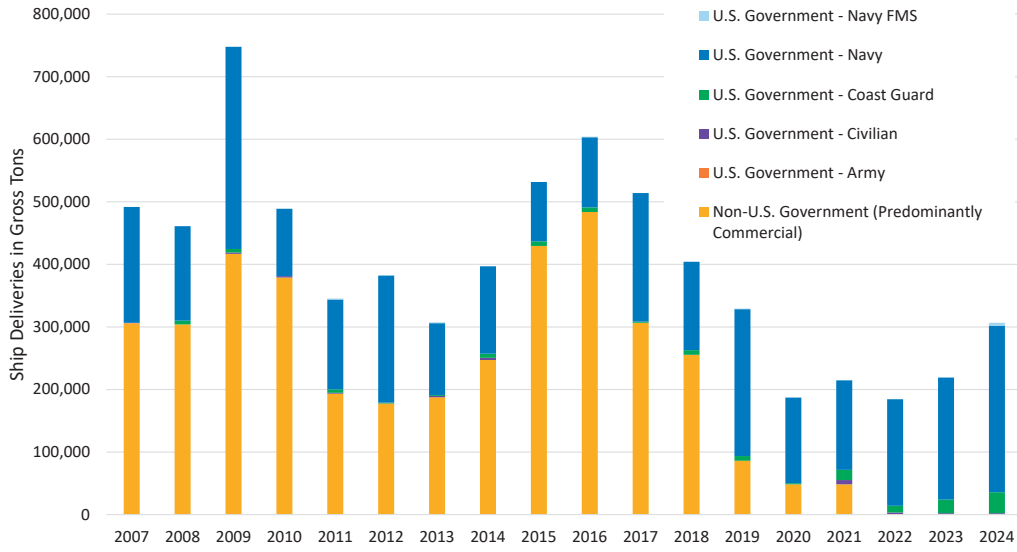
Construction of commercial ships

There are 13 shipbuilders in the United States that construct only large commercial ships and about 100 shipyards that build smaller government and commercial ships such as offshore support vessels, tugboats, and ferries. Although some shipbuilders do not construct military ships, they could be called upon in wartime to allow the Navy to ramp up ship production or replace ships lost in combat.

During the last decade, U.S. shipyards delivered more than 2,200 ships, boats, and ocean-going barges, including 168 large, ocean-going vessels. Shipbuilders also constructed more than 9,000 inland barges, in large part to support shipments from the growing U.S. oil and gas industries.[33] Figures 11 and 12 show that, in many years, commercial vessels are more than half of the U.S. ship construction workload. As noted above, smaller government vessels are built at shipyards that construct both government and commercial ships and depend on commercial orders to stay in business. The substantial volume of commercial shipbuilding is also important to sustaining the overall base of suppliers and workers that supports government shipbuilding.

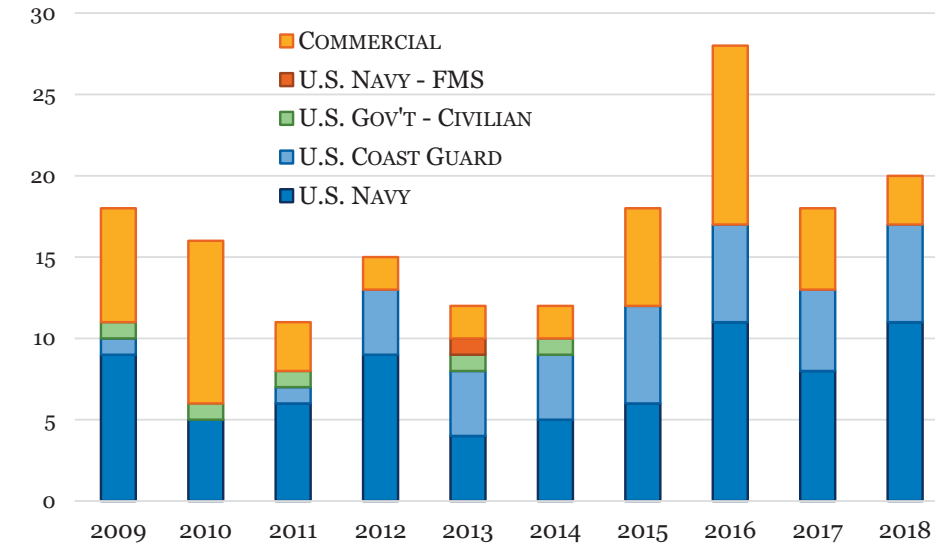
33 Based on 2009–2018 data compiled from Tim Colton, "Deliveries of Ships, Boats and Oceangoing Barges," *shipbuildinghistory.com*, database, accessed February 20, 2019, http://www.shipbuildinghistory.com/statistics.htm.

FIGURE 11: TONNAGE OF SHIPS DELIVERED BY U.S. SHIPYARDS OR PLANNED IN FUTURE GOVERNMENT SHIPBUILDING PLANS



Based on 2009-2018 data compiled from Tim Colton, "Deliveries of Ships, Boats and Oceangoing Barges," *shipbuildinghistory.com*, database, accessed February 20, 2019, http://www.shipbuildinghistory.com/statistics.htm. Note that commercial ship orders are generally not planned more than a few years in advance, whereas government shipbuilding plans project up to 30 years into the future.

FIGURE 12: LARGE, OCEAN-GOING VESSELS DELIVERED FROM U.S. SHIPYARDS



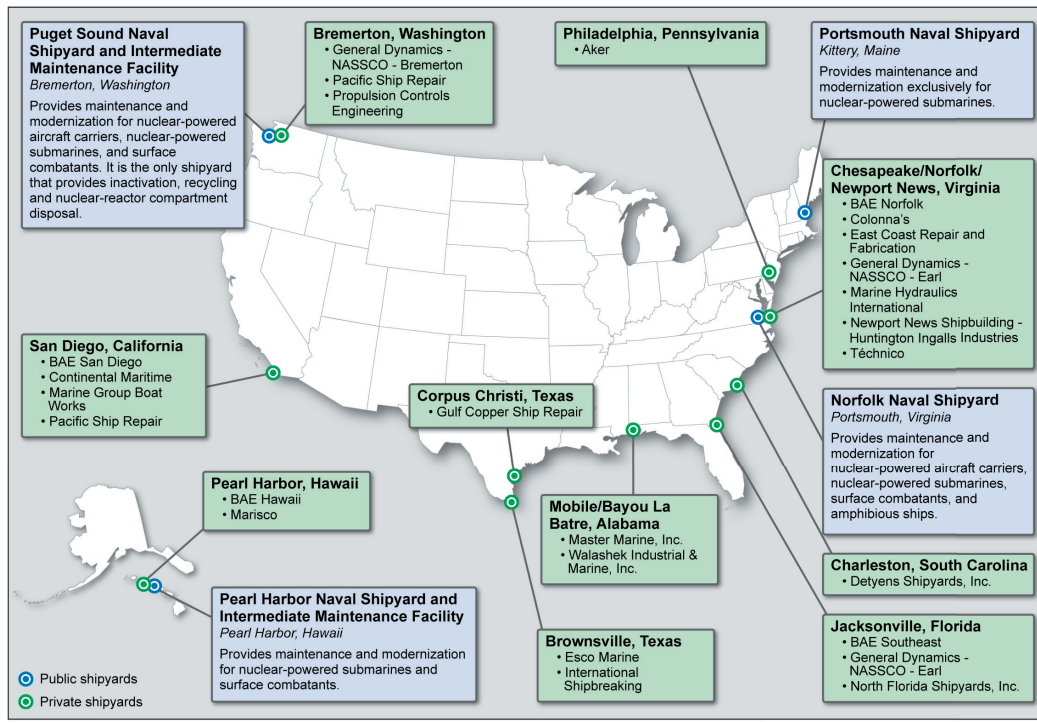
Based on 2009-2018 data compiled from Tim Colton, "Deliveries of Ships, Boats and Oceangoing Barges," *shipbuildinghistory.com*, database, accessed February 20, 2019, http://www.shipbuildinghistory.com/statistics.htm.

Figure 11 also highlights the difficulty shipyards face in workforce and infrastructure planning. Commercial customers often only plan their future shipbuilding needs a few years in advance and will not provide shipyards funding or firm orders until the ship is needed. Government ship orders, in contrast, may be made for multiple ships or over multiple years. The Navy also publishes a 30-year shipbuilding plan that is usually reliable for the first five years.[34]

Other than ships required to be U.S.-built under the Jones Act, U.S. commercial shipbuilding faces steep challenges from shipbuilders in China, South Korea, and Japan. These heavily subsidized foreign competitors accounted for over 90 percent of the global shipping tonnage delivered in 2018.[35]

Ship repair

FIGURE 13: PUBLIC AND PRIVATE SHIPYARDS SUPPORTING U.S. GOVERNMENT SHIPS



Source: GAO analysis of Navy data. | GAO-20-257T

Diana C. Maurer, *Persistent and Substantial Ship and Submarine Maintenance Delays Hinder Efforts to Rebuild Readiness* (Washington, DC: GAO, 2019), p. 3, available at https://www.gao.gov/assets/710/702979.pdf.

34 Deputy Chief of Naval Operations (Warfare System Requirements - OPNAV N9), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2020* (Washington DC: U.S. Navy, 2019), p. 11, available at https://www.navy.mil/strategic/PB20_Shipbuilding_Plan.pdf.

35 Data drawn from United Nations Conference on Trade and Development Stat, available at https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=89493; Costas Paris, "Asia State Players Wield Subsidies to Dominate Shipping," *Wall Street Journal*, December 2, 2018.

The U.S. ship repair industry comprises a mix of government and private shipyards, maintenance facilities, and service and material suppliers that support ships in the domestic, international, and government fleets. As with shipbuilding, most repair shipyards maintain either Navy ships or commercial and non-combatant government vessels due to the specialized capabilities needed for military ship repair. However, public and private ship repair yards rely on a common base of vendors for services and materials such as tile replacement, habitability bulkhead repair, technical support for navigation systems, or air conditioning and ventilation system maintenance.

Public repair shipyards. The U.S. Navy's nuclear submarines and aircraft carriers are largely maintained by public shipyards in Maine, Virginia, Washington, and Hawaii, but shipbuilders are conducting an increasing share of nuclear ship maintenance to compensate for backlogs experienced in the public shipyards.[36] Some government analysis further suggests routine submarine overhauls are less expensive at construction shipyards compared to public repair yards, but the impact on ongoing ship construction is not yet well understood.[37]

Since 2014, planned maintenance periods in public shipyards were delayed 1,135 days in total for aircraft carriers and 8,510 for submarines.[38] Several factors contributed to the delays, but the most proximate cause is the U.S. carrier fleet's increasing age, which causes unexpected growth in work packages during a maintenance period as new deficiencies are found.[39] Submarine overhauls and repairs are delayed when carrier maintenance periods are extended, either because submarines need to use a dry dock occupied by a carrier, or because workers that would be employed on submarines are still working on the delayed carrier.[40]

The challenge of addressing the aging carrier fleet's growing volume and complexity of repairs is exacerbated by a lack of skilled and experienced shipyard workers. As shown in Figure 14, the number of workers in public shipyards is expected to be less than required until 2022. After then, the public shipyard workforce is expected to remain highly variable due to turnover.

36 Megan Eckstein, "Navy: Lack of Submarine Parts Slowing Down Maintenance, New Construction," *USNI News*, March 26, 2019.

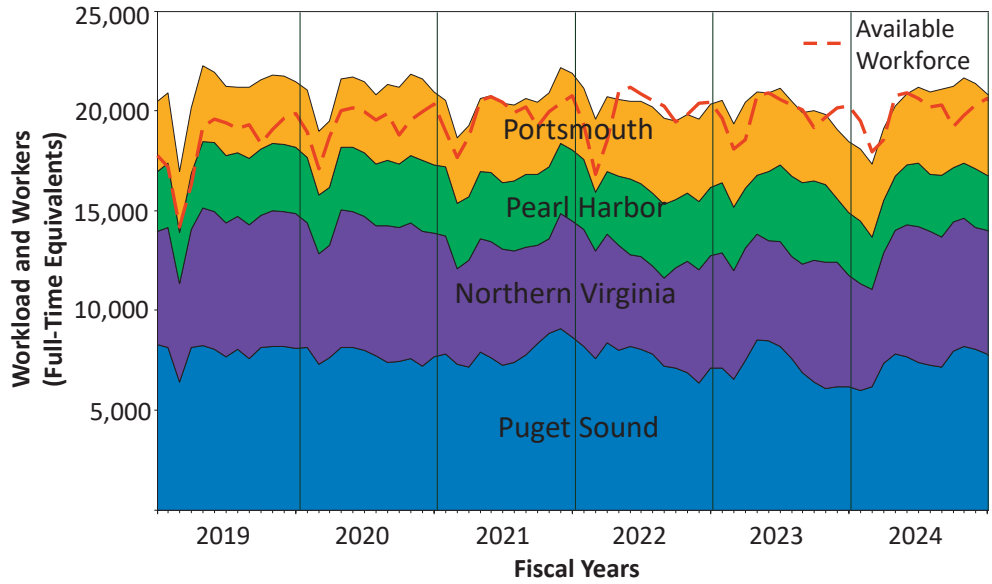
37 Derek Trunkey, *Comparing the Costs of Submarine Maintenance at Public and Private Shipyards* (Washington, DC: CBO, 2018), available at https://www.cbo.gov/system/files/2018-09/54444-SubmarineMaintenance.pdf.

38 Government Accountability Office (GAO), *Persistent and Substantial Ship and Submarine Maintenance Delays Hinder Efforts to Rebuild Readiness* (Washington, DC: GAO, 2019), p. 4, available at https://www.gao.gov/assets/710/702979.pdf.

39 Christopher Cavas, "US Carrier Delays Continue — And Another 'Gap' Could Affect the New Administration," *Defense News,* October 7, 2016.

40 GAO, *Actions Needed to Address Costly Maintenance Delays Facing the Attack Submarine Fleet* (Washington, DC: GAO, 2018), p. 6, available at https://www.gao.gov/assets/700/695577.pdf.

FIGURE 14: ESTIMATED WORKLOAD AND WORKERS IN FULL-TIME EQUIVALENTS



Estimated workload in full-time equivalent workers at U.S. public shipyards (shaded) and the estimated number of available workers (dotted line). Data drawn from Commander, Navy Regional Maintenance Center (CNRMC), "MARMC / SWRMC / SERMC / NWRMC / HRMC / FDRMC/Total Private Sector Workload Estimate," Naval Sea Systems Command presentation, March 9, 2019.

Although they are aggressively hiring today, public shipyards suffered a loss of seasoned technicians and tradespeople with the retirement of workers who were recruited in large numbers during the Cold War. As a result, 45 percent of the Puget Sound and 30 percent of the Portsmouth Naval Shipyards' skilled workforce have fewer than five years of experience.[41] In today's competitive employment environment, public shipyards will be challenged to sustain their hiring rates. Moreover, government shipyards will likely be competing for workers with nearby private shipyards, impacting the overall industrial base even if the public shipyards reach their hiring goals.

The young and growing public shipyard workforce will face steady headwinds as it attempts to get nuclear ship maintenance back on schedule. Due to a sustained lack of investment in infrastructure, some of which is 100 to 200 years old, U.S. public shipyards are inefficient and unable to conduct some types of work they should be able to do. For example, the layout of public shipyards greatly increases the time workers spend moving between tasks and to and from work centers or parts storerooms. More importantly, eight of the Navy's 18 dry docks are unable to support some or all of the submarines or aircraft carriers they are intended to host.[42]

41 GAO, *Persistent and Substantial Ship and Submarine Maintenance*, p. 4.

42 GAO, *Key Actions Remain to Improve Infrastructure to Better Support Navy Operations* (Washington, DC: GAO, 2019), p. 5, available at https://www.gao.gov/assets/710/702883.pdf.

The Navy began a 20-year initiative to improve its shipyard facilities, called the Shipyard Infrastructure Optimization Plan (SIOP), in 2019. The Navy estimates that the plan could eventually save 328,000 labor-days each year, but the investments made thus far have been small, and many of the most important improvements, such as dry dock upgrades, are scheduled to start in the mid-2020s.[43] The Navy's plan has also come under criticism for underestimating its costs, which the Navy places at $21 billion. The GAO estimates the SIOP could require billions of dollars more than the Navy projects.[44]

Private shipyards. The Navy's approximately 240 non-nuclear ships depend on U.S. private ship repair yards for regular maintenance and modernization, or to repair damage incurred from accidents or combat. Most of these repair yards maintain only Navy and Coast Guard ships, but some also occasionally work on deep-draft commercial vessels from the U.S.-flagged domestic fleet. As shown in Figure 11, repair shipyards that support government ships are concentrated around major Navy homeports and the U.S. Gulf Coast. Dozens of additional ship repair facilities support only commercial ships, but these shipyards are increasingly limited to smaller vessels such as tugboats, barges, and coastal cargo carriers. Larger oceangoing ships generally are maintained at less-expensive facilities overseas, although U.S.-flagged carriers pay a tax penalty for doing so.[45]

Commercial ship repair yards are newer and potentially more efficient than U.S. public shipyards but are also experiencing worker shortfalls. For example, most private repair companies use temporary contractors for some skilled work that is only episodically needed, such as tile replacement, habitability bulkhead repair, hull coating, or scaffolding installation and removal. Worker shortages are now also extending to core skill areas for ship repair, as shown in Table 1 for the Hampton Roads region around Norfolk, VA.[46]

43 Steve Lagana, "Shipyard Infrastructure Optimization Plan," Presentation to Sea-Air-Space Exposition, May 7, 2019, available at https://www.navsea.navy.mil/Portals/103/Documents/Exhibits/SAS2019/SteveLagana-SAS-05072019.pdf?ver=2019-05-07-144653-417; and GAO, *Key Actions Remain to Improve Infrastructure to Better Support Navy Operations*, p. 5.

44 GAO, *Key Actions Remain to Improve Infrastructure to Better Support Navy Operations*, p. 5.

45 Comments of A.P. Moller-Maersk Group (USA), Submitted to Office of Information and Regulatory Affairs, Office of Management and Budget, Request for Information on Maritime Regulatory Reform, July 11, 2018; David T. Matsuda, "State of the United States' Merchant Fleet in Foreign Commerce," Statement Before the Sub-Committee on Coast Guard and Maritime Transportation United States House of Representatives, September 29, 2010, available at https://www.transportation.gov/testimony/state-united-states'-merchant-fleet-foreign-commerce-0.

