

# CRS Report for Congress

## Navy LPD-17 Amphibious Ship Procurement: Background, Issues, and Options for Congress

May 6, 2008

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Prepared for Members and  
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## Summary

Some Members of Congress this year have expressed interest in the option of procuring a 10<sup>th</sup> San Antonio (LPD-17) class amphibious ship in FY2009, so as to help meet the Marine Corps' goal for amphibious lift capability. The Navy's proposed FY2009 budget does not request funding for a 10<sup>th</sup> LPD-17 and instead proposes ending LPD-17 procurement with the ninth ship, which was procured in FY2008.

The Navy's planned 313-ship fleet calls for a 31-ship amphibious force that includes 10 LPD-17s, and the Marine Corps states that a 33-ship amphibious force that includes 11 LPD-17s would be required to fully meet the Marine Corps' amphibious lift goal.

Procurement of a 10<sup>th</sup> LPD-17 is the Number 2 item on the Navy's FY2009 Unfunded Requirements List (URL) and the Number 1 item on the Marine Corps' FY2009 URL. Fully funding the procurement of a 10<sup>th</sup> LPD-17 in FY2009, the Navy and Marine Corps FY2009 URLs state, would cost \$1,700 million. Congress, as part of its action on the FY2008 defense budget, provided \$50 million in advance procurement funding for a 10<sup>th</sup> LPD-17.

The Marine Corps' goal for amphibious lift is to have a force of amphibious ships with enough combined lift capacity for the assault echelons (AEs) of two Marine Expeditionary Brigades (MEBs). This goal, Marine Corps officials state, reflects responsibilities assigned to Marine Corps forces in U.S. regional war plans. The Navy's FY2009 30-year (FY2009-FY2038) shipbuilding plan, if implemented, would achieve and maintain a 32- or 33-ship amphibious force including nine LPD-17s. This 32- or 33-ship force would fall short of meeting the 2.0 MEB AE lift goal in terms of square feet of storage space for wheeled vehicles.

In assessing whether to provide additional funding for LPD-17 procurement in FY2009, Congress may consider several factors, including the potential operational implications of not meeting the 2.0 MEB lift goal, the potential impact on other Navy or DOD programs of providing additional funding for LPD-17 procurement, the Navy's ability to realize service-life extensions for existing amphibious ships, whether all the ships in the planned complementary Maritime Prepositioning Force of the Future (MPF[F]) squadron will be procured, and the potential industrial-base impact of providing additional funding for LPD-17 procurement.

In assessing whether the Marine Corps' amphibious lift goal is appropriate, Congress may consider several factors, including the future international security environment, the potential for using other forces to meet demands for amphibious ships, the degree of operational risk in the current 33-ship amphibious lift requirement, and competing demands for Navy or DOD funding.

Congress has several options regarding funding for the LPD-17 program in FY2009. This report will be updated when events warrant.

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# Navy LPD-17 Amphibious Ship Procurement: Background, Issues, and Options for Congress

## Introduction

Some Members of Congress this year have expressed interest in the option of procuring a 10<sup>th</sup> San Antonio (LPD-17) class amphibious ship in FY2009,<sup>1</sup> so as to help meet the Marine Corps' goal for amphibious lift capability.<sup>2</sup> The Navy's proposed FY2009 budget does not request funding for a 10<sup>th</sup> LPD-17 and instead proposes ending LPD-17 procurement with the ninth ship, which was procured in FY2008. The Navy's proposed FY2009 budget requests \$103.2 million for LPD-17 program closeout costs.<sup>3</sup>

The Navy's planned 313-ship fleet calls for a 31-ship amphibious force that includes 10 LPD-17s,<sup>4</sup> and the Marine Corps states that a 33-ship amphibious force that includes 11 LPD-17s would be required to fully meet the Marine Corps' amphibious lift goal.

Procurement of a 10<sup>th</sup> LPD-17 is the Number 2 item on the Navy's FY2009 Unfunded Requirements List (URL)<sup>5</sup> and the Number 1 item on the Marine Corps'

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<sup>1</sup> For an explanation of the designation "LPD," see the section below on types of amphibious ships.

<sup>2</sup> See, for example, Zachary M. Peterson, "Skelton Says Navy Needs More Ships, Voices Concern About Reaching 313-Ship Mark," *InsideDefense.com*, April 28, 2008; Dan Taylor, "Senate Panel Asks About Lack of 10<sup>th</sup> LPD-17 in Navy's FY-09 Budget," *Inside the Navy*, March 10, 2008; Philip Ewing, "Navy, Marine Leaders Support 2 More LPD 17s," *NavyTimes.com*, March 6, 2008; Andrew Tilghman, "U.S. Marines Request an Extra Ship," *Defense News*, March 3, 2008.

