CONGRESS OF THE UNITED STATES
CONGRESSIONAL BUDGET OFFICE

CBO

Alternatives for Modernizing the Navy's Sealift Force

OCTOBER 2019

Notes

All years referred to in this document are federal fiscal years, which run from October 1 to September 30 and are designated by the calendar year in which they end. All dollar amounts reflect budget authority in 2019 dollars.

Numbers in the text and tables may not add up to totals because of rounding.

The data underlying the figures are posted with the report on CBO's website.

On the cover: The Military Sealift Command's USNS *Fisher*, a roll-on/roll-off sealift ship in the Bob Hope class. Navy photo by Mass Communication Specialist 2nd Class Eric Chan.

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Alternatives for Modernizing the Navy's Sealift Force

Summary

In March 2018, the Department of the Navy submitted to the Congress a plan to modernize the nation's sealift force over the next 30 years.[1] Sealift ships move most of the equipment and supplies that the Army and Marine Corps need when they are deployed to overseas theaters of operation. The Congressional Budget Office estimated the cost of implementing the Navy's plan and then compared that plan with four alternatives.

- **The Navy's Plan.** The Navy's plan calls for modernizing the sealift force through a combination of approaches: extending the service life of some existing ships, buying used ships in the 2020s, and then buying new ships starting in 2030. According to CBO's estimate, the Navy's plan would cost a total of about $39 billion (in 2019 dollars) over the next 30 years, including operation and support costs.

- **Buy More New Ships.** Of the four alternatives to the Navy's plan that CBO explored, the first two would have the federal government accelerate the purchase of new ships and not buy any used ships beyond those already authorized by the Congress.

- **Buy More Used Ships.** In the third alternative, the government would not buy new ships but would rely instead on purchasing used ships.

- **Use Chartered Ships.** The fourth alternative would have the government contract with private shipping companies over time to charter ships for the sealift mission, eventually relieving it of responsibility for purchasing, maintaining, and operating sealift forces.

All four of CBO's alternatives would meet or nearly meet the Department of Defense's (DoD's) goal for the cargo capacity of the sealift force, and the total costs for the Navy's plan and the four alternatives, including acquisition and 30-year operation and support costs, are similar. The costs of those alternatives would vary from $34 billion to $40 billion over the next 30 years; the two alternatives for buying new ships would cost more than buying used ships or chartering ships. Three of the four alternatives would cost less than the Navy's plan, according to CBO's estimates, by between 5 percent and 12 percent.

Background

DoD's current goal for the sealift force is to maintain at least 15.3 million square feet of militarily useful cargo space on its ships. That space would be used in the event of a war that required transporting the equipment of a large military force overseas. Troops would be flown to the overseas location where the equipment was deposited to begin operations. DoD would like to maintain an additional 4.3 million square feet of cargo capacity in commercially owned ships, available on 18 days' notice, to transport equipment and supplies to those overseas military forces. The civilian ships would primarily transport supplies for the military units once they were assembled.

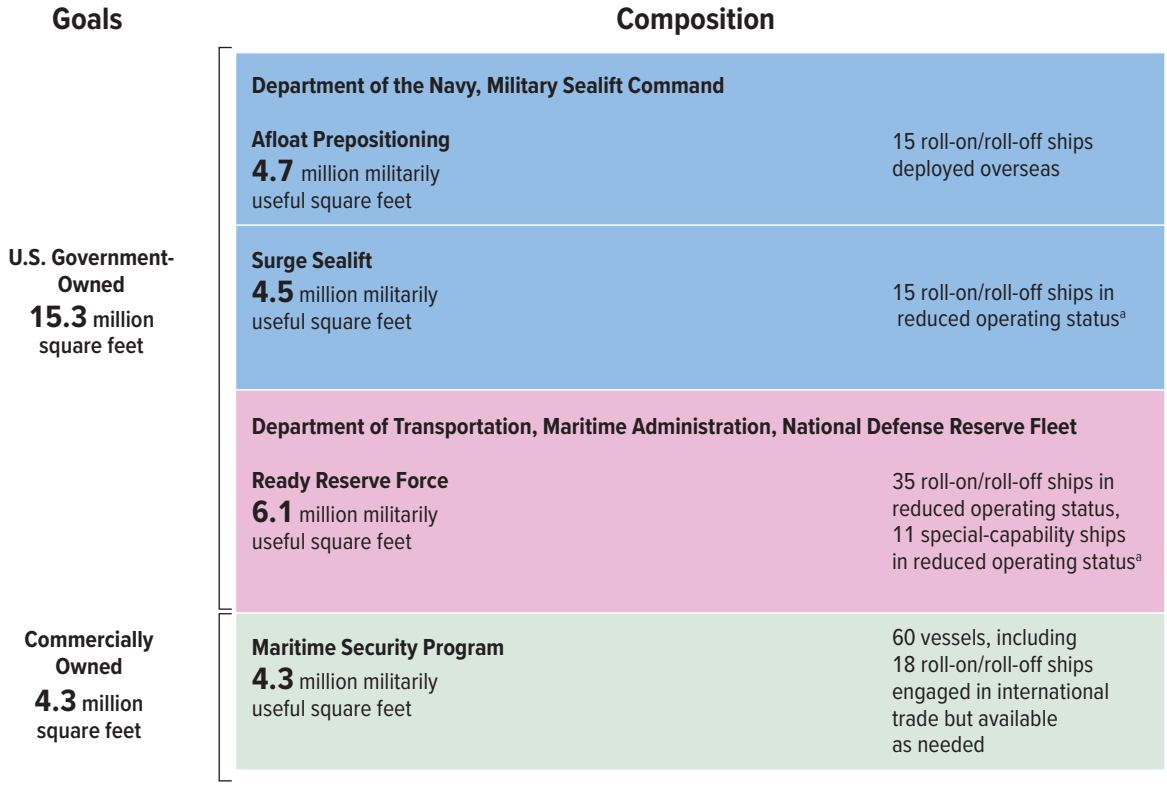
DoD's sealift force has four components (see Figure 1):

- **Afloat Prepositioning.** Currently, 15 roll-on/roll-off ships carrying Army and Marine Corps equipment are deployed in overseas locations. Those large vessels carry wheeled vehicles, such as cars, trucks, armored personnel carriers, tanks, or self-propelled artillery, that are driven onto the ship on a stern ramp, a side ramp, or both. Roll-on/roll-off ships are owned by the Navy's Military Sealift Command (MSC) and operated by commercial companies.