46

TABLE 1: PROFESSIONAL SHORTAGES AMONG PRIVATE SHIP REPAIR YARDS IN THE NORFOLK, VIRGINIA AREA

Trade	Estimated Current Worker Shortage	Trade	Estimated Current Worker Shortage
Welders	455	Coatings Applicators	315
Pipefitters	390	Outside Machinists	295
Shipfitters	485	Inside Machinists	190
Marine Electricians	370	Sheet Metal Workers	240
Fiber Optics Technicians	160	Q.A. Professionals	145
Safety Professionals	85		
Total Estimated Current Worker Shortage			**3,130**

Virginia Ship Repair Association, "Workload Capacity Survey," May 11, 2018, p. 3.

As with public shipyards, private ship repair companies face challenges building their workforces. The technically proficient tradespeople needed in shipyards are also in demand by other industries, including public shipyards, raising the compensation needed to attract workers. Because public shipyards have a well-defined and stable workload, they may be a more attractive option for potential recruits.

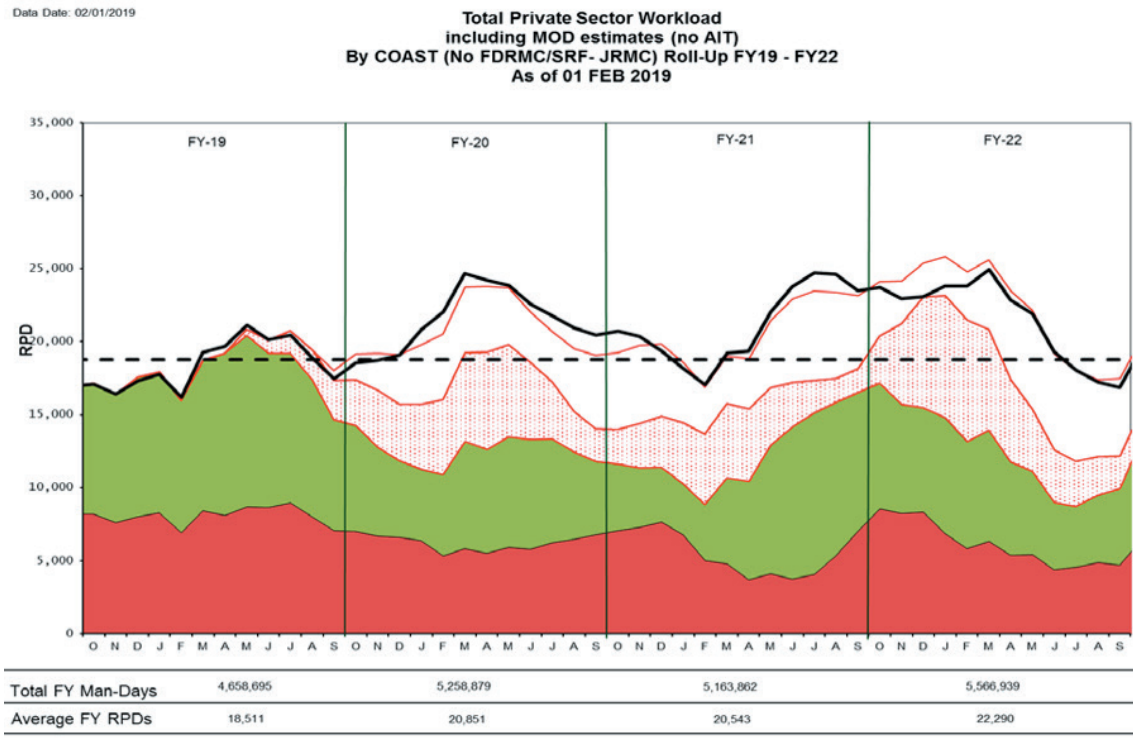
The other major limitation of private ship repair yards is dry docks. Like public shipyards, some dry docks at private shipyards require upgrades to support newer ship classes, or they need to be refurbished or replaced due to age. The most significant dry dock shortfall, however, relates to location. The Navy has rebalanced its fleet during the last decade toward the U.S. Pacific Coast to better address the military competition with China and the longer transit times required to reach Western Pacific allies. Commercial dry docks, however, remain concentrated on the U.S Atlantic Coast, where they were built to better support a fleet that was focused on the U.S. Cold War confrontation with the Soviet Union. Today, only seven private dry docks are available on the U.S. West Coast to support 60 non-nuclear surface combatants, whereas on the East Coast 14 dry docks support 49 ships.[47]

Public shipyards can make investments such as the SIOP and build or repair dry docks because the government can plan against a relatively well-defined workload over which it has some control. Private shipyards do not have the same assurances. As shown in Figure 15, the estimated overall Navy-related workload at private shipyards varies by more than 25 percent year-to-year, as indicated by the solid black line. Graphs for workload by region show a similar trend.

47 Naval Sea Systems Command, *Report to Congress on the Long-Range Plan for Maintenance and Modernization of Naval Vessels for Fiscal Year 2020,* p. 2, available at https://www.secnav.navy.mil/fmc/fmb/Documents/20pres/FY20%20Long%20Range%20Maintenance+Modernization%20Plan.pdf; and GAO, *Key Actions Remain to Improve Infrastructure to Better Support Navy Operations,* p. 5.

The Navy is attempting to provide more predictability to private shipyards through a long-range maintenance and modernization plan that describes projected projects during the next 30 years.[48] Although the initial version of the plan does not provide the detail needed for shipyards to plan workforce development or infrastructure investments, the Navy intends to increase the level of detail in future reports. The long-range plan also establishes a Private Sector Optimization program that would guide and coordinate investments in private shipyard infrastructure by the government and ship repair companies. The Navy expects to start funding private shipyard improvements as part of the FY 2021 budget request.[49]

FIGURE 15: PROJECTED FUTURE WORKLOAD BY COAST AND CAPACITY AT U.S. PRIVATE SHIPYARDS SUPPORTING NAVY SHIPS.



Projected future workload by coast (shaded and red areas) and capacity (black lines) at U.S. private shipyards supporting Navy ships. CNRMC, "MARMC / SWRMC / SERMC / NWRMC / HRMC / FDRMC/Total Private Sector Workload Estimate," Naval Sea Systems Command presentation, March 9, 2019.

An additional challenge for private shipyards is the need to individually bid on ship maintenance periods under the Navy's current contracting strategy of multiple award contract-multiple order (MAC-MO). The lack of predictability regarding future work reduces shipyards' ability to plan the size and shape of their workforces or define a return on investment for infrastructure improvements such as dry dock repair or replacement. The Navy is

48 Naval Sea Systems Command, *Report to Congress on the Long-Range Plan 2020*.

49 Justin Katz, "Navy creating private shipyard infrastructure investment plan," *Inside Defense,* March 21, 2019.

attempting to provide private shipyards more certainty for workforce and infrastructure planning by awarding maintenance contracts 180 days before work is scheduled to start rather than 90 days, as has often been the case.[50]

Private shipyards' workload uncertainty is ameliorated somewhat by the Navy's practice of contracting shorter surface ship maintenance periods with shipyards near the ships' homeport. Private shipyards can plan to receive a percentage of local work because regional private shipyard capacity has evolved to accommodate the Navy's demand; as a result, even if all the maintenance work in a homeport is awarded to one shipyard, the winning shipyard needs to subcontract part of the work to other nearby ship repair facilities. However, larger maintenance projects, as shown by the red lines on Figure 15, are bid on a coast-wide basis, expanding the pool of shipyards able to bid on the work and reducing the certainty of local shipyards regarding their potential workload.

The Navy's oversight processes are an additional source of inefficiency for private shipyards. The Navy is reducing the number of inspections and checks done during maintenance periods, which could lower the number of man-hours lost to overhead. The Navy also streamlined approval for new work costing less than $100,000 during an ongoing maintenance period, which can now be approved by the local Navy Ship's Supervisor. Shipyards report, however, significant delays in being reimbursed for these additions.[51]

The U.S. Merchant Marine

Civilian mariners in the U.S. Merchant Marine operate ships in the U.S. domestic and international commercial fleets, Navy auxiliary vessels in MSC, and ships of other government agencies. The exact number of U.S. civilian mariners is hard to determine. For instance, the Coast Guard issued more than 33,000 unlimited ocean credentials during the last five years, but an estimated 15,871 of these mariners are not working on ships in the maritime industry. Of the remaining mariners, MSC employs 5,576 as government employees, and MARAD estimates 11,768 mariners are employed in the U.S.-flagged domestic and international commercial fleets or as contract mariners to MSC and MARAD.

Because MSC civilian mariners would continue in their current positions during a surge sealift operation, the remaining 11,768 civilian mariners would operate commercial fleets and surge sealift vessels during a war or other contingency.[52] The vast majority of these non-government mariners, about 10,238, are associated with U.S. government policies:

50 Megan Eckstein, "Navy Confident That Maintenance Workload Transparency, Better Business Practices Will Avoid Future Backlogs," *USNI News,* April 2, 2018.

51 Megan Eckstein, "Navy Eyeing Ship Maintenance Contracting Improvements to Ensure On-Time, On-Budget Avails," *USNI News,* August 24, 2017. Megan Eckstein, "SECNAV Spencer Wants Navy to Manage Risk, Not Avoid it," *USNI News,* January 9, 2019.

52 U.S. MTSNAC, *Maritime Workforce Working Group Report*, pp.26-29.

- **U.S. international fleet.** The 60 ships operating in the MSP employ 2,386 mariners;
- **U.S. domestic fleet.** The 99 oceangoing ships of the domestic fleet created by the Jones Act employ 3,380 mariners;
- **Voluntary Intermodal Sealift Agreement participants.** Carriers associated with the VISA program employ 1,724 qualified mariners associated with the U.S. domestic or international fleets who are not already working on domestic oceangoing ships or vessels in the MSP; and
- **U.S. government fleet.** Other than the MSC's 5,576 government employee mariners, the MARAD Ready Reserve Force employs 626 mariners.
- **U.S. Navy Strategic Sealift Officer (SSO) Program.** Selected graduates of the U.S. and state maritime academies are commissioned in the Navy Reserve as SSOs. Today there are 2,122 SSOs with unlimited licenses.[53]

Meeting surge sealift requirements

As shown in Table 2, the 218 active U.S.-flagged commercial and MSC ships are operated by 5,571 mariners day-to-day, which requires 9,749 mariners total to account for crew rotation and shore leave. Crewing the inactive ships of the MARAD Ready Reserve Force and MSC Surge Fleet requires an additional 1,929 mariners. This requirement can be met by the current U.S. Merchant Marine only if every proficient qualified mariner in the total force of 11,768 is willing and able to serve, which is unlikely. Moreover, sustaining the government surge fleet in operation beyond six months requires 3,858 mariners to allow for crew rotation and shore leave; this requirement is beyond the current mariner capacity.[54]

The number of proficient, qualified mariners will likely shrink toward the day-to-day requirement. The median age of merchant mariners is 46 and rising, suggesting that new credentialed sailors are not joining the Merchant Marine in sufficient numbers to offset retirements and resignations.[55] Because there are no incentives for potential new mariners to begin training without the prospect of at-sea employment, stemming continued reductions or increasing the pool of available mariners to meet surge requirements would require expanding the number of ships under U.S. flag.

53 Ibid.

54 Ibid., p. 24.

55 Ibid., p. 10.

TABLE 2: U.S. MERCHANT MARINE UNABLE TO MEET SUSTAINED SURGE SEALIFT REQUIREMENTS

Category	Ships	Billets	Mariners	Mariners
			Initial Activation	Sustainment
U.S.-flagged Domestic and International Fleets	176	4,549	7,960	7,960
MSC Fleet	42	1,022	1,789	1,789
Day-to-Day Requirement	218	5,571	9,749	9,749
Surge Requirement for MARAD Ready Reserve Force and MSC Surge Sealift Fleet	63	1,929	1,929	3,858
Total Surge Requirement for Mariners			11,678	13,607
Estimated Supply of Available Mariners			11,768	11,768
Status			Barely Sufficient: Less than 1% margin	Insufficient: 15% shortfall (~2,000 mariners)

The U.S. Merchant Marine will fall short in meeting sustained surge sealift requirements. These challenges will grow worse in a prolonged crisis

The U.S. Merchant Marine faces the same competitive employment environment as shipyards, suppliers, and the military Services. Attracting more recruits and retaining them will require higher pay, additional benefits, or more time off compared to today. It will also require more employment opportunities on a larger fleet. These changes would make U.S.-flagged international commercial carriers less competitive compared to foreign shipping companies. They would also be difficult for government agencies to support on a finite budget. The U.S. government may have to increase MSP stipends or cargo rates to fund incentives that attract more mariners to the U.S. commercial fleet.

Growing the Merchant Marine would also require expanding mariner training facilities and processes. Current training institutions such as union-operated trade schools; the U.S. Merchant Marine Academy at Kings Point, NY; and state maritime academies in Texas, Maine, Massachusetts, Michigan, New York, and California have all adjusted their throughput over time to support the needed number of mariners for today's fleet. MARAD is beginning to support increased training capacity by building a new fleet of multi-mission training vessels, but additional instructors and facilities at academies and trade schools would also be needed, including to train mariners for operations in contested environments. Because the six state maritime academies supply 70 percent of licensed U.S. mariners, increasing their capacity may provide the largest increase in the overall mariner population.[56]

56 MARAD, "NSMV – National Security Multi-Mission Vessels," DOT, November 4, 2019, available at https://www.maritime.dot.gov/national-security/nsmv-––national-security-multi-mission-vessels.

MARAD, the maritime academies, and training schools must also prepare mariners for future operations in contested environments. Instruction in cyber resiliency for operations at sea and in port and operational and survival skills are needed to prepare American crews for the hazards of serving under wartime conditions.

The Expanding and Challenged Maritime Industry

The organizations of the DMIB described above form the traditional U.S. commercial and government maritime industry. The DMIB and broader DIB, however, are increasingly reliant on companies and institutions outside the traditional defense community for key technologies, services, and policy ideas. The 2017 National Security Strategy calls this larger ecosystem of organizations the National Security Innovation Base (NSIB), which it defines as an "American network of knowledge, capabilities, and people—including academia, National Laboratories, and the private sector—that turns ideas into innovations, transforms discoveries into successful commercial products and companies, and protects and enhances the American way of life."[57]

An example of how the NSIB differs from the DIB is in information technology. Innovations such as 5G mobile communications, artificial intelligence (AI), quantum computing, or agile software development are coming to the DoD from companies and research institutions without previous defense affiliations. The U.S. military's dependence on new organizations for foundational capabilities introduces risks and managerial challenges, which can be exacerbated when DoD is only one of many customers for commercial technology providers.

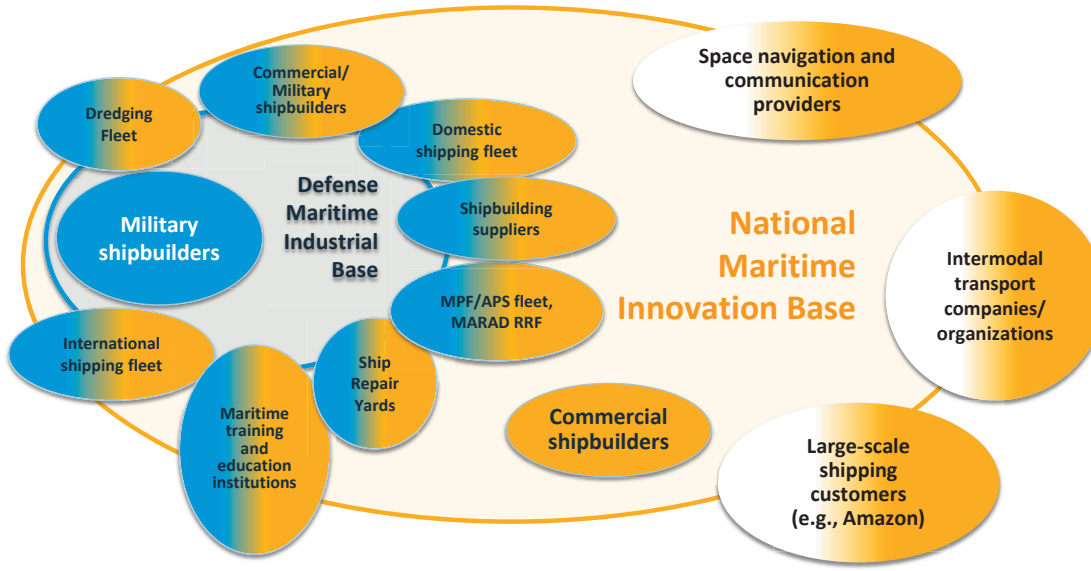
A similar dynamic is emerging in the U.S. maritime industry. A growing number of non-traditional organizations influence the national security contributions of commercial and government sectors of the NMIB. This larger ecosystem could be considered the National Maritime Innovation Base (NMIB). As shown in Figure 16, the NMIB includes traditional maritime industry providers such as shipbuilders and shipping companies of the DMIB. The NMIB would also incorporate important enablers of modern maritime operations. These would include satellite navigation and communication providers that allow highly automated ship operations or the large-scale shipping customers whose business models shape the routes and configurations used by commercial carriers.

An example of how new communication, navigation, and computer processing technologies have impacted the maritime industry is containerization. Started by American entrepreneur Malcom McLean, carriers in the U.S. fleet began adopting standard containers during the 1950s, and the approach of moving all cargo other than bulk materials in 20- or 40-foot containers quickly became the international industry standard. The expanding use of

57 Donald J. Trump, *National Security Strategy of the United States of America (*Washington, DC: U.S. Government Printing Office, 2017), p. 21, available at https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf.

containers was enabled by improvements in communication and satellite tracking technology that allowed carriers to move containers from trucks or trains to ships and vice versa. Today, individual containers are tracked from origin to destination, and ships can navigate autonomously, enabling future logistics models in which autonomous ships and vehicles transport containers.[58]

FIGURE 16: U.S. DEFENSE MARITIME INDUSTRIAL BASE IS AN ELEMENT OF THE LARGER NATIONAL MARITIME INNOVATION BASE



Companies in the DMIB are experiencing a range of pressures that impact their ability to remain in business and continue their contributions to national security. In addition to addressing the needs and constraints introduced by new participants in the NMIB, maritime companies working with DoD face competition from subsidized foreign rivals; shrinking demand for government work; and new mandates for cybersecurity, efficiency, and responsiveness. These factors will tend to reduce revenues and increase costs. The U.S. government will need to pursue revised policies and take proactive steps to ensure the health of the U.S. commercial maritime industry.