<sup>3</sup> The Department of the Navy (DoN) includes the Navy and the Marine Corps. The Navy's amphibious ships are procured through the Navy's shipbuilding account, known formally as the Shipbuilding and Conversion, Navy (SCN) account. This report uses Navy to refer to the Navy itself, and DoN or "naval" to refer to both the Navy and Marine Corps.

<sup>4</sup> For more on the Navy's planned 313-ship fleet, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

<sup>5</sup> The URL is a list of items that are not included in the proposed budget for a military service for a given fiscal year but which the military service would prefer to be funded if additional funding were to be made available to the service for that fiscal year. For this reason, the URLs are sometimes referred to informally as "wish lists." The military services

(continued...)

FY2009 URL. Fully funding the procurement of a 10<sup>th</sup> LPD-17 in FY2009, the Navy and Marine Corps FY2009 URLs state, would cost \$1,700 million. Congress, as part of its action on the FY2008 defense budget, provided \$50 million in advance procurement funding for a 10<sup>th</sup> LPD-17.

The primary issue for Congress addressed in this report is whether to provide additional funding for LPD-17 procurement in FY2009. An additional, related issue addressed in this report is whether the current amphibious lift goal is appropriate. Congress's decisions on these issues will affect, among other things, Navy and Marine Corps funding requirements and capabilities, and the shipbuilding industrial base.

This CRS report is the successor to an earlier report, now archived, on amphibious and maritime repositioning force (MPF) ships.<sup>6</sup>

## Background

### Amphibious Ships in General

**Functions and Uses of Amphibious Ships.** Amphibious ships are one of four principal categories of combat ships that traditionally have helped define the size and structure of the U.S. Navy. The other three are submarines, aircraft carriers, and surface combatants (e.g., cruisers, destroyers, frigates, and Littoral Combat Ships).<sup>7</sup>

The Navy's amphibious ships are crewed by sailors. The primary function of Navy amphibious ships is to lift (i.e., transport) U.S. Marines and their equipment and supplies to distant operating areas, and enable Marines to conduct expeditionary operations ashore in those areas. Amphibious ships have berthing spaces for Marines, flight decks and hangar decks for their helicopters and vertical take-off and landing (VTOL) fixed-wing aircraft, well decks for storing and launching their landing craft,<sup>8</sup> and storage space for their wheeled vehicles, their other combat equipment, and their supplies. Although amphibious ships are designed to support Marine landings against opposing military forces, they can also be used for Marine

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<sup>5</sup> (...continued)

submit their URLs to Congress each year following the submission of the proposed defense budget. The Number 1 item on the Navy's FY2009 URL is a set of improvements to Navy P-3 maritime patrol aircraft. The 10<sup>th</sup> LPD-17 was the Number 1 item on the Navy's FY2008 URL.

<sup>6</sup> CRS Report RL32513, *Navy-Marine Corps Amphibious and Maritime Repositioning Ship Programs: Background and Oversight Issues for Congress*, by Ronald O'Rourke.

<sup>7</sup> The Navy also includes mine warfare ships and a variety of auxiliary and support ships.

<sup>8</sup> A well deck is a large, garage-like space in the stern of the ship. It can be flooded with water so that landing craft can leave or return to the ship. Access to the well deck is protected by a large stern gate that is somewhat like a garage door.

landings in so-called permissive or benign situations where there are no opposing forces.

The large storage spaces on amphibious ships, and the ability of amphibious ships to use helicopters and landing craft to transfer people, equipment, and supplies from ship to shore without need for port facilities, make amphibious ships potentially useful for a range of combat and non-combat operations. Amphibious ships and their embarked Marine forces can be used for launching and conducting

- larger-scale ground combat operations;
- smaller-scale strike and counter-terrorism operations;
- non-combatant evacuation operations (NEOs);
- peace-enforcement operations;
- operations to train, advise, and assist foreign military forces;
- other nation-building operations, such as reconstruction operations;
- peacetime engagement activities, such as exercises; and
- disaster-response and humanitarian-assistance operations.

Amphibious ships and their embarked Marine forces can also be used for maintaining forward-deployed naval presence for purposes of deterrence, reassurance, and maintaining regional stability.