1. See Department of the Navy, *Report to Congress on the Sealift That the Nation Needs* (March 2018).

Figure 1.

Composition and Militarily Useful Square Footage Goals of the U.S. Sealift Force



Source: Department of the Navy.

a. Ships in reduced operating status are kept in a material condition from which they can be activated for operations within a specified period of time.

- **Surge Sealift.** Another 15 roll-on/roll-off ships are kept in reduced operating status (ROS) for use in the event that major military units need to be deployed overseas and resupplied.[2] Those ships are also owned by the MSC and operated by commercial companies.

- **Ready Reserve Force (RRF).** Like the surge sealift ships, the 46 RRF ships are kept in reduced status for use in the event of major military operations overseas. The RRF includes 35 roll-on/roll-off ships and 11 special-capability ships: 6 crane ships, 2 heavy-lift ships, 2 aviation support ships, and 1 tanker with an offshore petroleum discharge system. The ships are owned by the Department of Transportation's Maritime Administration (MARAD) and operated by commercial companies.

- **Maritime Security Program.** For an annual stipend, private owners agree to make 60 commercially operated ships available if the government needs them to resupply military forces engaged in operations overseas. When not needed by the government, the ships transport goods in international trade. The fleet includes 18 roll-on/roll-off ships, 6 heavy-lift ships, 2 tankers, and 34 container ships. (CBO's analysis largely excludes the Maritime Security Program.)

In putting together the sealift force that currently meets its goals, the government purchased 54 used ships in the 1980s and 1990s, most of which had been

2. Ships in ROS are kept in a material condition from which they can be activated for operations within a specified period of time. For example, many sealift ships are in ROS-5, which means that they should be able to be activated for operations within five days. The Navy and MARAD run activation tests to determine a ship's readiness.

built in other countries. Some of those ships were converted so that they could load, carry, and unload military vehicles and cargo, but others could be used essentially as purchased. The Department of Defense also built 20 new ships in the 1990s to use for sealift purposes. (In addition, 2 older ships were built new in the 1960s and still serve in the sealift force.) Many of those 76 government-owned sealift ships will need to be replaced over the next 30 years because of their age and deteriorating physical condition. In its report to the Congress, the Navy explained its plan to modernize the sealift forces but did not indicate how much the plan would cost. In separate materials, however, the Navy provided some cost information.

The Navy's Sealift Plan

The Navy plans to modernize the sealift ships in the fleet by extending the service life of some ships, buying used ships and modifying them to perform the sealift mission, and building new sealift ships. Specifically, the Navy would extend the service life of 36 ships that are currently in the sealift force so that they could serve an additional 5 to 10 years—retiring them after 55 to 60 years instead of at their current planned retirement age of 50 years. The service life extensions for 18 of those ships were funded, at least in part, with 2019 appropriations; completing the work on the remaining 18 would require additional appropriations (see Figure 2). The Congress authorized the Navy to acquire 7 used ships in the 2019 budget, and the Navy plans to request authorization to acquire another 19 used ships in future budgets. Starting in 2025, the Navy would purchase 18 new large roll-on/roll-off ships at a rate of one per year through 2029 and then increase to a rate of two per year.[3] The Navy assumed that each of those ships would have about 300,000 square feet of militarily useful space. The ships would be smaller than the Bob Hope and Watson class sealift ships that the Navy bought in the 1990s, which provided about 400,000 square feet, but larger than most of the sealift ships in the force today.

The Navy would extend the service life of ships in all three categories of government-owned ships—afloat prepositioning, surge sealift, and the RRF—but most of the service life extensions would occur in the RRF. As new and used ships were purchased, they would generally replace the oldest ships, the ships in the poorest condition, or both. Those replacements would occur in all three categories of government-owned ships, although the Navy would probably transfer ships between categories. For example, when newly constructed sealift ships became operational, they would probably go to the afloat prepositioning forces first, and the afloat prepositioning ships being replaced would be transferred to the MSC's surge sealift category or to the RRF. As more ships became operational, old ships and relatively new ships would be shifted to other parts of the sealift force. (Reassigning ships to different elements of the sealift force is a common practice.)

The Navy's sealift plan did not evaluate operational aspects of the Navy's sealift force, such as the speed with which it can perform its mission. (Likewise, CBO's options do not include operational aspects.) The Navy's plan reflected the assumption that replacement ships, whether new or used, would have specifications similar to those of the existing sealift force. If the changing security environment led to a shift in national security requirements—for example, if the Navy needed ships that could deliver cargo much more quickly than the existing ships can—then the sealift force would probably require a mix of ship capabilities different from those examined in this report.

The Navy's Cost Estimates for Its Sealift Plan

Neither the Navy's original report on the sealift plan nor the appendix to its annual 30-year shipbuilding plan included cost estimates for buying ships.[4] In a separate business case analysis submitted to the Congress, however, the Navy estimated the cost of buying 18 new sealift ships at $20.5 billion in 2018 dollars.[5] The total cost for 26 used ships (the 7 already authorized and the 19 still to be authorized) would be between $1.8 billion