Although the ecosystem of maritime organizations impacting national security is growing, the most significant contributions and difficulties in the U.S. maritime industry are with the companies and institutions in the DMIB. Chapter 2 summarizes the historical legacy of the DMIB, and Chapter 3 describes recommendations to bolster the U.S. maritime industrial base. The resulting plan of action is detailed in Chapter 4.

58 Steve Saxton and Matt Stone, "How container shipping could reinvent itself for the digital age," *McKinsey and Co.*, available at https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/how-container-shipping-could-reinvent-itself-for-the-digital-age.

CHAPTER 2

Background: A Brief History of the U.S. Maritime Industry

The U.S. maritime industry grew and evolved in concert with the nation. As noted in Chapter 1, the complex set of rules and regulations governing today's DMIB resulted from challenges and concerns emerging during events such as wars, territorial expansion, and the changing U.S. economy and trade relationships. This chapter describes how the U.S. maritime industry reached its current form and identifies key factors that inform the analysis and recommendations of this study.

Early History: From Colonies to a Republic

Shortly after arriving on the continent, American colonists took to the sea. In 1631 the Massachusetts Bay colony launched its first sea-going vessel, starting a proliferation of shipyards along the Atlantic seaboard.[59] Drawing on ample supplies of low-cost timber, American-built ships were 30 to 50 percent cheaper than their English counterparts. By 1776, ships constructed in the colonies accounted for a third of the British registry.[60] American colonists also fished and engaged in trade in American waters and beyond, protected by the Navigation Acts that mandated trade between British ports be carried on British ships.

When revolution came, the maritime industry proved essential. One of every four signers of the Declaration of Independence was a shipowner or had been a ship captain.[61] Colonial leaders knew the revolution could not be sustained by the 31 government ships in service. In

59 Peter J. Hugill, *World Trade Since 1431: Geography, Technology, and Capitalism* (Baltimore, MD: Johns Hopkins University Press, 1993), p. 58.

60 Ibid.

61 Benjamin Olney Hough, *Ocean Traffic and Trade*, Volume 16 (Chicago, IL: La Salle Extension University, 1916), pp. 330-331.

1775 the Continental Congress and some colonies directed construction of additional supply and combatant ships and issued letters of marque to hundreds of American privateers.

After the war, American merchants expanded their commerce across the globe. American ships opened up trade with the Pacific Northwest and established routes to all continents but Antarctica.[62] In the United States, however, limitations created by the Articles of Confederation were a challenge. Individual states charged a series of import duties and fees designed to protect their own industries and state-registered ships. This patchwork of laws inhibited interstate commerce, allowed foreign shipping to flood the American market, and encouraged rampant smuggling.[63] The uneven legal framework also made shipping between American ports increasingly reliant on foreign-flagged vessels, in particular British ones.

To rationalize the laws governing trade, the new U.S. Congress passed "An Act for Registering and Clearing Vessels, Regulating the Coasting Trade, and for Other Purposes," in its first session.[64] In a legislative movement led by Alexander Hamilton, the act and subsequent regulations advantaged U.S. shippers by charging them lower fees than foreign vessels on importing cargo.[65] The act—the forerunner of today's Jones Act—also required trade between U.S. ports to be conducted by U.S.-flagged vessels.

The approach of privileging domestic shipping through cabotage restrictions sought to cultivate American manufacturing, shipbuilding, and shipping. It also mirrored the laws of most other major countries at the time, including Great Britain's Navigation Acts.[66]

Rise and Fall in the 1800s and Early 1900s

The American maritime industry grew during the first half of the 1800s, with the exception of a hiatus during the War of 1812.[67] The Navigation Act of 1817 closed loopholes in the 1789 coastal trade law, fully excluding foreign vessels from cabotage among U.S. ports and forbidding "the importation of goods from any foreign port except in U.S. vessels or vessels of the country from which the goods were imported."[68] These reforms resulted in 92.5 percent of U.S.

62 "The Lookout of the Labor Movement," Sailors' Union of the Pacific, 1985, p. 1, available at https://sailors.org/sites/default/files/history1-2.pdf. and "Maritime History," Transportation Institute, available at https://transportationinstitute.org/know-our-industry/maritime-history/.

63 Harold Underwood Faulkner, *American Economic History* (New York: Harper & Brothers, 1938), p. 181.

64 First Congress, Session 1, Chapter 11, §1 (1789).

65 Of note in 1790 also at the request of Alexander Hamilton, Congress established the Revenue-Marine, whose original purpose was collecting customs duties and over time morphed into the modern Coast Guard. Sarah Sicard, "How Alexander Hamilton Launched the Coast Guard," *Task and Purpose*, August 4, 2016, available at https://taskandpurpose.com/badass-alexander-hamilton-father-coast-guard.

66 Hough, *Ocean Traffic and Trade*, p. 331.

67 The War of 1812 was precipitated in part by American outrage the impressment of American sailors by the Royal Navy and British restrictions on neutral trade while Britain fought France.

68 "Maritime History," Transportation Institute.

foreign trade being carried on U.S.-flag merchant vessels by 1826.[69] U.S. ships gained greater international market share during the wars between Great Britain and China, the Revolutions of 1848, and the Crimean War.[70] The completion of the Erie Canal by 1825 promoted greater inland trade, stimulated the development of the American Midwest, and contributed to the development of the Port of New York.

American maritime technology also gained greater prominence. *The American Practical Navigator*, first published by American mathematician Nathaniel Bowditch in 1802, superseded earlier Royal Navy texts and became the world's premier reference work for practical marine navigation for nearly a century.[71] American shipyards also developed the clipper ship in the 1840s, a fast-sailing ship that could quickly transport low volumes of high-profit, time-sensitive cargoes such as tea, spices, people, and mail between the East and West coasts of the United States, to Asia, and to other locations. Clippers were built for U.S. shippers and extensively exported.

Toward the middle of the 19th century, however, the U.S. maritime industry had three major setbacks. First, development of the American West led American financiers and entrepreneurs to redirect capital from shipbuilding and foreign trade to railroads and the development of natural resources. In many cases, maritime families reinvested fortunes built in relatively risky shipbuilding and foreign trade to inland enterprises perceived as safer and, in some cases, more profitable.[72]

Second, the leading U.S. ship type—the wooden clipper—was eclipsed by iron and later steel sailing vessels and steamships. Leveraging coal and iron reserves close to the sea and cheap labor, Great Britain took the technological lead in building iron and later steel sailing vessels and steamships. Rather than evolving, American shipyards doubled-down on building wooden ships, especially clippers, in part blinded by a surge in foreign orders for U.S. ships from 1853 to 1856 caused by the Crimean War. This demand waned, however, because steel vessels could be built more cheaply than wooden ones. Moreover, steamships required smaller crews than sailing ships and could more reliably keep schedules because they did not depend on the wind.

Third, the U.S. Civil War wreaked havoc on U.S. shipping. During the war, the percent of foreign trade to and from the United States carried on American ships dropped from 66 to 27 percent.[73] The decrease came as a result of losses caused by Confederate raiders and the sale or reflagging of U.S. ships to avoid higher insurance rates and pursue more lucrative markets. The reduction in U.S. commercial shipping created by the Civil War would not be reversed

69 Ibid.

70 Faulkner, *American Economic History*, pp. 280-281.

71 Nathaniel Bowditch, *The American Practical Navigator* (Newburyport, MA: Edmund M. Blunt, 1802), available at http://msi.nga.mil/MSISiteContent/StaticFiles/NAV_PUBS/APN/pub9.zip.

72 Steven Ujifusa, *Barons of the Sea* (New York: Simon & Schuster, 2018).

73 Faulkner, *American Economic History*, pp. 285-286.

until the First World War. In the meantime, Great Britain strengthened its dominance of commercial shipping, aided by U.S. ships that joined its registry and the British government's establishment of subsidies for the construction and operation of ships using new technologies such as steam propulsion.

After the Civil War, the U.S. maritime industry experienced a modest revival, but global trends and a lack of government interest precipitated its decline. The opening of the Suez Canal in 1869 shortened navigation times for steamships traveling between Europe and Asia, rewarding British government investments in iron steamship technology and undercutting the utility of sailing ships that had difficulty transiting the canal unaided. Although American tonnage engaged in coastwise trade continue to grow, the percentage of international trade carried in American ships continued to decline from 35 percent in 1870 to 10 percent in 1910.[74]

The Spanish-American War and the voyage of the Great White Fleet laid bare deficiencies in the U.S. Merchant Marine, as the U.S. Navy and Army were challenged to obtain appropriate transports as well as coaling stations and bunker ships to support the fleet.[75] However, apart from acquiring additional naval auxiliaries, the U.S. government did not take significant steps to improve its maritime industry. The opening of the Panama Canal in 1914 shortened navigation distances between the U.S. East and West Coasts, spurring inter-coast U.S. trade, but it did not have a major impact on the share of the U.S. fleet in international trade since the canal was open to foreign shipping as well.

The Seaman's Act of 1915 improved working conditions for American sailors by providing safety protections and regulating wages.[76] The U.S. law and others like it, however, increased the relative cost of the American mariner. This led to a small but growing number of U.S. shipping companies reflagging their ships in other countries to avoid these protections, further weakening the U.S. Merchant Marine.

World Wars and Revival of the U.S. Merchant Marine

The outbreak of the First World War caused major interruptions to ocean shipping, leading rates to skyrocket and causing U.S. exports to Europe to virtually cease. Too few U.S.-flagged ships were available to transport cargo, and foreign-flagged ships were either requisitioned by warring powers or remained in port to avoid capture.[77] Consequently, even though the United States was a neutral power, its lack of oceangoing commercial ships had a deleterious effect on the U.S. economy.

74 Ibid., pp. 672-673.

75 Timothy A. Walton, Ryan Boone, and Harrison Schramm, *Sustaining the Fight: Resilient Maritime Logistics for a New Era* (Washington, DC: Center for Strategic and Budgetary Assessments, 2019), p. 22.

76 Elizabeth DeSombre, *Flagging Standards: Globalization and Environmental, Safety, and Labor Regulations at Sea* (Cambridge, MA: MIT Press, 2006), pp. 75-76.

77 Andrew Gibson and Arthur Donovan, *The Abandoned Ocean: A History of United States Maritime Policy* (Columbia, SC: University of South Carolina Press, 2000), pp. 104-105.

American public opinion hardened against the Central Powers following the loss of nine neutral U.S. commercial ships and hundreds of sailors and passengers to German attacks.[78] Before the United States entered the war, however, the Shipping Act of 1916 established the United States Shipping Board to oversee the government purchase or lease, and subsequent operation of, merchant vessels in support of national interests. Although the Shipping Board attempted to boost shipbuilding, it suffered from bureaucratic struggles with other agencies and internal divisions over whether to allocate resources to the nearly half of U.S. shipyards that still built wooden ships.[79] Eventually the Shipping Board sponsored 1,700 merchant vessels, but most of them were completed after the armistice.[80]

Following the First World War, Congress directed the Shipping Board to sell its recently built ships at a loss, flooding the shipping market and debilitating the shipbuilding industry for more than a decade. However, Congress did take steps to improve shipping readiness during the Interwar Period. Principally, the Merchant Marine Act of 1920 reaffirmed the intent of the 1789 Act and subsequent legislation by requiring vessels conducting business between U.S. ports to be U.S.-owned, -built, and -crewed.[81]

By the 1930s, however, the U.S. maritime industry was atrophying. Funding cuts and treaty limits had reduced naval shipbuilding; commercial shipping companies satiated by the abundance of World War I-era merchant vessels refrained from new orders; and union disputes sapped efficiency. By the mid-1930s, only five shipbuilders remained that could effectively execute orders for large commercial ships and large surface combatants.[82]

Promoted by President Franklin D. Roosevelt, the Merchant Marine Act of 1936 pursued revitalization of the U.S. Merchant Marine. In addition to revising U.S. government cargo preference policies to help sustain the U.S. commercial fleet, the legislation established the Maritime Commission and authorized it to both subsidize the cost of new ship construction

78 Rodney Carlisle, *Sovereignty at Sea: U.S. Merchant Ships and American Entry into World War I* (Gainesville, FL: University Press of Florida, 2009).

79 Even after shipyard expansion in the years immediately preceding American entry to World War I to accommodate foreign demand, when the United States entered the war, national capacity was 154 ways for steel ships of 3,000 tons or greater and 102 ways for wooden vessels of like-size. During the war, 1,308 steel vessels were contracted under the U.S. Shipping Board's Emergent Fleet Corporation plan. The original program also called for 1,017 wooden vessels and fifty wood-steel composite ships, but this part of the program was ended early after these ships proved unsatisfactory for contemporary conditions. William Benson, *The Merchant Marine* (New York: The Macmillan Company, 1923), pp. 158-162.

80 Chris McMahon, "The U.S. Merchant Marine: Back to the Future?" *Naval War College Review* 69, no. 1, Winter 2016, p. 93.

81 MARAD, "The Maritime Administration's First 100 Years: 1916–2016," DOT, March 25, 2019, available at https://www.maritime.dot.gov/history/historical-documents-and-resources/maritime-administration's-first-100-years-1916-–-2016.

82 Frederick Lane, *Ships for Victory – A History of Shipbuilding Under the U.S. Maritime Commission in World War II* (Baltimore, MD: Johns Hopkins University Press, 1951), as excerpted in William and Sandra McGee, eds., *Amphibious Operations in the South Pacific in WWII*, Vol. III, *Pacific Express, The Critical Role of Military Logistics in World War II* (Tiburon, CA: BMC Publications, 2009), p. 23.)

and cover the cost of national defense features installed on merchant vessels as part of a ten-year merchant shipbuilding plan.[83]

Shortly before the U.S. entry into the Second World War, American shipbuilding boomed as the Maritime Commission funded construction of additional yards and as the United States exported ships to offset other countries' war losses. During the war, shipbuilding underwent a 20-fold increase in annual production, with 5,777 merchant vessels and 1,500 warships built for the United States alone.[84]

The thousands of new ships coming off the ways required crews to sail them. Shortages in mariners were particularly acute for skilled personnel like engineers and radio officers, and the War Shipping Administration struggled to train certified crews fast enough.[85] Personnel gaps were exacerbated by wartime losses with the Merchant Marine suffering a higher casualty rate than any of the military Services.[86]

The Cold War

The Second World War left the U.S. maritime industry in a strong and arguably dominant position. The U.S. shipbuilding industry was active, and 60 percent of global merchant tonnage operated under the U.S. flag.[87] U.S. leaders squandered this advantage, however, with a series of policies that mirrored those pursued in the wake of the First World War. The Merchant Ship Sales Act of 1946 sold off government-owned merchant vessels for a fraction of their original costs, which had the effect of subsidizing foreign commercial fleets and better enabling them to compete with U.S.-flagged vessels.[88]

By 1948, the U.S. share of world shipping slipped to 36 percent due to the availability of inexpensive vessels and the emergence of "flags of convenience," or the registration of ships in

83 McMahon, "The U.S. Merchant Marine: Back to the Future?" p. 94.

84 Lane, *Ships for Victory*, p. 23; and McMahon, "The U.S. Merchant Marine: Back to the Future?" p. 95.

85 McGee, eds., *Amphibious Operations in the South Pacific in WWII*, Vol. III, pp. 228-230, 244.

86 Of the 243,000 Merchant Mariners serving in World War II, 9,521 died. This includes total killed at sea as well as those that died as prisoners of war and from combat wounds ashore. Accordingly, 3.9 percent of Merchant Mariners were killed. The Marine Corps was the Service with the next highest casualty rate, with 2.94 percent of serving Marines killed during World War II. Arthur R. Moore, *A Careless Word—a Needless Sinking: A History of the Staggering Losses Suffered by the U.S. Merchant Marine, Both in Ships and Personnel, during World War II* (Kings Point, NY: American Merchant Marine Museum, U.S. Merchant Marine Academy, 1998). See also "U.S. Merchant Marine Casualties during World War II," U.S. Merchant Marine, available at www.usmm.org/casualty.html.

87 An exception to this trend was that during World War II many U.S.-flag ships engaged in coastwise trade were diverted to overseas routes. Rail, road, and pipeline modes of transport replaced them in their absence, and after World War II coastal shipping generally did not recapture their former markets. Gibson and Donovan, *The Abandoned Ocean*, pp. 171-172.

88 "Chapter 54-Merchant Ship Sales," 50 U.S. Code, available at http://uscode.house.gov/view.xhtml?path=/prelim@title50/chapter54&edition=prelim; and Daniel Marx Jr., "The Merchant Ship Sales Act of 1946," *The Journal of Business* 21, no. 1, January 1948, pp. 12-28. Alternatives would have been to only sell ships to U.S.-flag operators, scrap the ships, or use them as targets.

countries with little regulation and few taxes.[89] The Merchant Ship Sales Act also ended the government's Long-Range Shipbuilding Plan that had integrated naval and commercial shipbuilding demand to provide stability for the ship construction industry. At a stroke, the Act had both revitalized foreign shipping and undermined the post-war U.S. Merchant Marine and shipbuilding industry.

During the Korean War, U.S. commercial carriers with civilian mariners transported 80 percent of U.S. government cargo, with the remaining portion assigned to the Military Sea Transportation Service. U.S. commercial ships also served as naval auxiliaries, participating in the amphibious landing at Inchon and rescuing more than 14,000 Korean civilians from advancing Chinese Communist forces at Hungnam.[90] Commercial carriers were also called upon by the U.S. government to help address coal and grain shortages in Europe and India, respectively.

During the Vietnam War, the U.S. Merchant Marine again met military requirements, transporting 95 percent of cargo and in many cases sailing into combat zones under fire.[91] However, the U.S. commercial fleet was facing block obsolescence of World War II-era ships with the introduction of containers that facilitated intermodal transportation and boosted efficiency. U.S. shipping operators also faced fierce competition from foreign-flagged carriers—including Soviet ones—that reduced the U.S. share of international shipping to 5.6 percent by 1969.[92]

As a presidential candidate in 1968, Richard Nixon gave a speech in Seattle titled "Restoring the U.S. to the Role of a First-Rate Maritime Power." He noted that the Soviet Union was rapidly expanding its merchant marine as part of a program to become the dominant maritime power and that the United States needed to respond with a new maritime policy.[93] The Merchant Marine Act of 1970 promoted by Nixon established a Capital Construction Fund to finance more commercial merchant shipbuilding and created marketing programs to send more cargoes to the U.S.-flagged fleet.[94] Bolstered by the Act's investments, new U.S. merchant vessels under construction or on order at private American shipyards in 1978 totaled 48, second only to Japan.[95]

Although shipbuilding and demand for U.S.-flagged shipping were on the rise, the U.S. government-owned reserve sealift fleet was aging out of service. The Nifty Nugget mobilization

89 Gibson and Donovan, *The Abandoned Ocean*, p. 171; and McMahon, "The U.S. Merchant Marine: Back to the Future?" p. 95.

90 Ned Forney, "Moon Jae-in: From Geoje to Cheong Wa Dae," *The Korea Times*, May 9, 2017.

91 George W. Bush, "National Maritime Day, 2002," White House Archives, May 21, 2002, available at https://georgewbush-whitehouse.archives.gov/news/releases/2002/05/text/20020521-1.html.

92 "Maritime History," Transportation Institute.

93 Gibson and Donovan, *The Abandoned Ocean*, pp. 197-198.

94 Ibid., p. 202.

95 Ibid., p. 201.

exercise of 1978 exposed decades of flawed assumptions regarding the ability of U.S. forces to deploy in defense of Europe against potential Soviet invasion.[96] The actual Soviet invasion of Afghanistan that same year raised concerns regarding the lack of logistical support capabilities for potential operations in the Middle East. In response, the U.S. Navy and MARAD undertook a program during the late 1970s and early 1980s to convert used commercial ships and build new ships for government-owned sealift forces. This effort included the establishment of Maritime and Afloat Prepositioning Ship squadrons, the acquisition of eight Fast Sealift Ships, and placing inactive sealift ships into a Ready Reserve Force that would maintain higher states of readiness than the National Defense Reserve Fleet.

At the same time the Reagan administration enacted these improvements to the government-owned sealift fleet, it also implemented three major decisions that hurt the commercial maritime industry's competitiveness.[97] First, the Administration terminated further funding for construction differential subsidies, a program that helped ship buyers offset the higher cost of constructing vessels in U.S. shipyards. Second, it ended Operating Differential Subsidy contracts for U.S.-flagged ships in international trade.[98] This led to a major reduction in U.S.-flagged ships in international trade, since the operating cost of U.S. ships was now significantly more expensive than foreign-crewed ships. Third, the administration began collecting taxes on foreign earnings. In contrast, most other countries allow shipping companies to either pay no taxes at all or pay no taxes on their on their foreign earnings so long as they reinvested them into shipping assets. As a result of the tax change, many U.S. owners sold their ships, and the U.S.-flagged international fleet shrank by 30 percent between 1986 and 1991.[99]

From the Gulf War to Today

The U.S. military relied on a mix of government-owned, U.S.-flagged commercial, and chartered foreign vessels for strategic sealift during Operations Desert Shield and Desert Storm. Whereas this first war against Iraq demonstrated DoD's ability to project power and conduct precision strike warfare, it also laid bare the chronic under-resourcing of U.S. government maritime logistics and the long-term decline of the U.S. Merchant Marine since its World War II zenith. Due to shortfalls in the government and commercial fleets, DoD relied heavily on chartered foreign vessels.

U.S. maritime logistics underwent changes following the first Gulf War. The 1993 Bottom-Up Review created a new force-sizing construct for the post-Cold War era that heightened reliance on rapid strategic mobility, even as it reduced overall force structure and defense resources.

96 Walton, Boone, and Schramm, *Sustaining the Fight*, p. 25.

97 Gibson and Donovan, *The Abandoned Ocean*, p. 233.

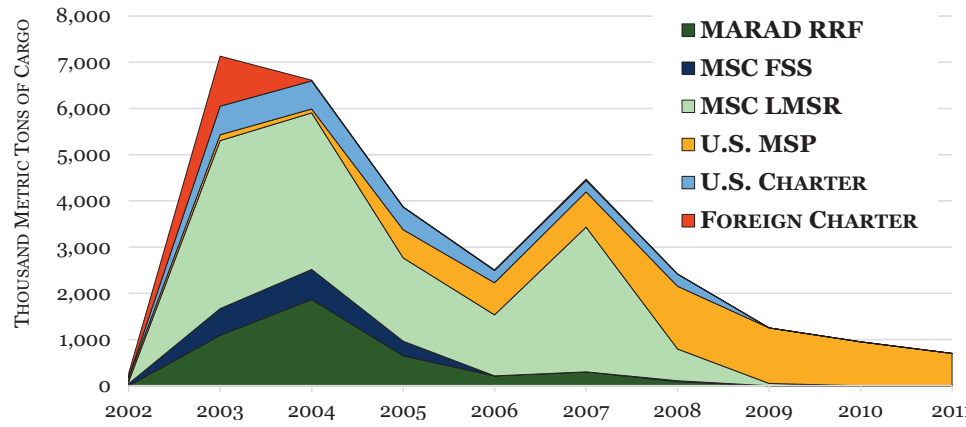
98 The Merchant Marine Act of 1936, as amended, established the Operating Differential Subsidy (ODS) program to provide direct support equal to the difference between U.S.-flag and foreign-flag vessel operating costs, through 20-year contracts to U.S.-flag vessels participating in international trade.

99 Gibson and Donovan, *The Abandoned Ocean*, pp. 232-233.

This led to new investments in maritime logistics during the early to mid-1990s, principally by building a fleet of Government-owned RO/ROs and establishing the MSP in 1996. The MSP partially replaced the Operating Differential Subsidy program that was phased out in 1981 and helped DoD secure access to a fleet of U.S.-flagged commercial vessels, their crews, and their global intermodal logistics networks.[100]

Post-Desert Storm investments in maritime logistics paid dividends during the buildup and sustainment of forces for Operations Enduring Freedom and Iraqi Freedom (OEF/OIF). As shown in Figure 17, the U.S. government fleet of purpose-built and converted sealift ships allowed rapid deployment of military equipment, while a mix of Ready Reserve Force and MSP ships supported sustainment.[101] MSC and MARAD ships were quickly activated within an average of three days, and the use of chartered foreign vessels was minimized.

FIGURE 17: OEF/OIF DRY CARGO SEALIFT COMPOSITION, 2002–2011



A.J. Herberger, Ken Gaulden, Rolf Marsha, *Global Reach: Revolutionizing the Use of Commercial Vessels and Intermodal Systems for Military Sealift, 1990-2012,* (Annapolis, MD: USNI Press, 2015) p. 194-200. In this chart, RRF=MARAD Ready Reserve Force, FSS=Fast Sealift Ship, and LMSR=Large, Medium-Speed, RO-RO ship.

Successful U.S. power projection during OEF and OIF may have reflected a high point for the U.S. maritime industry. Competitive pressures in the decade since have caused the U.S. international commercial fleet to shrink, reducing the U.S.-flagged vessels available to move U.S. government cargo. Companies that build military ships specialized to survive, making them vulnerable to changes in Navy strategy and acquisition such as the upcoming shift from LCS to FFG(X). And shipyards that build or repair a mix of commercial ships or of government and commercial ships experienced uneven and decreasing orders due to U.S. government budget uncertainty. These challenges are explained in more detail below.

100 "Maritime Security Program," MARAD, available at https://www.marad.dot.gov/ships-and-shipping/strategic-sealift/maritime-security-program-msp/. The MSP stipend was adopted as a more economical way of partially replacing the previous Operating Differential Subsidy Program (ODSP). ODSP was instituted in the Merchant Marine Act of 1936.

101 The initial government fleet included a chartered Jones Act ship, the SS *Northern Lights*. See Walton, Boone, and Schramm, *Sustaining the Fight*, pp. 23-24.

Competition

According to MARAD, the additional cost of operating a U.S.-flagged vessel compared to a foreign-flagged ship increased from about $4.8 million annually in 2010 to about $6.6 million by the latter half of the decade. To address this cost differential and make U.S.-flagged international ships more competitive, Congress increased the MSP from $3.5 million in 2016 to $5 million per vessel in 2017, with a planned authorization of $5.23 million in FY 2021. In a 2018 report, GAO found the MSP stipend and revenue from U.S. government cargo helped a sufficient number of U.S.-flagged oceangoing vessels to meet DOD's cargo capacity needs. MARAD officials said this increase has temporarily stabilized the financial situation of MSP vessel operators.[102]

The strongest competitor to the U.S. international fleet is China. Chinese President Xi Jinping has championed a vision for China to become a global superpower by 2049, the 100th anniversary of the founding of the People's Republic of China. Central to what Xi characterizes as the "Chinese Dream" are a world-class Navy, a strong domestic maritime industry, and investment in partner nations through the "One Belt, One Road" initiative, now called the Belt and Road Initiative (BRI). BRI funds infrastructure to connect China with parts of Asia, Africa, and Europe in order to boost trade and global influence by economic, political, and military means.[103] Through the BRI, the Chinese government has also slowly but systematically gained port access around the world for commerce, logistics, and naval operations.[104]

In pursuing the Chinese Dream, Xi was able to leverage the already growing Chinese shipbuilding industry, which the Chinese government began to transform starting in 2010 from being defense-focused into a broader commercial enterprise. Today, Chinese shipyards build the whole range of container ships, bulk cargo carriers, crude oil tankers, and specialized vessels such as liquified natural gas carriers. China's expanding economy and strong state support, coupled with the country's large workforce, have been the driving force in growing China's shipbuilding industry.[105]

Using its shipbuilding capacity, the Chinese government is increasing its comprehensive maritime power through the merchant fleet, Chinese Coast Guard, People's Maritime Militia, and fishing fleet. China continues to use this growing national fleet to expand its global influence and reach, including through excessive sovereignty claims in the South and East China Seas.

102 GAO, *Maritime Security: DOT Needs to Expeditiously Finalize the Required National Maritime Strategy for Sustaining U.S.-Flag Fleet* (Washington, DC: GAO, August 2018), p.35

103 Michael McDevitt, *Becoming a Great "Maritime Power": A Chinese Dream* (Center for Naval Analysis, June 2016), p. iv.

104 This is consistent with the popular phrase "rich country, strong army" (富国强兵. fù guó qiáng bīng) from the Legalistic Chinese text *Strategies of the Warring States* (战国策, Zhàn Guó Cè). Of note, this phrase also became a Japanese national slogan during the Meiji Period. James Holmes, "Mahan is Alive in China," *National Interest*, July 7, 2004.

105 Menon Economics and DNV GL, "The Leading Maritime Nations of the World," 2018.

Budget uncertainty

Budget uncertainty has been a challenge for U.S. government agencies during the last several decades due to late appropriations in all but four of the last 40 years and the resulting use of Continuing Resolutions (CR) to keep the government operating.[106] Under CRs, funding levels for each program are frozen at the previous year's level and no new programs are allowed to be started. This constrains DoD's flexibility in reallocating resources to implement new strategies or exploit emerging technologies.

U.S. government budget stability was further undermined by the Budget Control Act of 2011 (BCA), which imposed caps on defense spending between 2013 and 2021 that could only be lifted with commensurate increases in non-defense discretionary spending.[107] With the agreement on FY 2021 spending included in the FY 2020 budget resolution, the BCA's budget caps have been raised in all but one year and were further supplemented every year by Overseas Contingency Operations (OCO) funding. These mitigations, however, often occurred after the DoD budget proposal was developed or submitted for the coming year.[108]

Budget uncertainty results in DoD and other government agencies being unable to use their funding effectively. Military Services' maintenance, acquisition, and workforce development plans that were originally developed to accommodate a different funding amount need revision to incorporate additional spending or reductions. For capital-intensive services like the Navy, Coast Guard, or Air Force, maintenance and acquisition must be planned a year or more in advance to accommodate operational schedules and allow procurement of long-lead items in advance. Additional funding at the last minute ends up being spent on smaller projects that can be executed, rather than implementing DoD's strategy for growing or transforming the force and improving its lethality.

The uncertainty of defense budgets has significant impacts on the DMIB. Among prime contractors such as Navy shipbuilders and aircraft manufacturers, budget uncertainty may have contributed to continued consolidation. The post-Cold War wave of consolidation during the 1990s left the DIB with three major prime contractors and many small suppliers.[109] By the late 1990s, the top five contractors' share of awarded contract dollars rose from 21.7 percent in 1990 to 31.3 percent in 2000.[110] Mergers among mid-tier defense contractors such as L3 Technologies and Harris Corporation and the pending merger of Raytheon and United

106 Heather Krause, *Continuing Resolutions and Other Budget Uncertainties Present Management Challenges* (Washington, DC: GAO, February 6, 2018), available at https://www.gao.gov/assets/690/689914.pdf.

107 Todd Harrison, What Has the Budget Control Act of 2011 Meant for Defense? (Washington, DC: Center for Strategic and International Studies, August 1, 2016).

108 Jon Harper, "The Budget Control Act is Dead. Now What?" *National Defense Magazine,* August 29, 2019.

109 David Cooper, *Defense Industry Consolidation: Competitive Effects of Mergers and Acquisitions* (Washington, DC: GAO, March 1998), available at https://www.govinfo.gov/content/pkg/GAOREPORTS-T-NSIAD-98-112/pdf/GAOREPORTS-T-NSIAD-98-112.pdf.

110 The National Bureau of Economic Research, https://nber.org/digest/jan19/w25160.shtml with GRAPH.

Technologies will create more large prime contractors. If this trend continues, it will likely only increase the share of procurement contracts awarded to large vendors. And although large prime contractors could weather schedule and quantity changes created by changing budgets, smaller vendors and suppliers to prime contractors are less able to stay in business between orders. As a result, thousands of smaller vendors left the defense industry during the last decade.[111]

Budget uncertainty is particularly problematic for government-sponsored R&D. As private technology investment has grown and become more globalized, the share of R&D funded by the U.S. government decreased significantly.[112] Defense contractors and their systems are, therefore, increasingly dependent on commercial technology, especially for information systems, sensors, and computer processing. Because commercial investments will not address specialized military capability needs like electronic warfare systems or munitions, DoD R&D spending is concentrated on specific areas that are now highly dependent on stable government funding. In addition to disrupting this research, budget uncertainty erodes the attractiveness of defense research to potential new technologists.

Conclusion

History highlights the challenges to sustaining U.S. maritime power. In addition to inadvertent damage imposed by government decisions, the U.S. commercial maritime sector is subject to market and non-market forces such as the outbreak of conflicts and heavily subsidized foreign competition. Because of these domestic and exogenous factors, the U.S. maritime industry is on a path toward continued decline, promising deleterious impacts on U.S. economic prosperity and national security. New policies and initiatives are needed to revitalize the maritime industry and ensure the United States is able to pursue its national security interests. Those recommendations are addressed in the final two chapters of this report.

111 DoD, *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States*, Interagency Task Force in Fulfillment of Executive Order 13806, Report to the President, September 2018, available at https://media.defense.gov/2018/Oct/05/2002048904/-1/-1/1/ASSESSING-AND-STRENGTHENING-THE-MANUFACTURING-AND%20DEFENSE-INDUSTRIAL-BASE-AND-SUPPLY-CHAIN-RESILIENCY.PDF.

112 "Global Research and Development Expenditures," fact sheet, Congressional Research Service, available at https://fas.org/sgp/crs/misc/R44283.pdf with graphs.

CHAPTER 3

Recommendations

The United States depends on the sea for resources, trade, transportation, and national security. Without a healthy maritime industry, America will be unable to foster and protect the benefits that come from its access to the sea, extensive coasts, EEZs, and inland waterways. As described in the previous chapters, several trends eroded the NMIB during the last decade, leaving it able to support the day-to-day needs of U.S. government and commercial fleets, but without the resilience to withstand shocks such as natural disasters and economic downturns or the capacity to surge in response to national security or humanitarian crises. The main challenges facing the NMIB, as described in the previous chapters, are:

A shortage of cargo and tanker capacity for surge sealift operations. The U.S. government and commercial fleets likely do not meet today's cargo requirements and fall far short of the tankers needed for projected wartime demands. These shortfalls will only get worse as large portions of the aging MARAD and MSC surge sealift fleets retire during the next decade.

Too few mariners to operate surge sealift. Even if DoD is able to mobilize sufficient ships to move cargo and fuel in wartime, these operations will be hindered by a lack of mariners to crew oceangoing ships for protracted operations.

A shrinking shipbuilding industry. The number of shipbuilders constructing multiple ships per year is shrinking. Several U.S. shipyards, such as Philly Shipyard in Philadelphia, face closure due to a lack of orders.[113] Fewer shipyards will reduce the options for building small government patrol, survey, and support ships, which by themselves are not consistent enough to keep shipyards in business. The shrinking ship construction industry will also reduce capacity to build or repair ships during a conflict.

A lack of private repair yard capacity, especially dry docks. West Coast private ship repair yards have only half as many dry docks as repair yards on the East Coast, although 60

113 Costas Paris, "Philadelphia Shipyard Fights Again for Its Life," *Wall Street Journal,* April 17, 2019.

percent of the Navy fleet is on the West Coast. To compensate, ships are sometimes moved to the East Coast when they are due for dry docking, schedules are changed to ensure West Coast dry docks are available, or maintenance is deferred. Each of these measures can reduce the operational availability of ships now and in the future.

Aging and inefficient infrastructure at government shipyards. The poor layout and lack of certain facilities at public shipyards adds significant hours to each maintenance task, while a shortage or outright lack of appropriate dry docks precludes some maintenance from being done at all. The Navy has shifted some overhauls and other maintenance to private shipyards that also build ships, which could negatively impact new construction unless shipbuilders make new infrastructure and workforce investments.