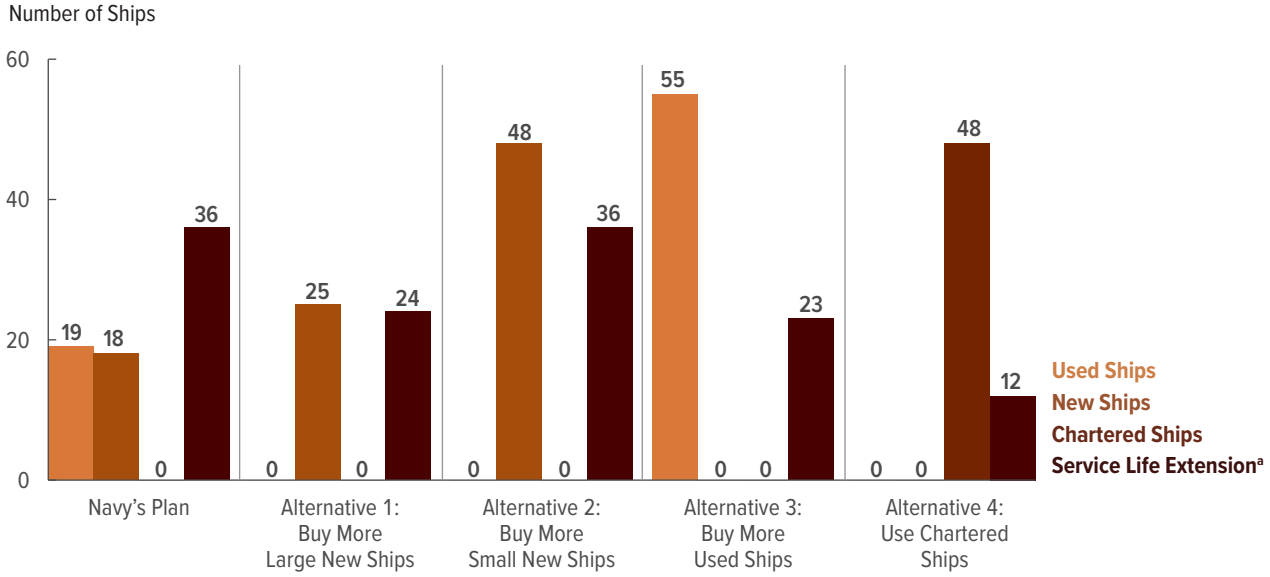
3. The Navy's 2020 shipbuilding plan, released in March 2019, would have the service purchase the first new ship in 2025, rather than in 2028, the date noted in Department of the Navy, *Report to Congress on the Sealift That the Nation Needs* (March 2018). Throughout this report, CBO uses the terms "purchase" and "buy" to refer to authorization by the Congress to acquire ships. The budget authority for such purchases may be provided over several years, depending on how the Congress appropriates the money for them.

4. See Department of the Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2020* (March 2019), https://go.usa.gov/xyhvK.

5. See Office of the Chief of Naval Operations, Deputy Chief of Naval Operations (Fleet Readiness and Logistics, N4), *Business Case Analysis for the Recapitalization of the Ready Reserve Force*, Report to Congress (January 2019).

Figure 2.

The Navy's 30-Year Plan and CBO's Alternatives



Source: Congressional Budget Office.

a. Includes ships funded in 2019.

and $4.3 billion, according to that report, depending on how many U.S.-built used ships the Navy purchased; ships built in the United States are more expensive than ships built overseas. None of the Navy's reports include estimates of operation and support costs.

In its business case analysis, the Navy estimated the average procurement cost for 18 new sealift ships at $1.14 billion per ship in 2018 dollars. That estimate was based on the construction costs of the lead ship of the Watson class sealift ships, which was purchased in 1993. The Navy escalated that lead-ship cost to 2023 dollars (not 2018 dollars as stated in the report) and then added the costs of design, a new electronics system, and program support. Both of those steps are typical for cost estimates for a lead ship of a new class of ship, and they resulted in the $1.14 billion (in 2023 dollars) cost per ship, which the Navy then used as its estimate in the business case analysis, redesignating the estimate in 2018 dollars.

The Navy's business case analysis departed from standard practice, however, in using the cost of a lead ship as the average cost for all 18 ships. Cost estimates typically charge design and program support costs to the lead ship and exclude them from the costs of subsequent ships. A standard cost estimate would also adjust the costs of those later ships downward to reflect the effects of rate and learning as more ships of the class were built, which the Navy's estimate did not do.[6] Finally, the Navy's report indicated that the new ship it would build would be smaller than the Watson class, but the Navy's estimate did not include a downward adjustment for the smaller size of the proposed new ship. In CBO's estimation, standard cost-estimating practices would result in an average cost for the Navy's new sealift ship that would be about half of the service's estimate.

For those reasons, as well as the absence of estimates for operation and support costs, CBO set aside the Navy's estimates in the business case analysis. Instead, CBO made its own estimates of the costs of the Navy's plan and used those numbers to compare with the cost estimates of the agency's alternatives.

6. Rate refers to the production efficiencies that are made possible when several ships of the same type are built simultaneously or in close succession at a given shipyard. Learning represents the gains in efficiency that accrue over the duration of a ship's production as shipyard workers gain familiarity with a particular ship model.

CBO's Cost Estimates for the Navy's Sealift Plan

According to CBO's estimates, the Navy's plan would cost $38.9 billion dollars through 2048: $13.6 billion to procure new and used ships and $25.4 billion for operation and support costs, including the service life extensions of existing ships. To estimate the cost of new ships, CBO relied on the historical costs of analogous ships, converted to 2019 dollars and adjusted for rate, learning, and economic conditions.[7] To estimate the cost of used ships, CBO used examples of ships that were available for sale over the past year. The cost of used ships is subject to a fair amount of uncertainty because the age, condition, and availability of those ships can substantially affect their price. To estimate the cost of operating the ships, CBO collected data from the Military Sealift Command and the Maritime Administration and used an average cost based on that data, with adjustments for future economic conditions.

Four Alternatives to the Navy's Plan

The Navy's plan includes the purchase of both new and used ships. CBO considered four alternatives that provide about the same amount of sealift as the Navy's plan—that is, 15.3 million militarily useful square feet—but that emphasize buying new ships only (large ships in one alternative, small ships in another), buying used ships only, or hiring private companies to charter ships for the sealift mission. All four alternatives would include extending the service life of some ships in the current fleet.

Alternative 1: Buy More Large New Ships

In the first alternative, the Navy would accelerate the purchase of new ships by 2 years compared with its own plan, purchase more of them, and forgo the purchase of any used ships other than those already authorized by the Congress. The new ships would be very large roll-on/roll-off ships, equivalent in size to the Bob Hope class ships purchased in the 1990s. This alternative would also extend the service life of 24 sealift ships to 60 years, 12 fewer ships than under the Navy's plan (see Table 1).