The U.S. government should revise its policies and investments to address the challenges described above and help the maritime industrial base more effectively meet demands for commerce, crises, and conflict. The analysis performed in connection with this study suggests the following recommended actions, organized around the themes of creating and implementing a national maritime strategy, restoring the U.S. Merchant Marine, and improving the U.S. shipbuilding and repair industry.

These recommendations assume that the current maritime industry regulatory and governance framework remains in place. Specifically, the U.S. government should maintain the Jones Act in place and expand or improve the MSP and Cargo Preference programs as noted below.

Create and Implement a U.S. National Maritime Strategy

A national maritime strategy is needed to help organize, guide, and support the efforts of the NMIB and relevant U.S. government agencies to foster U.S maritime power. The strategy should identify actionable means to strengthen U.S. maritime power and designate specific metrics to track progress over time.

The concept of national maritime strategy is not new or unique to the United States. As discussed in Chapter 1, the U.S. Congress and several presidential administrations attempted to promote an integrated approach to building U.S. maritime power. More recently, as discussed in Chapter 2, the PRC adopted an integrated maritime strategy. The Chinese government's investment in the People's Liberation Army Navy, China Coast Guard, People's Maritime Militia, and state-owned shipping companies created the world's largest government and commercial fleets and fostered the development of a robust domestic shipbuilding industry. It has also gained port access around the world for commerce, logistics, and naval operations through the BRI.[114] Over time, this comprehensive maritime power may enable the Chinese government to indirectly restrict U.S. access to markets and shipping routes, reshaping the global maritime order.

114 This is consistent with the popular phrase "rich country, strong army" (富国强兵. fù guó qiáng bīng) from the Legalistic Chinese text *Strategies of the Warring States* (战国策, Zhàn Guó Cè). Of note, this phrase also became a Japanese national slogan during the Meiji Period. James Holmes, "Mahan is Alive in China," *National Interest*, July 7, 2004.

In contrast to China's integrated maritime strategy, during the past few decades the United States has adopted a predominantly military strategy designed to synchronize missions and capability priorities between the U.S. Navy, Marine Corps, and Coast Guard, but not at the whole-of-society level.[115] The 2015 *Cooperative Strategy for 21st Century Seapower* asserted that "seapower has been and will continue to be the critical foundation of national power and prosperity and international prestige for the United States of America. Our Sea Services will integrate with the rest of our national efforts, and those of our friends and allies."[116] Nonetheless, the strategy did not discuss cooperation, much less integration, with MARAD and the broader Merchant Marine. Similarly, Chief of Naval Operations Admiral John Richardson's 2016 *Design for Maintaining Maritime Superiority* cited how Alfred Thayer Mahan helped chart the nation's course toward increased prosperity, "arguing that American growth required access to overseas markets, which in turn required a preeminent navy to protect that access."[117] However, the document failed to discuss the role of a strong U.S. Merchant Marine in providing access to those same markets. Admiral Richardson's "Design 2.0" document and current Chief of Naval Operations Admiral Michael Gilday's "Fragmentary Order 01/2019" fail to do the same.[118]

The U.S. government should develop, release, and implement a comprehensive national strategy to foster U.S. maritime power as well as strengthen and increase the competitiveness of the maritime industrial base. Although Congress called for the DOT to develop such a strategy in 2014, as of early February 2020 it has yet to be published.[119]

115 Seth Cropsey and Bryan McGrath have observed the United States' dangerous experiment of pursuing naval power, while undervaluing other components of its maritime power. They state: "These issues with America's maritime industry, and its industrial base more broadly, indicate a distinct lack of comprehension of the connection between global maritime and naval power. Somewhat surprisingly, America has been able to sustain its maritime power with solely naval strength. Mahan's study of the Dutch maritime decline indicates the Dutch focus erred by constructing a merchant fleet without a blue-water navy to protect it. America has made the opposite mistake—its navy grew in strength throughout the 20th century, while its merchant fleet steadily declined." Seth Cropsey and Bryan McGrath, *Maritime Strategy in a New Era of Great Power Competition* (Washington, DC: Hudson Institute, 2018), p. 19.

116 *A Cooperative Strategy for 21st Century Seapower*, Revised, U.S. Navy, U.S. Marine Corps, and U.S. Coast Guard, 2015, available at http://www.navy.mil/local/maritime/150227-CS21R-Final.pdf.

117 John M. Richardson, "A Design for Maintaining Maritime Superiority," U.S. Navy, Version 1.0, January 2016, https://news.usni.org/wp-content/uploads/2016/01/Design_Final.pdf#viewer.action=download.

118 Michael Gilday, "Fragmentary Order 01/2019: A Design for Maintaining Maritime Superiority," U.S. Navy, December 4, 2019, available at https://www.navy.mil/cno/docs/CNO%20FRAGO%20012019.pdf.

119 "In 2014, Congress statutorily mandated that the DOT develop two national strategies related to the U.S.-flag fleet, one a national sealift strategy focused on ensuring the long-term viability of the U.S. Merchant Marine (U.S. flag vessels and U.S.-citizen mariners) and the other a national maritime strategy focused, among other things, on increasing the competitiveness of internationally trading U.S.-flag vessels." Andrew Von Ah, *DOT Needs to Expeditiously Finalize the Required National Maritime Strategy for Sustaining U.S.-Flag Fleet* (Washington, DC: GAO, 2018), p. 10, available at https://www.gao.gov/products/GAO-18-478.

Restore the U.S. Merchant Marine

The U.S. Merchant Marine plays a critical role supporting the U.S. economy through conducting trade and harvesting resources such as oil and gas from the ocean floor. Its ships and sailors help ensure U.S. strategic autonomy and access to the global economy. The U.S. Merchant Marine also plays an important role in providing sealift capacity and mariners for U.S. military sustainment and force projection. In addition to maintaining the Jones Act, restoring the U.S. Merchant Marine will require a mix of market, policy, and regulatory incentives to bolster U.S.-flagged shipping and help ensure an appropriately sized merchant sealift ship and mariner force.

Expand the Maritime Security Program

The current MSP offers a stipend to 60 U.S.-flagged ships from FY 2016 through FY 2035. At a relatively low cost compared to acquiring, crewing, and maintaining additional government ships, the MSP provides DoD access through VISA to commercial vessels, mariners, and associated global intermodal networks.[120] By supporting the operation of U.S.-flagged ships in commerce around the world, the MSP also contributes to U.S. tax revenue and commercial access. However, the government could improve the program's effectiveness by stabilizing the MSP stipend, expanding MSP to cover sealift shortfalls and replacement of aging government-owned ships, and bringing specialized ship types into the MSP that are expensive for the government to buy and maintain.

Stabilize the MSP stipend. The MSP stipend is authorized at $5.3 million per ship for 2020, consistent with industry estimates of the higher cost of operating under U.S. flag with U.S. citizen crews and ownership. MARAD, however, has sometimes requested lower amounts for MSP in its budget proposals. For example, the FY 2019 President's Budget Request included only $214 million for MSP, which would have resulted in a $3.6 million stipend per ship.[121] Although Congress eventually appropriated the full stipend they authorized, uncertainty in the MSP stipend amount may increase the likelihood shipping companies would leave the program. Therefore, Congress and future presidential administrations should ensure MSP is fully funded at the levels authorized and regularly renew the 15-year authorization for the program.[122]

120 "A 2006 study for the National Defense Transportation Association estimated that it would cost approximately $13 billion to replicate the RO/RO and containership capacity of MSP vessels and $52 billion to replicate the intermodal networks provided by MSP vessel operators." National Defense Transportation Association, *The Role of the United States Commercial Shipping Industry in Military Sealift*, prepared for Military Sealift Committee (Yarmouthport, MA: Reeve and Associates, August 2006).

121 Statement of Mark H. Buzby, Administrator, MARAD, DOT, Before the Committee on Armed Forces, Subcommittee on Seapower and Projection Forces and Subcommittee on Readiness, U.S. House Of Representatives Hearing on Mobility and Transportation Command Posture, 8 March 2018.

122 Of note the National Defense Authorization Act for Fiscal Year 2020 did increase the MSP stipend amount and increased the length of the program from ten to fifteen years. These changes provide carriers greater long-term stability to plan and execute ship recapitalizations and reflaggings. Section 3502. Reauthorization of Maritime Security Program, S. 1790: National Defense Authorization Act for Fiscal Year 2020.

Expand MSP participation. In addition to restoring the MSP's stability, MARAD should increase the number of participating MSP ships from the current 60 to fill gaps in strategic sealift and replace ships in the MARAD Ready Reserve Force and MSC Surge Fleet that are reaching the end of their service lives. Expanding the MSP and VISA would exchange aging, inactive government sealift ships for newer, fully crewed ships currently in operation. Each MSP ship also includes about 42 mariners, approximately half of which would be on leave and available to crew remaining inactive government sealift ships.[123]

Although commercial vessels like those in the MSP may not be as militarily useful as purpose-built sealift ships, they can provide the basic storage and onload and offload capability needed for strategic sealift.[124] MSP ships could be upgraded to improve their utility.[125] For example, RO/ROs could incorporate higher capacity ramps, taller loading doors, and a secure radio room. In general, these additions would inject the minimum number of low-cost modifications to a ship's design to disproportionally increase its military utility, and without decreasing the commercial competitiveness of the vessel. An expanded MSP would require increasing the MSP stipend to offset a likely decrease in the amount of available preference cargo per ship in the fleet. As with today's MSP, new ships entering the MSP would likely be foreign-built, although loan guarantees could be provided by the U.S. Government to incentivize U.S construction of MSP ships.

An expanded MSP could also be used to replace Afloat and Maritime Prepositioning Squadron (APS/MPS) ships with U.S.-flagged chartered vessels. MSP vessels would not receive their stipends while under charter because they are not conducting commercial shipping during that time. Shipping companies would man and maintain chartered prepositioning ships in a standby status as with today's government-owned Prepositioning Fleet, rotating them back into commercial service every two to three years. This option could be used to replace today's APS/MPS ships at the end of their service lives, but the flexibility of chartered ships would also allow changes to the size, configuration, location, or readiness status of the Prepositioning Fleet to support evolving naval strategies.

Incorporate specialized ships and tankers into MSP-like programs. The MSP could also be used to provide infrequently needed specialized ships that are expensive to buy and maintain in government service. For example, the FY 2020 National Defense Authorization Act (NDAA) established a Cable Security Fleet that provides stipends for U.S.-flagged cable-laying ships. The stipend should allow these vessels to remain commercially competitive while being available to DoD for national security missions such as repairing undersea

123 Maritime Workforce Working Group Report, MARAD, 2017, p. 27.

124 For example, on average MSP RO/ROs provide approximately 167,000 square feet of militarily useful space. This is compared to an average of 187,000 and 387,000 square feet of militarily useful space on MPF Bobo-class and MSC Surge Fleet Bob Hope-class ships, respectively.

125 Of note, currently, Navy-funded National Defense Features are only authorized for U.S.-built ships. In order to allow foreign-built, U.S.-flagged MSP ships to receive National Defense Features funding, legislation would have to be changed or they could be funded via other means.

communication cables or sonar arrays. The same approach could be applied to Float-on/Float-off (FLO/FLO) vessels used to transport other ships overseas. An MSP-equivalent could incentivize currently foreign-flagged and operated FLO/FLOs to join the U.S. fleet.[126]

As described in Chapter 1, DoD faces a gap of approximately 76 fuel tankers to meet surge sealift requirements. A Tanker Security Program (TSP) would be a rapid and cost-effective means to help address this gap, which the Congress directed DoD to study as part of the FY 2020 NDAA.[127] Alternatively, the MSP could be expanded to include tankers with an appropriate stipend. In either case, tankers would likely be foreign-built, but the U.S. Government could incentivize U.S. construction through loan guarantees.

The stipend for tankers under MSP or a new TSP would need to be higher than that for cargo vessels to cover the greater cost of operating and maintaining a tanker. It would also need to account for the limitation that tankers generally could not carry both U.S. government and commercial fuel simultaneously.[128] Because of this constraint, tanker operators need to decide whether to be U.S.-flagged and uncompetitive compared to foreign tankers, relying on U.S. government stipends and fuel cargoes, or be foreign-flagged and able to compete, but not allowed to carry government fuel.[129] Therefore, although cargo vessels in MSP receive a $5.3 million stipend, tankers would need a stipend of $6 million to $7.5 million if sufficient government fuel shipments were available to keep MSP or TSP tankers employed. If sufficient fuel shipments are not available, the stipend may need to be $10–11 million per ship to enable tankers to be viable.[130]

126 CSBA market research indicates the current annual stipend of $5.3 million per vessel would be inadequate to offset FLO/FLO operating differentials. However, a specialized annual stipend of $8.5 to $12 million may incentivize operators to join the U.S.-flag fleet.

127 U.S. Congress, "National Defense Authorization Act of 2020," U.S. Government Printing Office, Section 3511, available at https://www.congress.gov/bill/116th-congress/house-bill/2500/text.

128 First, tankers are technically more complex and require more maintenance (especially for pipes, pumps, and tanks) than dry cargo ships. As a result, U.S.-flag tankers are more expensive to operate than dry cargo ships. Second, the level of preference cargo (U.S. government-impelled cargoes that must be transported by U.S. ships) available to tankers is less than that available to dry cargo operators, since the U.S. Defense Logistics Agency Energy (the DoD entity responsible for acquiring and managing bulk fuels) frequently procures fuel products as economically as possible close to the point of use (at times using pipelines rather than tankers). Accordingly, the distance tankers operate on behalf of DLA is relatively short (earning tanker operators less revenue to cover fixed operating costs). In contrast, dry cargo operators generally carry cargoes sourced in the United States to distant locations. Third, dry cargo operators can frequently transport both U.S. government cargoes and commercial cargoes on the same ship; in contrast, tankers can only carry cargo for one party. Finally, under current MSP rules and the MSP Operating Agreement, tanker operators cannot collect MSP retainer payments while under charter to DoD (such as time charters by the Military Sealift Command).

129 Of note, MARAD withholds payments for whole vessel charters to the U.S. government under the general rule against double payments by the U.S. government. However, a carrier could still receive MSP payments for non-time charter situations.

130 These estimates are based on CSBA market research on the costs of operating a tanker under U.S. flag and the prices paid for transporting fuel overseas.

Under the proposed TSP, militarily useful tankers would participate in the Voluntary Tanker Agreement, be equipped with capabilities for delivering fuel at sea via CONSOL tanking, and carry crews trained to support military operations during contingencies. As with the MSP, tanker operators could participate in the program while carrying preference cargo. During periods in which they were chartered by the U.S. government, the tanker stipend could be decremented by an appropriate amount.

Increase government cargo

In addition to the MSP stipend, U.S. government cargo is another major source of income that aids U.S.-flagged carriers in balancing their higher cost compared to foreign-flagged ships. The current MSP stipend covers about 80 percent of the operating cost differential between U.S. and foreign-flagged vessels, making the higher prices carriers charge for U.S. government cargo an important element of balancing U.S. shipping companies' books.[131] Two significant developments, however, have reduced the level of U.S. government cargo shipped by U.S. carriers: a smaller military presence in Eurasia as the U.S. military withdrew substantially from Iraq and Afghanistan and the increased use of cash payments instead of direct food aid in U.S. foreign assistance programs.[132]

The U.S. government should take action to increase government cargo shipments and improve compliance with and enforcement of Cargo Preference laws, regulations, and policies. One of the lowest-cost and highest-impact opportunities to increase U.S. government cargo is for DoD to increase its purchase of fuel from U.S. refineries, which would need to be shipped in U.S.-flagged tankers. Purchasing a larger portion of DoD fuel from U.S. rather than foreign refineries would grow the U.S.-flagged tanker fleet, provide additional business to the U.S. energy industry, and increase the security of the U.S. military operational fuel supply. If DLA Energy shifted purchases of all tanker-delivered overseas fuel, equal to approximately 6.9 million barrels, and 25 percent of pipeline-delivered overseas fuel, equal to approximately 5.75 million barrels, from foreign to U.S. refineries, the resulting increase in fuel shipments would require seven additional tankers.[133] These tankers could be enrolled in the TSP to provide additional surge tanker capacity for overseas contingency operations.

131 Von Ah, *DOT Needs to Expeditiously Finalize the Required National Maritime Strategy for Sustaining U.S.-Flag Fleet*, p. 17.

132 John Frittelli, *Cargo Preferences for U.S.-Flag Shipping* (Washington, DC: Congressional Research Service, 2015), p. 8.

133 While DLA should pursue these goals, it could partially waive these targets if necessary (in contingencies or if demand cannot be reasonably met by U.S. refineries). Analysis of U.S. refinery capacity from U.S. Energy Information Agency data suggests U.S. refineries would be capable of meeting these higher demands, especially if implemented over a period of a few years. Data for analysis drawn from Defense Logistics Agency (DLA) Energy, "Fiscal Year 2017 Fact Book," DLA briefing slides, December 2017, slide 48, available at www.dla.mil/Portals/104/ Documents/Energy/Publications/E_ Fiscal2017FactBookLowRes2.pdf; and Military Sealift Command (MSC), *2017 in Review: Empowering Global Warfighting Capabilities* (Norfolk, VA: MSC, 2018), p. 50, available at https://www.msc.navy.mil/annualreport/2017/ MSCAnnual17.pdf.

Another measure to increase U.S. government cargo is to mandate that energy companies transport a gradually increasing portion of exported crude oil on U.S.-built and U.S.-flagged tankers.[134] This approach would increase the number of U.S.-flagged tankers engaged in the crude oil trade. During a conflict, tankers could be cleaned in a matter of weeks if necessary and loaded with military fuels. Table 3 shows the impact of the gradual implementation of such a plan.