In this alternative, the Navy would buy 25 very large ships, each with about 400,000 militarily useful square feet. The ships would be bigger than those the Navy plans to purchase, which have 300,000 militarily useful square feet each, but similar in size to the sealift ships the Navy bought in the 1990s. The first ship would be purchased in 2023, and the remainder would generally be purchased at a rate of 2 per year between 2025 and 2036. Total ship production costs would be $13.9 billion over 30 years, or an average of $560 million per ship. Operation and support costs would total $23.2 billion over the next 30 years. Overall, this alternative would cost $37.1 billion to implement, or about $2 billion less than the Navy's plan.

The costs for this alternative (as well as for Alternative 2) are uncertain because the estimates for new ships are based on the design and capabilities of the Bob Hope and Watson class sealift ships built in the 1990s. If the design of the new sealift ships included capabilities that were greater or lesser than the capabilities of those earlier ship classes, CBO's estimates for the costs of those ships could be different. For example, if the new sealift ships had greater aviation support capabilities than the Bob Hope or Watson class, then the costs of those ships would be higher than what CBO estimated.

This alternative would call for 50 ships in the inventory in 2048, compared with 57 under the Navy's plan. The principal advantage of Alternative 1 is that a smaller number of large ships would allow for a greater degree of unit integrity when the ships transported the military equipment of various units overseas. One large ship like those in the Bob Hope class can carry all or most of the equipment of, for example, a U.S. Army Task Force, which includes nearly 1,000 tracked and wheeled vehicles. If the Navy procured the smaller ships described in its estimate, it would need two ships—all of one and part of another—to carry the same amount of equipment. Transporting all the equipment of a discrete military unit on one ship would allow it to constitute into a fighting unit more quickly and efficiently than it could if the equipment was dispersed across 2 or more ships. Alternative 1 would also have the lowest operating costs and ships with the youngest average age of all the alternatives CBO examined.

A disadvantage of this alternative is that large ships are less flexible in the wide range of overseas operations that might employ sealift ships. Although sealift ships are generally used to transport military equipment to overseas military operations, they are sometimes used for other purposes in peacetime when greater flexibility might be needed. A smaller number of large ships cannot

7. For a more detailed discussed of CBO's approach, see Congressional Budget Office, *How CBO Estimates the Costs of New Ships* (April 2018), www.cbo.gov/publication/53785.

Table 1.

The Navy's Plan and CBO's Alternatives

	Navy's Plan	Alternative 1: Buy More Large New Ships	Alternative 2: Buy More Small New Ships	Alternative 3: Buy More Used Ships	Alternative 4: Use Chartered Ships
	Number of Ships Purchased, Chartered, or Undergoing Service Life Extension				
Used Ships	19	0	0	55	0
New Ships	18	25	48	0	0
Chartered Ships	0	0	0	0	48
Service Life Extension[a]	36	24	36	23	12
	30-Year Costs (Billions of 2019 dollars)				
Procurement	13.6	13.9	13.9	4.4	0
Operation and Support or Charter	25.4	23.2	26.3	30.0	35.1
Total	**38.9**[b]	**37.1**	**40.2**	**34.4**	**35.1**
	Amount of Militarily Useful Square Footage, by Ship Type				
New	300,000	400,000	200,000	n.a.	n.a.
Used	170,000	n.a.	n.a.	176,000	n.a.
Chartered	n.a.	n.a.	n.a.	n.a.	200,000
	Characteristics of the Sealift Force, 2033				
Number of Ships in the Inventory	70	66	77	81	71
Millions of Militarily Useful Square Feet	15.7	15.7	15.3	15.8	15.1
Average Age of the Ships	37	32	29	34	n.a.
Average Age of the Militarily Useful Square Feet	37	29	32	34	n.a.
	Characteristics of the Sealift Force, 2048				
Number of Ships in the Inventory	57	50	71	80	73
Millions of Militarily Useful Square Feet	15.6	15.5	15.5	15.5	15.6
Average Age of the Ships	33	31	29	34	n.a.
Average Age of the Militarily Useful Square Feet	32	29	27	41	n.a.
Principal Areas of Uncertainty	Military requirements of the new ships and their costs	Military requirements of the new ships and their costs	Military requirements of the new ships and their costs	Future costs of purchasing and converting used ships	Future costs of charters

Source: Congressional Budget Office.

n.a. = not applicable or not available.

a. Includes ships authorized in 2019.

b. CBO estimated the cost of the Navy's plan by using its own methodology for both procurement and operation and support costs.

be in as many places as a larger number of smaller ships, if military commanders wanted to use the ships in that way. Very large roll-on/roll-off ships may also have fewer ports that can accommodate them in a conflict overseas. Another disadvantage of large ships is the risk of losing more equipment if the ship is damaged or sunk in a conflict. Large ships put more resources in fewer places, simplifying the targeting options of an enemy who might want to destroy them before they could unload.

Alternative 2: Buy More Small New Ships

Like the first alternative, Alternative 2 would accelerate the purchase of new ships by 6 years and would not include the purchase of any used ships. The new ships would be much smaller, however, with about 200,000 militarily useful square feet each—half the size of the new ships in Alternative 1. Because they would be smaller in this alternative, the Navy would buy 48 new ships between 2022 to 2039, mostly at a rate of 3 ships per year. This alternative would also extend the service life of 36 existing ships to 55 to 60 years, as the Navy plans today. In 2048, there would be 71 ships in the inventory, compared with 57 under the Navy's plan.

Total ship construction costs would be $13.9 billion, or an average of about $290 million per ship. Operation and support costs would amount to $26.3 billion over the next 30 years, for a total cost of $40.2 billion—about $3 billion more than Alternative 1 and about $1 billion more than the Navy's plan.

Alternative 2 has two advantages over the Navy's plan and Alternative 1. First, no individual ship would carry as much military cargo as the ships in the Navy's plan, so the consequences of the loss of any one ship would essentially be halved—fewer resources per ship in more places. Second, the overall sealift force would be more flexible than under the previous alternative because the force could be more broadly dispersed as necessary for peacetime and wartime operations.