TABLE 3: POTENTIAL IMPACT OF ENERGY EXPORTS ON U.S.-BUILT AND U.S.-FLAG SHIPS ON TANKER AND MARINER NUMBERS

Percent of Product to Travel on U.S.-Built and U.S.-Flagged Vessels		Date	Estimated Required Number of Tankers to Meet Requirement		Estimated Number of Additional U.S. Mariners Generated
LNG	Crude Oil		LNG Tankers	Crude Oil Tankers	
0%	1%	2023	0	3	150
2%	1%	2024	3	3	300
3%	4%	2026	4	12	800
5%	4%	2028	7	12	950
5%	8%	2029	7	24	1,550
7%	8%	2030	10	24	1,700
8%	10%	2032	12	31	2,150
10%	10%	2034	16	31	2,350
11%	10%	2036	18	31	2,450
13%	10%	2038	22	31	2,650
15%	10%	2040	25	31	2,800

Table percentages, dates, and tanker numbers drawn from the "Energizing American Shipbuilding Act" bill. Mariner estimates assume an average of 25 crew members per tanker and that there are two mariners for every tanker billet, since commercial mariners typically work six months at sea and receive six months of shore leave.

In addition to growing the amount of U.S. government cargo shipped, existing Cargo Preference laws, regulations, and policies could be more effectively enforced on U.S. government agencies and defense contractors. Reports suggest government and vendor shippers sometimes circumvent rules requiring the use of U.S.-flagged carriers by scheduling shipments when an acceptable U.S.-flagged vessel is not available or by modifying or recharacterizing items to consider them as commercial rather than U.S. government property.[135]

134 The Energizing American Shipbuilding Act of 2018, introduced into the House by Congressman John Garamendi and into the Senate by Senator Roger Wicker, proposes this approach for crude oil and liquefied natural gas exports. "Energizing American Shipbuilding Act," S.2916, 115th Congress, 2017–2018, available at www.congress.gov/bill/115th-congress/senate-bill/2916/text.

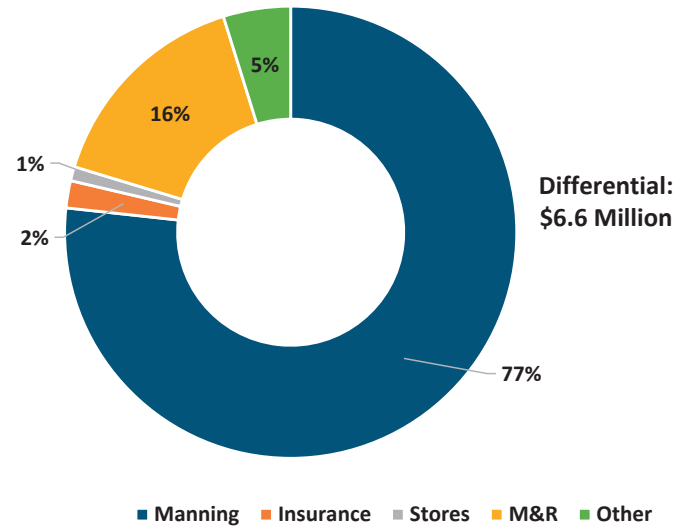
135 The 1994 Federal Acquisition Streamlining Act (FASA) exempted "commercial items" from the U.S-flag requirement. Since then, however, some defense agency acquisition officials have allowed DoD subcontractors to use foreign-flag ocean transportation for the shipment of cargo that is clearly identifiable to a DoD contract at the time of shipment. In a particularly egregious case, a prime contractor used a foreign subsidiary to purchase dozens of "commercially available" military-grade helicopters manufactured abroad and added communications equipment to claim the "value added in the U.S." enabled the prime contractor to avoid using U.S.-flag ships. W.A. Brown, "Cargo Preference Regulations in DoD Contracting," National Defense Transportation Association, January 2019.

To deter Cargo Preference avoidance and violation, MARAD should regularly exercise its authorities to conduct 45-day administrative reviews of contracts for Cargo Preference compliance and recommend suspension and debarment of violators. The government should also eliminate the exception that allows equipment or supplies that can be characterized as "commercial off-the-shelf" to avoid Cargo Preference requirements.

Reform taxes and regulations

Tax and regulatory reforms are the third class of major initiatives Congress and the Administration should pursue to encourage a robust Merchant Marine. In addition to providing government revenue, taxation also creates financial incentives and disincentives.[136] Unfortunately, many U.S. tax policies and regulations toward the maritime industry are outdated and disincentivize new entrants or expansion by increasing the cost of operating U.S.-flagged ships compared to foreign alternatives. As shown in Figure 18, there is a $6.6 million cost differential between U.S. and foreign-flagged vessels, and operating cost data for MSP vessels indicates that the differential has grown larger in recent years: from $4.6 million in 2010 to $6.6 million in 2017.

FIGURE 18: OPERATING COST DIFFERENTIAL BY COST CATEGORY (2017)



Drewry Maritime Research (for foreign vessel operating cost data) and MARAD (for U.S.-flag vessel operating cost data). U.S.-flag vessel operating costs are submitted to MARAD by U.S.-flag carriers as a condition of their enrollment in the MSP.

136 As an example of disincentives in industry, the Tax Reform Act of 1986 repealed a Subpart F of the U.S. Internal Revenue Code that exempted payment of taxes on foreign earnings of U.S.-owned Flag of Convenience (Foreign Flag) ships provided those earnings were reinvested in qualified shipping assets (in particular fleet replacement). This contributed to a reduction in the number of U.S. flag tankers from 246 tankers in 1986 to 126 tankers in 2000. The 2004 American Jobs Creation Act restored the Subpart F tax deferral. "An Evaluation of Maritime Policy in Meeting the Commercial and Security Needs of the United States," *IHS Global Insight*, January 7, 2009, p. 31, available at http://www.ihsglobalinsight.com/gcpath/MARADPolicyStudy.pdf.

Personnel costs account for the largest share of the difference between U.S. and foreign-flagged ship operating expenses, and they include compensation, insurance, taxes, and workplace safety requirements that drive up the cost per mariner on U.S.-flagged ships. To reduce the difference and make U.S.-flagged shipping more competitive, U.S. merchant mariners should be granted tax status similar to that available for nearly all other Americans who work outside the United States.[137] Lowering or rebating taxes on overseas earnings would reduce expenses for ship operators and enable mariners to keep more of their income, improving the attractiveness of joining the U.S. Merchant Marine.

After manning costs, maintenance and repair is the second-largest driver of higher operating costs for U.S.-flagged ships. Under the Tariff Act of 1930, a 50 percent ad valorem duty is imposed on U.S.-flagged owners for non-emergency repairs of U.S.-flagged vessels in foreign ship repair yards.[138] Many U.S. carriers still use foreign shipyards, however, because the cost of performing repairs overseas and paying the duty is often lower than the cost of navigating the ship back to a U.S. port and conducting repairs in a U.S. yard.[139] In effect, the duty is a tax on oceangoing U.S.-flagged ships that fails to provide additional work for U.S. ship repair yards. The ad valorem duty should be eliminated, which would reduce costs and improve the ability of U.S.-flagged ships conducting international trade to participate in pooling agreements that keep ships working among foreign ports.[140]

Bolster intermodal logistics

An essential element of maritime transportation is the intermodal links that move cargo or passengers between ships and trucks, barges, trains, or aircraft. Supporting these intermodal links will require an emphasis on dredging and infrastructure connecting ports with railways

137 Most maritime nations (such as the United Kingdom) are granted a complete tax rebate on income earned on vessels in international trade. Implementing a similar approach in the United States, such as a complete tax rebate or exempting from federal tax the first $90,000 dollars of income earned by U.S. mariners working aboard U.S. flag vessels in international trade would give U.S. ship operators a level playing field with other nations and would grant U.S. merchant mariners tax status similar to that available for nearly all other Americans who work overseas. The Joint Committee on Taxation estimated the mariner tax exemption proposal in February 2004, at $142 million for five years. "An Evaluation of Maritime Policy in Meeting the Commercial and Security Needs of the United States," p. 32. MARAD's 2017-2021 strategic plan identifies "income tax relief and liability insurance reform" as promising areas to reduce the operating cost differential between U.S. and foreign-flagged ships. MARAD, *Maritime Administration Strategic Plan Navigating the Future 2017-2021*, p. 15, available at https://www.marad.dot.gov/wp-content/uploads/pdf/MARAD-Strategic-Plan-2017-2021-20170119-Final-signed.pdf.

138 19 U.S.C. § 1466(a).

139 Joseph Keefe, "Electrocuted," *American Maritime Professional,* May 5, 2017, available at https://www.maritimeprofessional.com/blogs/post/electrocuted-15206.

140 This change would not affect regulations pertaining to U.S.-built vessels engaged in U.S. domestic commerce. Specifically, rules regarding the addition of more than 7.5 percent of a vessel's steelweight to the "hull and superstructure" would remain in effect. Charlie Papavizas, "U.S. Coast Guard Issues Jones Act Build and Rebuilt Guidance," Winston & Strawn, LLP, Aug 1, 2017, available at https://www.winston.com/en/maritime-fedwatch/u-s-coast-guard-issues-jones-act-build-and-rebuilt-guidance.html.

and highways.[141] Today, the higher cost or lower efficiency importers experience in some U.S. ports incentivize them to bring cargo into a Canadian or Mexican port and transport it via rail or tuck into the United States.

To deter diversion of cargo to Mexican or Canadian ports and fund modernization of U.S. intermodal links, U.S. Customs and Border Protection should, as part of the Merchandise Processing Fee, apply an additional fee equivalent to the Harbor Maintenance Tax to U.S. imports that originate in countries other than Canada and Mexico but are transported to the U.S. via a port in Canada or Mexico.[142] Like the Harbor Maintenance Tax, the fee would be borne by the importer of the goods, and the fee would be imposed when the goods enter a United States taxing jurisdiction. Additional receipts collected from the Merchandise Processing Fee could be used to fund modernization of U.S. intermodal infrastructure, with a focus on port and rail links, to lower the cost of importers bringing goods directly to U.S. ports.

Improve Merchant Marine recruiting and retention

The U.S. Merchant Marine needs to recruit more mariners for surge sealift in addition to the next generation of sailors. Recruitment is generally strong for the U.S. Merchant Marine Academy and the six state maritime academies because they offer free or subsidized college educations. For non-officer ratings, MARAD should more aggressively promote U.S. maritime industry recruitment through the Department of Labor's Job Corps and other vocational programs.

The attractiveness and ease of beginning a maritime career could be enhanced if the Coast Guard were to align its mariner license exam with International Maritime Organization (IMO) requirements and accept IMO credentials for Coast Guard licensing. This approach would allow mariners to study for a single set of requirements rather than two, decreasing the cost and level of effort required to join the workforce. Similarly, consistent with Executive Order

141 For example, Canadian ports are increasingly drawing business away from Ports of Seattle and Tacoma them. Guided by a whole-of-government Asia-Pacific Gateway Initiative strategy and leveraging hundreds of millions of dollars in grants to improve their port facilities and railroad links, the Canadian ports of Vancouver and Prince Rupert have, as planned, handled a growing portion of U.S.-bound cargo, resulting in a 15 percent reduction in Seattle and Tacoma port market share and diverting cargo that would have gone to the U.S. ports. This cargo diversion dynamic increases the competitiveness of Canada as a shipping destination and in turn decreases the export shipping costs for Canadian businesses, while raising it for American ones. Jeff Burghardt, Arthur DeFehr, and T. Richard Turner, "Asia Pacific Gateway and Corridor Initiative (APGCI), Report and Recommendations," 2007, available at http://artdefehr.com/documents/bl190-a-asia-pacific-gateway-report-may-28-07-final.pdf; and John McCarthy, "Building Infrastructure in America," Testimony Delivered to the Transportation and Safety Subcommittee of the U.S. Senate Committee on Commerce, Science, and Transportation, January 28, 2020, available at https://www.commerce.senate.gov/2020/1/building-infrastructure-in-america-overview-of-the-build-america-bureau-and-the-u-s-department-of-transportation-rural-transportation-initiatives.

142 "User fee - Merchandise Processing Fees," U.S. Customs and Border Protection, available at https://help.cbp.gov/s/article/Article-334?language=en_US.

13860, the Coast Guard should accelerate its efforts to recognize U.S. Armed Forces mariner training for the purposes of mariner licensing.[143]

The U.S. government should also formalize the role of merchant mariners. In spite of the fact they may be called upon to serve in conflict zones, Merchant Marines are civilians and would not receive veteran's benefits. Many mariners express concern about this disparity and may be unwilling to serve during a major conflict.[144] To alleviate this concern and improve mariner retention, Congress should establish a Merchant Marine Reserve similar to military reserve components. Members would receive basic training on naval operations and financial support to keep their licenses active. If individual members are activated during a conflict, they would be eligible to receive veteran's benefits.

Strengthen the Shipbuilding and Repair Industry

U.S. government reforms should address the growing national security role of shipyards that construct mostly commercial vessels. These shipbuilders will be central to the recapitalization of the aging strategic sealift force, the construction of smaller and non-combatant Navy and Coast Guard ships, and the rebalancing of the U.S. Navy's surface fleet toward small surface combatants and small or medium amphibious ships.[145] As noted in Chapter 1, the Jones Act's requirements help provide a baseline of demand to sustain these smaller shipyards that should be maintained.

Better integrate commercial and government shipbuilding and repair

To promote stability for U.S. shipbuilding and repair, the U.S. government should take steps to better coordinate commercial and U.S. government construction and maintenance activities.[146] To procure long-lead items like motors and generators, however, shipbuilding orders need to be placed months to a year before construction. The cost of new ships also incentivizes commercial shipping companies to plan shipbuilding investments in advance, alongside other major capital expenditures such as manufacturing facilities or enterprise computer networks.

143 Donald J. Trump, "Executive Order on Supporting the Transition of Active Duty Service Members and Military Veterans into the Merchant Marine," White House, March 4, 2019, available at https://www.whitehouse.gov/presidential-actions/executive-order-supporting-transition-active-duty-service-members-military-veterans-merchant-marine/.

144 John Konrad, "Admiral, I Am NOT Ready for War," *gCaptain*, May 8, 2019, available at https://gcaptain.com/editorial-admiral-i-am-not-ready-for-war/?utm_campaign=twitter&utm_medium=twitter&utm_source=twitter.

145 For information on strategic sealift and auxiliary demands, please see Walton, Boone, and Schramm, *Sustaining the Fight*. For information on surface combatant and amphibious ship demands, please see Bryan Clark and Timothy Walton, *Taking Back the Seas: Transforming the U.S. Surface Fleet for Decision-Centric Warfare* (Washington, DC: Center for Strategic and Budgetary Assessments, 2019).

146 In 1968 while on the campaign trail Richard Nixon gave a speech in Seattle titled "Restoring the U.S. to the Role of a First-Rate Maritime Power." He stated: "The new Administration's maritime policy will seek a higher level of coordination between naval and merchant shipbuilding. In that way, we can create a climate in which shipbuilding can attract the capital, as well as the stable labor force, needed to make it competitive with foreign yards and to provide an expansion base for national emergencies." Maritime Administration Authorization, 1970: Hearings, Ninety-first Congress, First Session, on H.R. 4152, United States Congress House of Representatives, Committee on Merchant Marine and Fisheries, U.S. government Printing Office, December 31, 1969, p. 104.

MARAD could take advantage of the need for advance planning of commercial ship orders by collecting voluntary inputs from commercial operators on their anticipated ship construction during the next one to five years. Major ship repairs such as overhauls are also often planned a year or more in advance and could be incorporated into this survey. Commercial inputs would be compared with anticipated U.S. government ship construction and maintenance described in long-term plans of the Navy, Coast Guard, Army, NOAA, and other agencies. For shipyards that do not exclusively build Navy ships, this analysis would identify opportunities for the government to adjust its plans to level the demand on the shipbuilding and repair industry and stabilize infrastructure utilization and workforce levels.[147] A better-integrated shipbuilding effort between government and commercial carriers could also allow the government to take industrial policy actions such as continuing production of a ship in anticipation of commercial orders at the same shipyard.

The costs of government shipbuilding could be reduced if commercial standards were applied to a greater degree in military ship construction Although most non-combatant government ships are built to commercial survivability and operational standards, military vessels apply standards that in many cases predate the advent of computer-assisted or automated systems. Some military standards also do not acknowledge the ability of commercial-grade components such as valves, pumps, or electrical distribution systems to perform adequately in military applications, often due to a lack of testing or analysis of modern commercial systems. The Navy should make a concerted effort to assess military against commercial standards for ship construction and adopt the commercial standard where possible to improve commonality, which would reduce costs for components and may improve construction efficiency of vessels built at shipyards that also build commercial vessels.

Revise Navy maintenance contracting

The shortage of private dry docks on the U.S. West Coast impacts Navy ship schedules and reduces maintenance efficiency. The Navy's recent introduction of a long-term maintenance plan may provide West Coast shipyard operators the confidence to build more dry docks, but the Navy's continued use of MAC-MO contracting disincentives investment in shipyard infrastructure and workforces. By contracting each maintenance period as an individual project with only 90-180 days' notice, the Navy does not provide shipyard owners a reliable return on investment for dry dock construction.

The Navy's previous contracting mechanism, Multi-Ship-Multi-Option (MSMO), contracted ship repair yards to conduct multiple ship maintenance periods over several years. The long-term nature of this contracting approach, however, did not "lock-out" shipyards that did not win the contract because there was enough work for all the local shipyards to remain utilized.

147 Of note the Navy makes these types of decisions today, usually by extending production of ships at certain shipyards in order to keep it competitive for future programs. However, the process can be haphazard and insufficiently accounts for private shipyard demand.

Following contract award, ship repair yards in a region would cooperate to subcontract work to each other, which had the effect of level-loading manhours between them. The primary problem with MSMO contracting was overruns, primarily because the contracts were "cost-plus," under which repair yards were reimbursed for additional or unplanned work performed during a maintenance period.[148]

The Navy should replace its current MAC-MO contracting mechanism with a version of MSMO contracts that use firm-fixed-price delivery orders rather than cost-plus. MSMO contracts with an overall cost cap and firm-fixed-price delivery orders for each maintenance period would help the government control costs relative to cost-plus MSMO contracts. This new approach would also provide shipyards a better-defined workload for the upcoming year or longer that would incentivize workforce and infrastructure planning and investment.

To enable firm-fixed-prices to be established, the Navy and shipyards could apply analysis of maintenance needs from the Navy's Regional Maintenance Centers (RMC) and Surface Maintenance Engineering Planning Program (SURFMEPP). Using the insights from SURFMEPP's ship-by-ship analysis of ship condition and likely maintenance requirements, RMCs could provide more specificity in requests for proposals and better assess repair yard bids. Maintenance planning and analysis could also help evaluate changes proposed by repair yards during maintenance periods and determine whether new problems should be fixed immediately or deferred to a future maintenance period.

Identify critical shipbuilding suppliers in need of support

The modern shipbuilding and repair industry draws equipment and parts from a web of U.S. and foreign suppliers. The complexity of the supplier base, particularly two or three tiers below the shipbuilder, sometimes obscures that one or two manufacturers are the only sources for key components that are being used by all shipbuilding and repair yards. Readily identifiable examples today are air conditioning plants, gas turbines, and propulsion shafts.[149]

As it did recently in the case of munitions manufacture, the government should survey and monitor U.S. shipbuilding and repair suppliers to identify critical chokepoints that create fragility in the industrial base and would hinder efforts to ramp up production during a crisis.[150] When appropriate, it should fortify the competitiveness of U.S. suppliers using the Defense Production Act (DPA) to invest in infrastructure or buy equipment or parts ahead of need. Use of the DPA would complement ongoing Navy and Congressional efforts to increase advance procurement of long-lead equipment and materials before ship construction has been funded.[151]

148 Matthew E. Duncan, Richard P. Hartl, *Multiple Award, Multiple Order Contracts—The Future Of Navy Surface Maintenance Procurement* (Monterey, CA: U.S. Naval Postgraduate School, 2015), p. 2-4, available at https://apps.dtic.mil/dtic/tr/fulltext/u2/a632448.pdf.

149 Peter Spiegel and Andrew Edgecliffe-Johnson, "US navy secretary warns of 'fragile' supply chain," *Financial Times*, November 5, 2019.

150 Joe Gould, "Trump to use federal funds to prop up US bomb makers," *Defense News,* January 6, 2019.

151 David Sharp and Lolita Baldor, "Navy considers shipbuilding cuts for upcoming budget," *ABC News,* December 28, 2019.

Improve shipyard infrastructure and foster innovation

To maintain a healthy U.S. shipbuilding and repair base, the U.S. government should fund investments that improve shipbuilding and repair processes. Although the U.S. government is a shrinking contributor to global R&D spending, government funding and policy should aim to spur innovation and prime the pump for further investments by the private sector.

MARAD's Small Shipyard Grant Program is an excellent example of government supporting shipbuilding and repair innovation. The program is open to shipyards employing fewer than 1,200 workers and is designed to "make capital and related improvements to qualified shipyard facilities that will be effective in fostering efficiency, competitive operations, and quality ship construction, repair, and reconfiguration, and provide training for workers in shipbuilding, ship repair, and associated industries."[152]

The Small Shipyard Grant Program was appropriated $20 million in FY 2020, but MARAD lacks a national maritime strategy or a government plan to guide the investments. MARAD should consider the program a down payment on shipyard improvements, and Congress should continue the program into FY 2021. Because the Navy's Private Sector Optimization program intends to also invest in private shipyard infrastructure and processes starting in FY 2021, the Navy and MARAD should coordinate their shipyard investments during FY 2021 and beyond. This would ensure funding improves shipyard efficiency and exploits new technologies, such as transitioning to digital ship plans and augmented reality to support worker training and performance.

Whereas the MARAD Small Shipyard Grant Program and Navy Private Sector Optimization plan will focus on improving today's infrastructure and methods, the National Shipbuilding Research Program (NSRP) has the potential to significantly modernize U.S. shipbuilding and ship repair technology.[153] Poorly funded by the U.S. government, the NSRP's impact has been limited to modest improvements at medium-sized shipyards and collaboration among shipyard executives. Increased funding and the ability to collaborate with government and private research organizations could develop new technologies and sponsor their prototyping and adoption at shipyards. A more potent NSRP would help bring new civilian research institutions and commercial suppliers into the national shipbuilding base.

Private shipyards should also invest in their own infrastructure and processes, which could be supported by MARAD's Title XI program of federal loan guarantees for private debt incurred to modernize infrastructure and ship construction at U.S. shipyards.[154] Low-interest rate guaranteed loans could encourage private investment into U.S. shipbuilding and shipyards and

152 MARAD, "Small Shipyard Grants," DOT, available at https://www.maritime.dot.gov/grants-finances/small-shipyard-grants, accessed February 3, 2020.

153 "About," National Shipbuilding Research Program, available at https://www.nsrp.org/about-nsrp/.

154 "Financing and Debt Overview," MARAD, available at https://www.maritime.dot.gov/grants/title-xi/financing-and-debt-overview.

is similar to programs offered by other countries. However, recent funding has only covered administration of the program, rather than new investments. Congress should appropriately fund the Title XI program, specifically with a focus on the construction of new ships in domestic trade and shipyard modernization programs.

Shielding innovative processes and technologies from exploitation requires improved policies for protection of unclassified information. A large portion of U.S. shipbuilding and repair data is unclassified but sensitive, and similar data has been stolen by adversaries in the past.[155] As new autonomous or AI-enabled ships enter the force, the data used to train and test these systems will become increasingly valuable to defense manufacturers and adversaries. DoD's emerging Cybersecurity Maturity Model Certification program is expected to certify the data security practices of defense contractors beginning in 2020, using National Institute of Standards and Technology standards.[156] Government determinations of shipyard suitability and best value should incorporate an evaluation of shipbuilders' cybersecurity certification status.

Summary

To effectively compete, the U.S. government should stop considering the commercial and national security contributions of the maritime industry as largely distinct. Instead, the United States should adopt a new approach that recognizes the inherent linkage between the two and fosters a healthier private maritime industry that can support U.S. national security.

A new comprehensive approach is all the more important given the growing threat posed by Chinese maritime power, which highlights the urgent need for new approaches to shipbuilding and repair of U.S. government vessels. A National Maritime Strategy and its commensurate initiatives should describe how the U.S. government plans to restore the U.S. Merchant Marine and strengthen the shipbuilding and repair industry. The following chapter proposes a plan of action that would implement these recommendations.

155 Ellen Nakashima and Paul Sonne, "China hacked a Navy contractor and secured a trove of highly sensitive data on submarine warfare," *The Washington Post,* June 8, 2018.

156 Rick Weber, "NIST readies foundational data security guidelines for another comment period," *Inside Defense*, January 13, 2020.

CHAPTER 4

Plan of Action and Conclusion

The most important national security contributions of the U.S. maritime industry are providing surge sealift for war or other contingencies, enabling U.S. government ship construction and repair, and securing access to U.S. ports and coastal or inland waterways. The recommendations described in Chapter 3 support these contributions by fostering the overall health of the U.S. maritime industrial base. This chapter translates the study's recommendations into a coherent plan, focused on U.S. sealift and shipbuilding, which are the most tangible outcomes of the policy proposals described in Chapter 3.

The U.S. government's current approach to strategic sealift has yielded an aging and inactive government fleet that depends on a shrinking pool of merchant mariners to get underway. Although the U.S. international commercial fleet can supply needed cargo capacity today, it will not be enough to compensate for retiring government vessels and is wholly inadequate to meet DoD's needs for tankers and fuel delivery during a war or other contingency.

The Navy's FY 2020 30-Year Shipbuilding Plan and multi-agency *Sealift That the Nation Needs* report outlined a three-phased approach to replace aging sealift ships: extend the service lives of select current surge sealift ships; acquire and convert used foreign-built ships during the 2020s; and construct new U.S. ships using a common hull starting in 2030.[157] This approach is estimated to cost almost $40 billion over the next 30 years in procurement and operations and maintenance, but it will not substantially improve the age or material condition of the fleet due to its reliance on existing or used vessels.[158] And because the government would continue to own sealift ships, MARAD, MSC, or the Navy would have to fund uncertain future maintenance costs and the recapitalization of sealift ships.

157 U.S. Navy, *Report to Congress on the Sealift That the Nation Needs* (March 2018); "Appendix 7: Auxiliary and Sealift Vessel Plan" in Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2020, Office of the Chief of Naval Operations, March 2019.

158 Eric Labs has estimated the procurement and operation and support costs of the Navy's proposed plan at $39 billion over 30 years. Eric Labs, *Alternatives for Modernizing the Navy's Sealift Force* (Washington, DC: Congressional Budget Office, October 2019), pp. 3, 4, and 6, available at https://www.cbo.gov/system/files/2019-10/55768-CBO-navy-sealift.pdf.

Instead of sustaining or buying old vessels and augmenting them with U.S.-built ships, the U.S. government should transition to a new sealift model that relies on the U.S. Merchant Marine to provide ships and mariners for commerce and contingencies. The new model would also coordinate shipbuilding efforts across the U.S. government and commercial sector in an integrated shipbuilding and repair plan that provides a stable demand signal for industry and costs less than existing government plans.

Fuel Transportation

Meeting DoD's strategic sealift requirement of 86 fuel tankers will require a major shift in policy.[159] Instead of hoping sufficient foreign-flagged tankers will be available during a crisis or contingency, the U.S. government should grow the fleet of U.S.-flagged government and commercial tankers by expanding the proportion of U.S.-sourced fuel and creating the TSP, or by establishing a tanker stipend within the MSP. This approach would better use the overall U.S. Government and commercial fleets to support defense strategy while improving the reach and competitiveness of the U.S. commercial carriers.

Under this proposed approach, the first tankers available during a potential contingency would be government-owned or long-term chartered tankers in Prepositioning Squadrons serving as ready, floating fuel stores. They would be joined by government-owned or long-term chartered tankers engaged in peacetime fuel deliveries for DLA Energy, which would purchase a greater portion of its fuel products from U.S. refineries. To further expand fuel-carrying capacity, U.S.-flagged tankers engaged in international trade and supported by proposed TSP or MSP stipends would be available to DoD, along with access to the global intermodal resources of participating carriers. Like cargo ships participating in MSP, tankers would offset the higher cost of being U.S.-flagged with a combination of their TSP or MSP stipend and preference cargo from DLA Energy.[160] If additional tankers were necessary beyond the requirement due to factors such as higher-than-anticipated attrition rates, some U.S.-flagged tankers from the domestic fleet could be called upon by DoD. In this case, U.S.-owned foreign flagged or allied foreign tankers could be employed to backfill domestic routes.[161]

This National Fleet approach, shown in Figure 19, would allow DoD to meet its stated tanker requirements and surge forces faster than DoD's current approach. It would also generate a larger force of U.S.-flagged ships engaged in commerce and be far more economical than

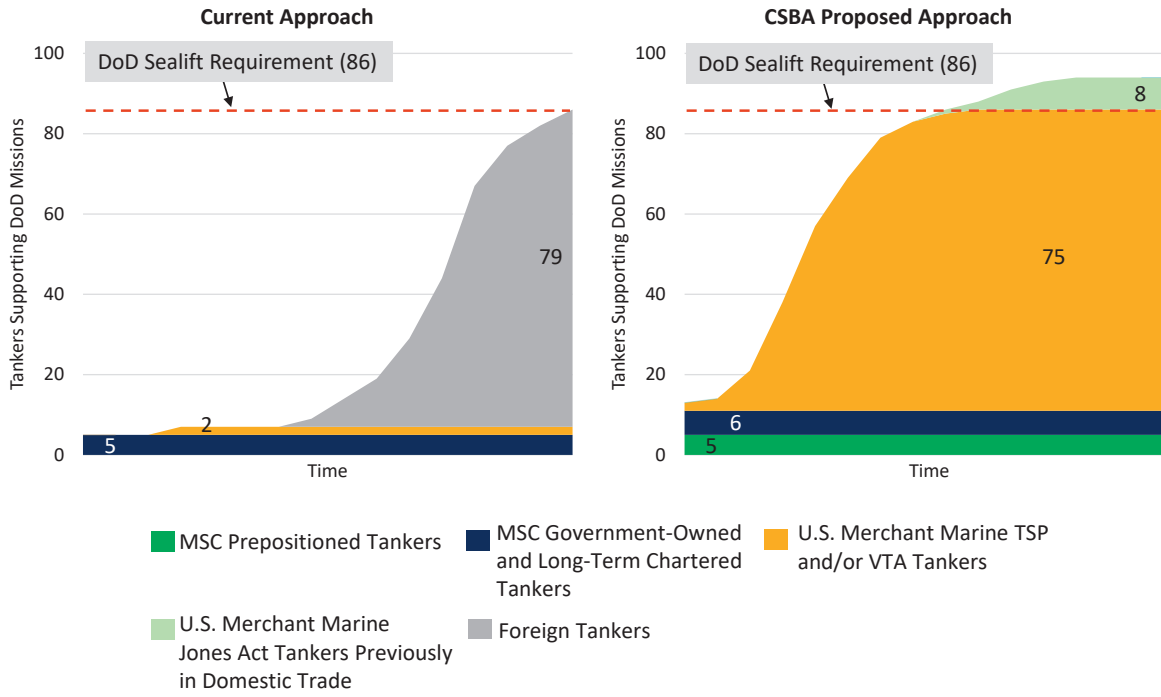
159 Lieutenant General Stephen Lyons, U.S. Army, Deputy Commander of USTRANSCOM, "Logistics and Sealift Forces," statement before House Armed Services Committee Subcommittee on Seapower and Projection Forces, March 22, 2016, p. 3.

160 The incorporation of additional preference cargo, such as a commercial preference cargo requirement associated with crude exports, would further support the fleet and lower the necessary cost of TSP stipends.

161 Execution of this approach would require national security waiver to aspects of current cabotage laws, which could reasonably be obtained in a major war.

acquiring a wholly Government-owned tanker fleet.[162] Given the ability of shipping companies to quickly purchase or charter and reflag foreign vessels, the proposed TSP and changes to DLA Energy fuel sourcing could be adopted within two to three years.[163]

FIGURE 19: CURRENT AND ALTERNATE APPROACHES TO SECURING DOD SEALIFT TANKER SUPPORT IN CONFLICT



Cargo and Munitions Transportation

As noted in Chapter 1, the United States is likely unable to meet its dry cargo and munitions sealift requirements due to low MSC Surge Fleet and MARAD Ready Reserve Force readiness and a shortfall of mariners to operate the ships. The U.S. government should transition to a unified approach that leverages the best attributes of the government and commercial fleets to meet cargo sealift requirements. This study proposes a new model that undertakes four primary changes from the government plan outlined in *The Sealift That the Nation Needs* based on the recommendations described in Chapter 3:

162 It would cost DoD approximately $8.59 billion to construct and $532 million per year to man and operate the 76 additional tankers necessary to meet the joint requirement. This figure assumes a fleet of 76 additional tankers (for a total sealift fleet of 86) with an average capacity of 330,000 bbl (each costing $165 million to acquire and $7 million annually to operate).

163 In order to ensure an adequately trained base of mariners, it would be beneficial for the TSP to gradually grow in slots over time. For example, it could grow by 5–10 slots per year.

- Replace the government-owned MSC Prepositioning Fleet with MARAD-chartered commercial ships;
- Recapitalize and expand the MSC Surge Fleet with former Prepositioning Fleet ships and new vessels with special capabilities like cranes or petroleum distribution systems;
- Expand the MSP to replace today's MARAD Ready Reserve Force; and
- End the MARAD Ready Reserve Force and reassign the MSC Surge Fleet to MARAD.164

The proposed plan transforms the Prepositioning Fleet by shifting from today's government-owned Prepositioning Squadrons to a model in which MARAD would charter commercial prepositioning vessels.[165] Operating under five-year charters, commercial ships would load military cargo for prepositioning and moor at forward locations, periodically getting underway or being exchanged with other commercial vessels to maintain their readiness.[166] To implement this shift, starting in FY 2022 MARAD would charter four new prepositioning ships per year, increasing to a total fleet of 25 ships.[167] Government-owned ships currently in the Prepositioning Fleet would be gradually transferred into the MSC Surge Fleet, which would eventually be reassigned to MARAD.

Second, the proposed approach improves readiness of the MSC Surge Fleet by transferring Prepositioning Fleet ships that are less than ten years old into the MSC Surge Fleet as they are replaced by chartered vessels. As a result, the oldest ships in today's MSC Surge Fleet would be retired by the early 2030s. To address DoD needs for ships with specialized capabilities or high weight capacity that are met by aging MSC or MARAD Ready Reserve Force vessels today, the Surge Fleet would be augmented by 11 new U.S.-built special capability ships and 15 new RO/ROs. This would prevent the need to purchase used foreign vessels or extend the lives

164 This chapter focuses on RO/RO capacity and special capability shipping. Container and dry bulk capacity are also critical to strategic sealift. However, RO/RO capacity and special capability shipping pose the greatest challenge in meeting requirements and are more difficult to source from the open market.

165 The Prepositioning Fleet consists of the Maritime Prepositioning Force (MPF) and Army and Air Force Prepositioning Stocks. It forward deploys equipment closer to potential conflict areas to facilitate rapid deployment of Marine Corps Air Ground Task Forces (MAGTFs) and to provide initial equipment and sustainment support for Army and USAF units. For more information on this and other elements of the sealift force, please see Walton, Boone, and Schramm, *Sustaining the Fight*, p. 7.

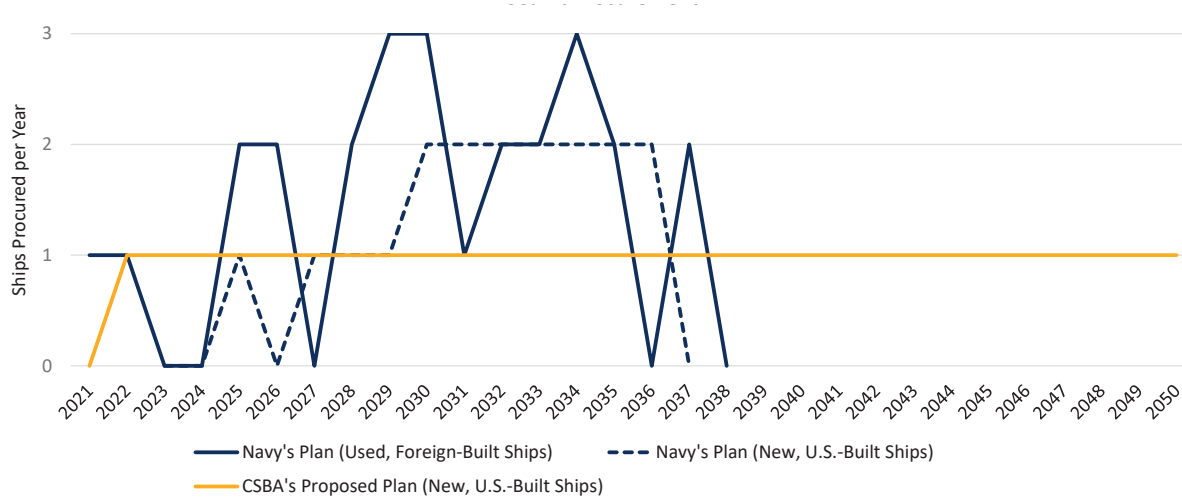
166 Some commercial ships chartered for the Prepositioning Fleet will require major modifications to support mission requirements, such as the incorporation of heavy cranes, specialized slewing ramps, cargo fuel capacity, additional berthing spaces, and flight decks. In some cases, these modifications may decrease their commercial competitiveness.