The primary disadvantage of Alternative 2 is that it is the most expensive of the alternatives CBO considered. Although its procurement costs would be the same as those of Alternative 1, the larger number of ships would result in higher overall operation and support costs. A second disadvantage of Alternative 2 is that the larger number of smaller ships would reduce the Navy's ability to maintain unit integrity on a single sealift ship. A third disadvantage is that, with more ships than under the Navy's plan or Alternative 1, the sealift force would be somewhat more difficult to manage, berth, and deploy if activated.

Alternative 3: Buy More Used Ships

In this alternative, the Navy would forgo the purchase of new ships and buy only used ships. Beginning in 2024, the Navy would purchase an average of 5 used ships per year for 11 years. CBO's estimate incorporates the assumption that each ship would be 20 years old and would have 176,000 square feet of militarily useful cargo space. Those used ships might or might not require some conversion. This alternative also would extend the service life of 23 ships to 55 to 60 years, 13 fewer than the Navy plans.

CBO's estimate includes an average cost for used ships, along with any necessary conversion expenses, of $80 million per ship. That cost is based on available information about the used-ship market. Under this alternative, ship purchase and conversion costs would total $4.4 billion over the 30 years, although operation and support costs would be higher, on average, under this option than under any other option that involves buying ships—$30.0 billion between 2020 and 2048. Total costs for this alternative, at $34.4 billion, would be less than the costs of the new-ship alternatives.

A primary advantage of Alternative 3 is that it would be less expensive than the Navy's plan and the new-ship alternatives. However, the cost of buying and modifying used ships is one of the most uncertain aspects of the alternatives discussed in this report. The purchase price of used ships is variable and depends on the availability of those ships on the market as well as their age, condition, and size. Ships that are 20 years old cost less than ships that are 10 years old. Moreover, the prices for used ships 10 years from now could be very different from the prices for used ships today. Thus, the cost advantage of this alternative compared with the new-ship alternatives and the Navy's plan could grow or disappear as the U.S. government buys used ships over time.

In addition, this alternative has some of the same advantages as Alternative 2. Individual ships would not carry as much cargo as they would under the Navy's plan or Alternative 1. A larger number of smaller ships would make less attractive targets and would provide the Navy with more flexibility to conduct operations in different places. In addition, the risk of losing a substantial amount of equipment with the loss of one ship would be much smaller.

The primary disadvantage of Alternative 3 is that, compared with the Navy's plan and the other alternatives, it would result in the highest average age of the sealift force over time. Buying only used ships would also perpetuate the diversity and management challenges of the existing force, which includes more than 20 different classes of ship. Currently, the government manages many different

maintenance plans, spare parts inventories, and contracts to maintain and operate the ships. If the Navy bought used ships to replace existing ships, the number of ship types would not decline as much as it would if the Navy bought new ships of the same type. The type of used ships the Navy bought could differ from year to year or even within the same year.

This alternative also has some of the same disadvantages as Alternative 2. The larger number of older ships would contribute to higher operating costs, and a larger force would be more challenging to manage and deploy if activated. Since the used ships would be about the same size as the new ones in Alternative 2, maintaining unit integrity on one ship would be much more difficult than in Alternative 1.

Alternative 4: Use Chartered Ships

This alternative represents a substantial departure from the approach taken in the Navy's plan or the first three alternatives. Rather than buy new or used ships, in Alternative 4 the government would purchase sealift services by hiring private companies and chartering sealift ships. The private companies would be responsible for acquiring, maintaining, and operating the ships in accordance with the terms of their contracts. The government would charter ships at a rate of 5 per year, starting in 2025, although it could charter more ships if needed and available. Using information about the Navy's recent charters of sealift ships as well as information from private industry, CBO assumed that each chartered ship would have 200,000 militarily useful square feet. Alternative 4 would put 48 ships under charter between 2025 and 2034, although eventually the entire sealift force would be chartered ships: As existing government-owned ships reached the end of their service life, they would be replaced by chartered ships. This option would also extend the service life of 12 existing ships to nearly 60 years. Those service life extensions would still be needed while the chartered fleet was built up.

As ships were put under charters, private companies would operate and maintain them. CBO estimated an annual charter rate of $21.0 million for each ship in active service, such as ships in the prepositioning force currently operated full time by the Military Sealift Command. To estimate the cost of charters, CBO relied on information provided by private companies that have charters with the government and on recent contracts for charters between private industry and the MSC. For ships in reduced operating status, awaiting a call-up in the event of a military contingency, CBO estimated an annual charter rate of $8.4 million per ship, or 40 percent of a full-time charter. If any ship was not available to perform its mission because of inadequate maintenance or insufficient crew, the chartering company would not be paid its daily rate until the ship was ready.

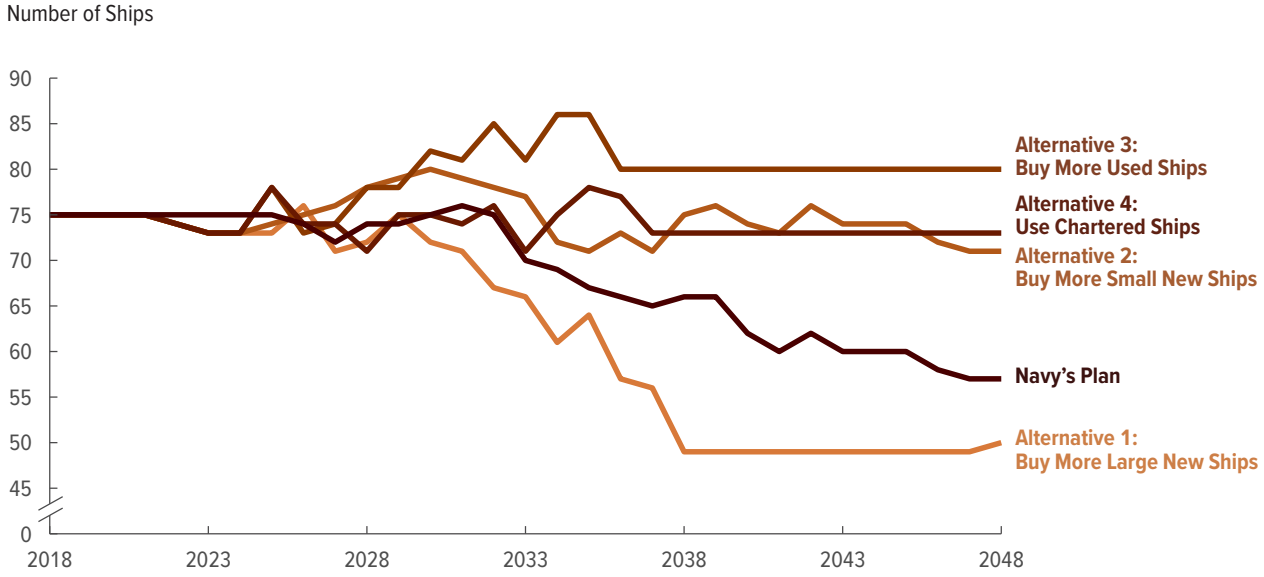
This option has three advantages. First, it is one of the least expensive options that CBO analyzed, with a total cost of $35.1 billion based on annual charter rates. Second, it would relieve the government of all responsibility for maintaining and operating the ships, effectively outsourcing the sealift mission to the private sector. But that transition to the private sector would not be complete for several decades because the government would continue to maintain and operate the newer sealift ships that are already in its fleet. Third, as sealift requirements changed over time, using charters could allow the Navy to alter the composition of the sealift force more easily than it could alter its own fleet. The Navy could specify new requirements for ships that the chartering company would need to meet to get the contract.