167 25 Chartered Prepositioning ships would replace 15 Government-owned Prepositioning ships. This is because this study's conservative estimate of an average 176,000 militarily usable square footage capacity on the chartered ships, which is less than the approximately 317,000 square feet of militarily usable capacity on current government-owned prepositioning ships. Commercial ships with more militarily useful capacity would result in fewer charters.

of aging U.S. ships.[168] The proposed plan procures new U.S.-built special capability ships at a rate of one per year starting in FY 2022 and transitions in FY 2033 to procuring new U.S.-built RO/ROs purpose-built for transporting heavy DoD equipment.[169]

The proposed shipbuilding approach shown in Figure 21 meets DoD's requirements and provides U.S. shipyards with a stable rate of work to avoid shipbuilding "boom and bust" cycles. Its stability—especially relative to the significant oscillations in the Navy's proposed plan—allows shipyards to plan their construction programs and in turn reduce costs. It also provides the U.S. government the opportunity to coordinate strategic sealift construction with other civilian and government ship construction.

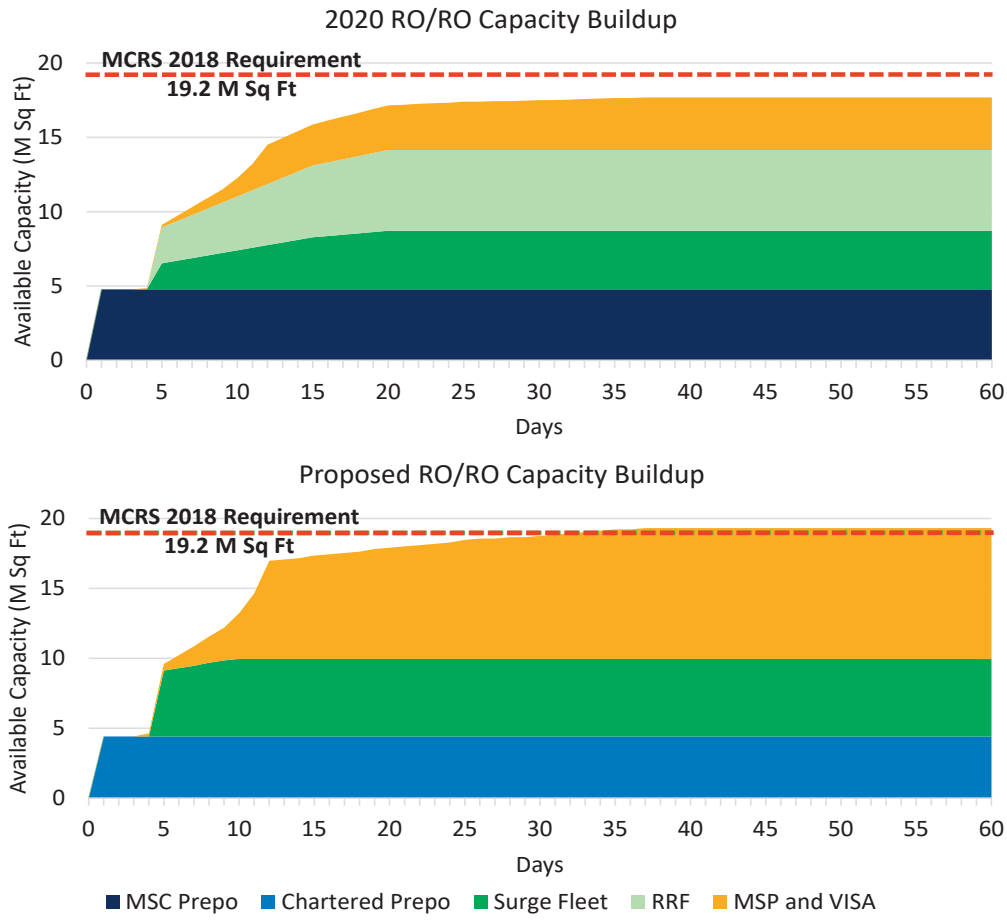
FIGURE 20: STRATEGIC SEALIFT PROCUREMENT



168 Special capability ships (crane ships, barge ships, aviation logistics support, specialized container ships, and Offshore Petroleum Distribution Ships) that meet DoD requirements are not found on the open market and are rapidly aging out of service, which make them the top priority for new construction. Furthermore, conversions to foreign-built ships can be expensive. Originally commercial foreign-constructed ships in Maritime Prepositioning Squadrons (MPS) underwent extensive modifications to provide for not only RO/RO capacity, but also container cells and tanks needed to provide a proportional amount of the 30 days' worth of sustaining munitions, supplies, fuel, and water. During the early 1980s, these modifications cost approximately $150 million per ship, the equivalent of approximately $400 million in 2020. In general, significant modifications can match or exceed the cost of the original ship.

169 This study assumed the use of LMSR-like RO/ROs costing $400 million each with a nominal capacity of 400,000 square feet (that was modeled as 370,000 square feet of usable capacity). Larger RO/ROs could provide the necessary capacity with fewer hulls but may face challenges entering narrower or shallower-draft ports. Smaller RO/ROs would require more hulls to be built but could potentially access a wider range of locations. However, CSBA review of operationally relevant ports across the world did not identify a major difference in port accessibility, primarily as a result of draft limitations common throughout RO/ROs of 400,000 square feet capacity or less.

FIGURE 21: ESTIMATED 2020 AND PROPOSED RO/RO CAPACITY BUILDUP



The third element of CSBA's proposed approach expands the MSP. Starting in FY 2025, the plan grows the MSP by 33 ships at an average rate of three per year.[170] A larger MSP fleet would provide operational ships to replace older inactive vessels in the MSC Surge Fleet and MARAD Ready Reserve Force, as well as more crews for inactive Surge Fleet vessels. The MSP stipend for RO/ROs will need to increase to account for the relative decrease in government cargo available per ship caused by the increased number of MSP RO/ROs in the fleet.[171] An advantage of a higher stipend is that, coupled with other reforms discussed in the preceding chapter, U.S.-flag RO/ROs may become more competitive and able to carry more commercial cargo.[172]

170 This study assumed an average 176,000 square feet of militarily useful capacity on new MSP RO/ROs, which is consistent with the average militarily useful capacity of the current MSP RO/ROs.

171 This study estimated the stipend would need to average at least approximately $6.1 million over the next 30 years and applied an escalating stipend for MSP RO/ROs that offset the growth in the fleet.

172 An alternative method of providing additional RO/RO preference cargo would be to implement an approach proposed but not enacted in the 1985 Equitable Automobile Transportation Act bill, where the import of 50 percent of commercial automobiles and trucks would have been required by law to be transported on a U.S.-flagged vessel.

Because they would be in commercial service, MSP RO/ROs will not always be well-positioned near ports of embarkation for U.S. military cargo. MSP ships are required to be available on 14–18 days' notice compared to five days for the MSC Surge Fleet and most of the MARAD Ready Reserve Force.[173] Most U.S. forces and equipment, however, are expected to take weeks to months to reach ports of embarkation, making the MSP requirement an acceptable compromise to gain the improved readiness of active vessels compared to inactive MARAD or MSC ships.[174] As shown in Figure 21, even with the longer response time, MSP ships will provide more capacity faster than the planned MSC Surge Fleet and MARAD Ready Reserve Force when the high casualty rates of older government ships is taken into account.[175]

Following recapitalization of the MSC Surge Fleet and expansion of the MSP, the final element of the proposed plan eliminates the MARAD Ready Reserve Force, which today includes the oldest vessels in the nation's strategic sealift fleet. MARAD Ready Reserve Force ships would be retired as new RO/RO ships enter the MSP and special capability ships enter the Surge Fleet, with the Ready Reserve Force completely eliminated by 2035.[176] MARAD would gradually take over management of the recapitalized Surge Fleet, allowing MSC to focus on day-to-day support of the Navy, rather than maintenance of inactive surge sealift. As shown in Figure 22, the proposed sealift fleet rebalances the fleet mix from one that secondarily relies on the U.S. Merchant Marine to one that uses the U.S. Merchant Marine to provide the most sealift, complemented by specialized ships in the Surge Fleet.[177]

173 MSP times drawn from Labs, *Alternatives for Modernizing the Navy's Sealift Force*, p. 1. MSC and MARAD RRF readiness requirement drawn from Martin and Yardley, *Approaches to Strategic Sealift Readiness*, p. 10.

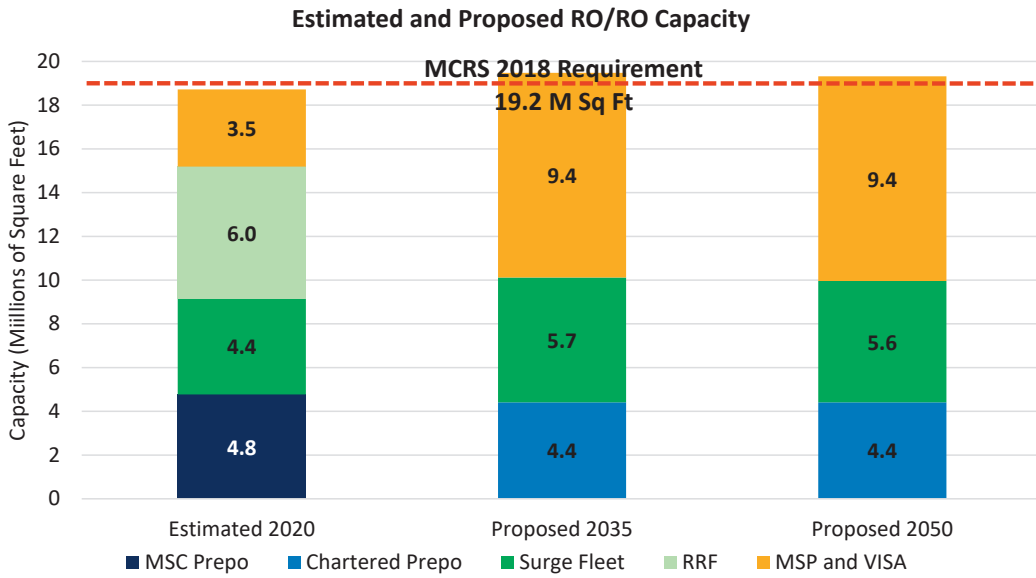
174 Martin and Yardley, *Approaches to Strategic Sealift Readiness*, p. 10.

175 Figure 22 accounts for an approximately 40 percent readiness rate within the MSC Surge Fleet and MARAD RRF within five days that gradually rises to 90 percent by 20 days and subsequently remains constant. David B. Larter, "Congress should fund new, not used sealift vessels, say former Maritime Administration officials," *Defense News*, January 22, 2020. CSBA analysis examined commercial shipping route patterns and the time it would take to load military cargo under best case and less than optimal conditions. It employed representative sailing routes and loading/unloading locations involving Rotterdam, Netherlands; Shanghai, China; Chennai, India; Santos, Brazil; Colon, Panama; Savannah, GA; Brownsville, TX; Tacoma, WA; and Los Angeles, CA. Accounting for the time it would take to load and unload commercial cargo and two days of military port of embarkation loading time, it found that under best case conditions and routes half of the MSP RO/RO fleet could be loaded with militarily useful cargo within 11 days of activation and under less than optimal conditions and routes, half of the MSP RO/RO fleet could be loaded with militarily useful cargo within 15 days of activation. MSP ships were loaded at a rate in which 25 percent were ready by the 9th day, 50 percent by the 11th day, 75 percent by the 12th day, and 100 percent by the 37th day.

176 Some of these ships could be placed in the National Defense Reserve Fleet.

177 This approach is consistent with the intent of the Wilson-Weeks Agreement of 1954. An agreement signed on July 1, 1954 between Charles E. Wilson, the Secretary of Defense, and Sinclair Weeks, the Secretary of Commerce, was designed to govern the relationship between government and commercial shipping and maintain a healthy merchant marine. "The agreement acknowledged that Military Sea Transportation Service must maintain a large, dedicated fleet for specific DoD purposes, yet it required that available ships in liner service be used to the fullest possible extent to move DoD cargoes." Gibson and Donovan, *The Abandoned Ocean*, pp. 245–246.

FIGURE 22: PROPOSED RO/RO CAPACITY IN 2035 AND 2050 WILL MEET PROJECTED REQUIREMENTS



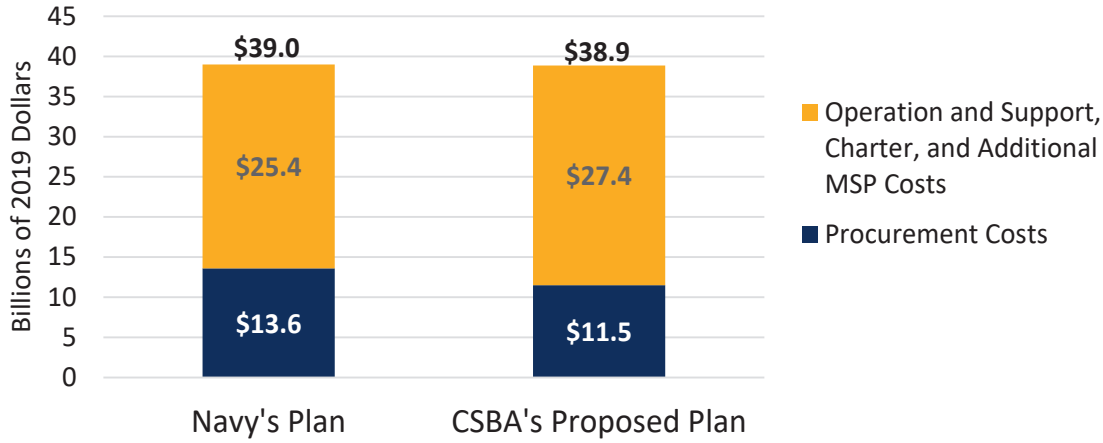
Conclusion

The United States depends on the sea for resources, trade, transportation, and national security, which in turn rely on the U.S. maritime industry. Several trends eroded the DMIB during the last decade, leaving it able to support day-to-day needs of U.S. government and commercial fleets, but without the resilience to withstand casualties or the capacity to surge in response to national security or humanitarian crises.

The approach to sealift and shipbuilding and repair proposed by this study fosters a vibrant U.S. maritime industrial base that helps insulate the United States and its allies from its competitors' use of coercive economic power as well as their attempts to constrain maritime access around the world. Perhaps more importantly, as shown in Figure 23 the proposed plan provides needed sealift capacity faster, with greater reliability, and at lower costs than current U.S. government approaches.

The nation's strategic sealift challenge is representative of the broader challenges facing the NSIB. The U.S. government can continue misallocating increasingly scarce funds on a flawed model. Or, guided by a new national maritime strategy, the nation can adopt a whole-of-society approach to cultivating a vibrant maritime industrial base that spurs innovation and enhances American prosperity and security. Variations of the reforms and plans proposed in this study can be pursued, but it is clear that only through a comprehensive commercial and government effort can the nation sustain the maritime industrial base it needs.

FIGURE 23: COSTS OF THE NAVY'S PLAN AND CSBA'S PROPOSED DRY CARGO SEALIFT PLAN



This comparison draws costs from Eric Labs' CBO estimate of the Navy's proposed plan. In the case of new CSBA elements (such as an expanded MSP), cost estimates were derived through analysis of MARAD data and consultations with industry. If this study used the Navy procurement cost estimate of $24.8 billion (rather than the CBO estimate of $13.6 billion), the savings in CSBA's plan would be much greater. Labs, *Alternatives for Modernizing the Navy's Sealift Force*, p. 3.

LIST OF ACRONYMS

AI	artificial intelligence
APS	Afloat Prepositioning Squadron
BCA	Budget Control Act of 2011
BRI	Belt and Road Initiative
CBO	Congressional Budget Office
CNO	Chief of Naval Operations
CONSOL	Consolidated Logistics
CR	Continuing Resolution
DIB	defense industrial base
DLA	Defense Logistics Agency
DMIB	Defense Maritime Industrial Base
DoD	Department of Defense
FLO/FLO	Float-on/Float-off
GAO	Government Accountability Office
GD-BIW	General Dynamics-Bath Iron Works
GDEB	General Dynamics-Electric Boat
HII	Huntington Ingalls Industries
IMO	International Maritime Organization
LCS	Littoral Combat Ship
MAC-MO	multiple award contract-multiple order
MARAD	Maritime Administration
MCRS	Mobility Capability Requirements Study
MPS	Maritime Prepositioning Squadron
MSC	Military Sealift Command
MSP	Maritime Security Program
NASSCO	General Dynamics-North American Steel and Shipbuilding Company
NDAA	National Defense Authorization Act
NMIB	National Maritime Innovation Base
NSIB	national security innovation base
NSIB	National Security Innovation Base
OBOR	One Belt, One Road
OCO	Overseas Contingency Operations
RMC	Regional Maintenance Center
RO/RO	Roll-On/Roll-Off
RRF	Ready Reserve Force
SIOP	Shipyard Infrastructure Optimization Plan
SSO	Strategic Sealift Officer
SURFMEPP	Surface Maintenance Engineering Planning Program
TSP	Tanker Security Program
VISA	Voluntary Intermodal Sealift Agreement
VTA	Voluntary Tanker Agreement

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