Alternative 4 also has three potential disadvantages. The first is that although the government has had some ongoing experience in chartering ships from the private sector, including sealift ships, it has not done so on such a large scale in the past 30 years. It could face challenges in finding enough ships to charter each year, as well as in setting up and administering such a large charter program. The second disadvantage is that the cost of chartering ships in the future is unknown and may not conform to CBO's estimate. The uncertainty of those future costs means that the relative cost-effectiveness of this alternative could be much higher or lower over the long term. A third disadvantage is that charter companies with civilian crews might not be willing to enter an active combat zone if military necessity required it. However, the Navy already employs many civilian mariners not only on its existing sealift ships but also on almost all the combat logistics and support ships in its battle force—the fleet of ships the Navy would send to war.[8]

8. For a discussion of the different types of ships in the U.S. fleet, see Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2020 Shipbuilding Plan* (October 2019), www.cbo.gov/publication/55685.

Figure 3.

Number of Ships in the Navy's Plan and CBO's Alternatives



Source: Congressional Budget Office, using data from the Department of the Navy.

Comparing CBO's Alternatives With the Navy's Plan

CBO used several metrics to compare its alternatives with the Navy's plan: number of ships, militarily useful square footage, average age of the sealift force, average age of the militarily useful square footage, and total 30-year costs. Because of the differences in ship size, the number of ships in the sealift force would differ by the end of the 30-year period under the different alternatives. The amount of militarily useful square footage was, by design, about the same under each alternative over the time period. Average age and 30-year costs also varied: The new-ship alternatives would provide ships with the lowest age and the highest costs, whereas the used-ship and charter alternatives would be the least expensive approaches.

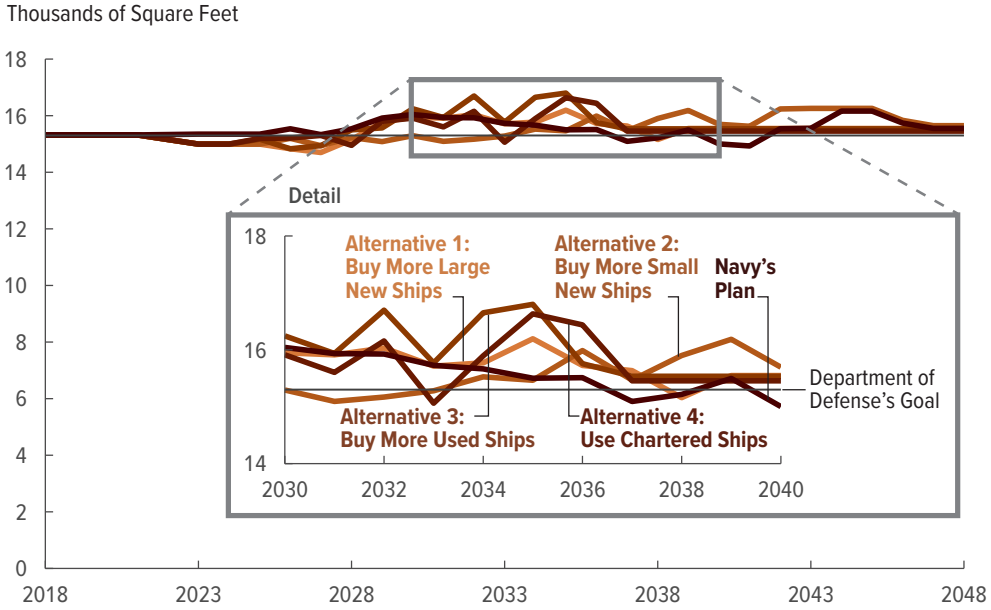
Number of Ships

The size of the sealift force is a useful metric with which to compare the alternatives because it provides insight into the difficulties of managing the force, the flexibility of its use, and its vulnerability if activated to transport military equipment and supplies to a war overseas. A larger sealift force would be more challenging to administer because it would require more crews, more ship berthing spaces around the country or overseas, and potentially a greater diversity in the types of ships the government must oversee. Some of those issues would not apply to Alternative 4 because the chartering companies would be responsible for providing crews and maintenance, but finding berths for the ships would presumably still fall to the government. A larger sealift force might be more flexible, however, because the ships could be in more places and do more things; individual ships within a larger force could also provide less lucrative targets to an enemy because each ship would hold less military equipment than the larger ships. A smaller sealift force, although easier to manage, would pose the hazard of having more military equipment on a smaller number of large ships. In the event of war, the ships of smaller sealift forces would be more attractive targets for a potential enemy.

The number of ships in the sealift force would not change much in the four alternatives or the Navy's plan for the next 10 years (see Figure 3). By 2029, the sealift force would still have between 74 and 79 ships, compared with 76 ships today. By 2048, however, the inventory would vary greatly—from 50 ships under Alternative 1 to 80 ships under Alternative 3. Overall, Alternative 1 and the Navy's plan would provide the

Figure 4.

Militarily Useful Square Footage in the Navy's Plan and CBO's Alternatives Compared With the Department of Defense's Goal



Source: Congressional Budget Office, using data from the Department of the Navy.

smallest sealift force, whereas Alternative 3 would provide the largest.

Militarily Useful Square Footage

The Department of Defense wants to maintain at least 15.3 million square feet of cargo space on its sealift ships that would transport military equipment, especially heavy items such as tanks, artillery, and armored personnel vehicles. By design, CBO's alternatives would all meet or nearly meet that goal throughout the next 30 years (see Figure 4). The variation among the options is a function of the ebb and flow of the number of ships caused by the retirement of old vessels and the acquisition of their replacements. Because the existing force is diverse in size and carrying capacity, the capacities of new ships entering the force would differ from those of retiring ships, causing variations around DoD's goal.

Average Age of the Force and Its Militarily Useful Square Footage

The average age of a fleet of ships can indicate some of the challenges the government might face in maintaining those ships, as well as the likelihood that additional ships would need to be replaced.[9] A younger fleet should be less expensive to maintain and should require the purchase of fewer new ships over the next 30 years to maintain its capability.[10] In addition to comparing the average age of the fleet under the four alternatives, CBO compared the average age of the square footage of the sealift force, which gauges the overall material condition of the sealift carrying capacity over time. (The notional service life of a sealift ship is 50 years.)

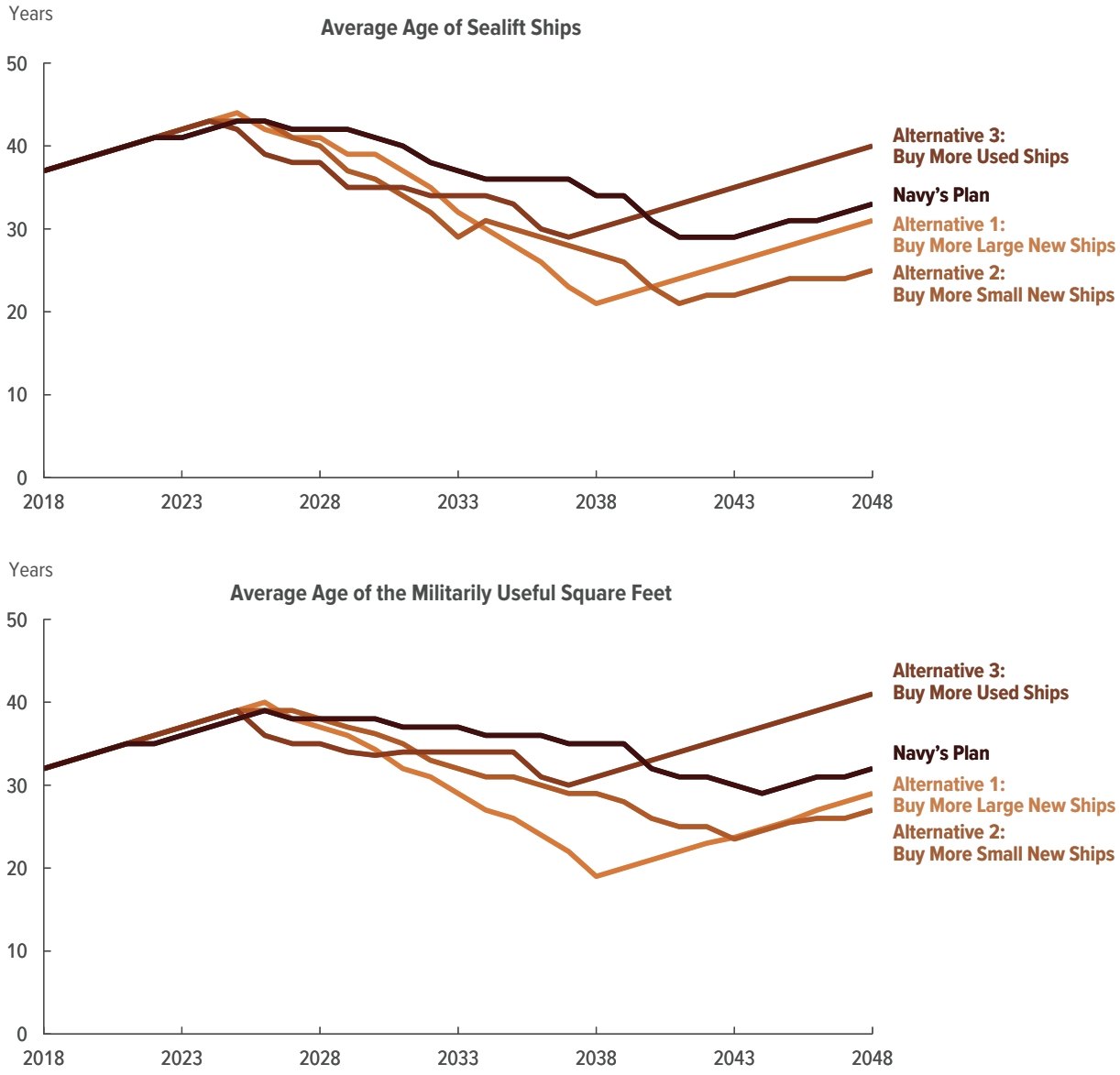
The average age of the sealift force under both measures would rise during the 2020s, but there would be little difference between the Navy's plan and CBO's various alternatives (see Figure 5). Counterintuitively, Alternative 3—buying only used ships—would bring the average age down faster than any other alternative

9. For more on readiness issues in the sealift force, see Bradley Martin and Roland J. Yardley, *Approaches to Strategic Sealift Readiness* (RAND Corporation, 2019), www.rand.org/pubs/research_reports/RR3049.html.

10. Although older equipment is generally costlier to maintain than newer equipment of the same type, estimating the operation and support costs for new generations of sealift ships can be complex. For example, a modern ship's digital control systems may be more expensive to repair than an older ship's analog control systems.

Figure 5.

Average Age of the Sealift Force, by Ship and Militarily Useful Square Footage



Source: Congressional Budget Office.

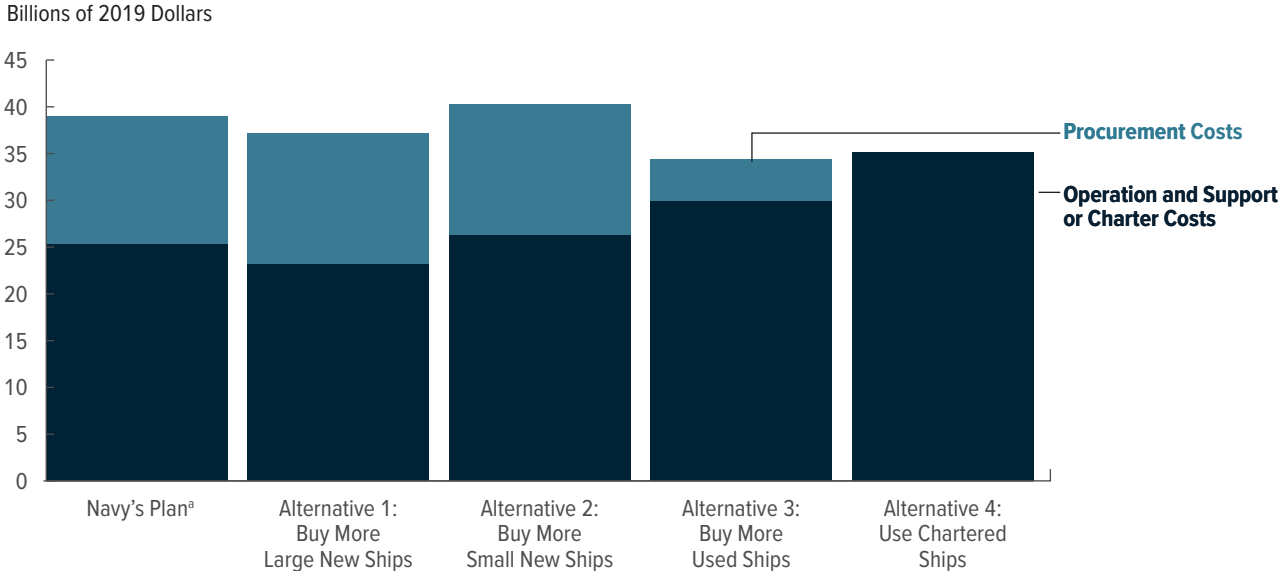
The average age of the chartered ships (Alternative 4) is not provided because it is not known.

through the late 2020s. Although used ships are assumed to be purchased at an average age of 20 years, they would be acquired much faster under Alternative 3 than under any other option, except perhaps those under Alternative 4. (CBO did not include Alternative 4 in the average age calculation because the agency could not estimate the types or ages of ships a private company would provide under those charters. The Navy could specify the age of the ships it chartered to prevent very old ships from being used.) Thus, Alternative 3 would introduce younger ships into the sealift force at a much faster rate in the early years than the first two alternatives or the Navy's plan.

By the mid- to late 2030s, however, the new-ship alternatives would bring the average age of the sealift force

Figure 6.

Procurement and Operation and Support Costs of the Navy's Plan and CBO's Alternatives



Source: Congressional Budget Office.

a. CBO estimated the cost of the Navy's plan by using its own methodology for both procurement and operation and support costs.

down the most. By 2048, Alternative 2 would yield the youngest average age of the sealift ships and, by a slight margin, the youngest average age of the square footage. Alternative 1 would have the youngest average age of the square footage between 2031 through 2042. The age of the sealift force under the Navy's plan—a combination of buying used and new ships—would vary in a narrower range than any other alternative, between 29 and 42 years over the 30-year period.

Total Costs

According to CBO's estimates, the total costs for the Navy's plan and the four alternatives, including acquisition and 30-year operation and support costs, would not vary much. Alternative 3, buying only used ships, would be the least expensive option—but not by much (see Figure 6). That alternative would cost more than $34 billion through 2048. Outsourcing most of the sealift mission to a private chartering company or companies, Alternative 4, would cost about $35 billion.[11] The two new-ship options, Alternatives 1 and 2, would be the most expensive, with total costs of about $37 billion and $40 billion, respectively. Although those two options would have the same procurement costs, the much larger fleet in Alternative 2 would result in higher operation and support costs. The Navy's plan would cost about $39 billion.

The Navy's goals in modernizing the sealift force are relatively straightforward: procuring and operating ships that can move large amounts of military equipment from one continent to another. The closeness of the estimated costs for the Navy's plan and CBO's alternatives reflects that simplicity. Because of uncertainty in various elements of those costs over time—including procurement, especially of used ships; operation and support costs; and chartering costs—the relative costs of the alternatives could easily change.

11. The appropriate budgetary treatment of charter contracts would depend on the details of the legislative authority used to enter those contracts and on the specific terms of those contracts. For the purpose of Congressional budget enforcement, legislative authority to enter fixed-term, multiyear contracts and to record obligations for such contracts on an annual basis would be treated as contract authority, a form of mandatory budget authority. If the Navy used that authority to charter ships that are newly constructed to meet the Navy's specification, chartered for lengthy terms, or solely reserved for the Navy's use, those contracts would be substantially the same as acquisition contracts. In that case, to provide consistency across contracts that achieve similar outcomes, the Administration should record obligations up front for the full value of such contracts at the time they take force.

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About This Document

This Congressional Budget Office report was prepared at the request of the Chairman and Ranking Member of the Subcommittee on Seapower and Projection Forces of the House Committee on Armed Services. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Eric J. Labs wrote the report with guidance from David Mosher and Edward G. Keating. Aaron Betz provided useful comments on the report, as did Jonathan Kaskin, formerly of the U.S. Navy's Strategic Mobility/Combat Logistics Division, and Sam J. Tangredi of the U.S. Naval War College. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Wendy Edelberg and Robert Sunshine reviewed the report. The editor was Rebecca Lanning, and the graphics editor was Robert Rebach. The report is available on CBO's website (www.cbo.gov/publication/55768).

CBO continually seeks feedback to make its work as useful as possible. Please send any comments to communications@cbo.gov.

Phillip L. Swagel
Director
October 2019