Although the Marines have not conducted a large-scale amphibious assault against opposing military forces since the Korean War, Marine Corps officials state that there have been about 85 U.S. amphibious operations of other kinds between 1990 and April 2008.<sup>9</sup> In addition, a possibility of an amphibious landing can generate tactical benefits, even if the landing is not carried out. During the 1991 Persian Gulf War, for example, the possibility of an amphibious landing by a force of about 17,000 Marines embarked on amphibious ships in the Persian Gulf tied down several Iraqi divisions in coastal-defense positions. Those Iraqi divisions positions were not available for use against U.S.-coalition ground forces moving north from Saudi Arabia.<sup>10</sup>

**Types of Amphibious Ships.** U.S. Navy amphibious ships have designations starting with the letter L, as in amphibious *landing*. Navy amphibious ships can be divided into two main groups — the so-called “big-deck” amphibious assault ships, designated LHA and LHD, which look like medium-sized aircraft carriers, and the smaller (but still sizeable) amphibious ships designated LSD or LPD,<sup>11</sup> which are sometimes called “small-deck” amphibious ships. The LHAs and

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<sup>9</sup> Source for the figure of about 85 amphibious operations between 1990 and April 2008: Marine Corps briefing to CRS on April 25, 2008.

<sup>10</sup> See CRS Report 91-421 F, *Persian Gulf War: Defense Policy Implications for Congress*, coordinated by Ronald O’Rourke, p. 41. (May 15, 1991; out of print and available directly from the report coordinator.)

<sup>11</sup> LHA can be translated as landing ship, helicopter-capable, assault. LHD can be translated as landing ship, helicopter-capable, well deck. LSD can be translated as landing ship, well deck. LPD can be translated as landing ship, helicopter platform, well deck. Whether noted (continued...)

LHDs have large flight decks and hangar decks for embarking and operating numerous helicopters and VTOL fixed-wing aircraft, while the LSDs and LPDs have much smaller flight decks and hangar decks for embarking and operating smaller numbers of helicopters. The LHAs and LHDs, as bigger ships, in general can individually embark more Marines and equipment than the LSDs and LPDs.

**Forward Deployments.** On any given day, some of the Navy's amphibious ships, like some of the Navy's other ships, are forward-deployed to various overseas operating areas. Forward-deployed U.S. Navy amphibious ships are often organized into formations called expeditionary strike groups (ESGs). An ESG notionally includes one LHA or LHD, one LSD, and one LPD. The amphibious ships in an ESG together can embark a Marine expeditionary unit (MEU) consisting of about 2,200 Marines, their aircraft, their landing craft, their combat equipment, and about 15 days worth of supplies. Each ESG also notionally includes three surface combatants (some or all armed with Tomahawk cruise missiles), one attack submarine, and perhaps one or more P-3 long-range, land-based maritime patrol aircraft. ESGs are designed to be independently deployable, strike-capable naval formations, but they can also operate in conjunction with carrier strike groups (CSGs) to form larger naval task forces. On average, two or perhaps three ESGs might be forward-deployed at any given time.

Amphibious ships are also sometimes forward-deployed on an individual basis to certain lower-threat operating areas, particularly for conducting peacetime engagement activities with foreign countries or for responding to smaller-scale contingencies. In such deployments, an amphibious ship might serve as the core of a new kind of Navy formation called a Global Fleet Station (GFS). The Navy announced the GFS concept in 2006 and is now implementing it in certain areas around the world, including the Caribbean and the Gulf of Guinea, off the western coast of Africa. A core of a GFS consists of an amphibious ship or a high-speed sealift ship that is forward-deployed to a region of interest. Smaller Navy ships, such as Littoral Combat Ships (LCSs), might then operate in conjunction with this core ship. The Navy states that the GFS

is a persistent sea base of operations from which to coordinate and employ adaptive force packages within a regional area of interest. Focusing primarily on Phase 0 (shaping) operations, Theater Security Cooperation, Global Maritime Awareness, and tasks associated specifically with the War on Terror, GFS offers a means to increase regional maritime security through the cooperative efforts of joint, inter-agency, and multinational partners, as well as Non-Governmental Organizations.<sup>12</sup>

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<sup>11</sup> (...continued)  
in the designation or not, all these ships have well decks.

<sup>12</sup> U.S. Department of the Navy, *Naval Operations Concept 2006*, Washington, 2006, pp. 30. The Navy states further on pages 30-31 that:

Like all sea bases, the composition of a GFS depends on Combatant Commander requirements, the operating environment, and the mission. From its sea base, each GFS would serve as a self-contained headquarters for regional operations  
(continued...)



## Current Inventory of Amphibious Ships

As of the end of FY2007, the Navy included the following 31 amphibious ships:

- **7 Wasp (LHD-1) class ships**, commissioned between 1989 and 2001, each displacing about 40,500 tons;<sup>13</sup>
- **3 Tarawa (LHA-1) class ships**, commissioned between 1976 and 1980, each displacing about 40,000 tons;
- **12 Whidbey Island/Harpers Ferry (LSD-41/49) class ships**, commissioned between 1985 and 1998, each displacing about 16,000 tons;
- **3 San Antonio (LPD-17) class ships**, the first commissioned in 2006, each displacing about 26,000 tons;<sup>14</sup> and
- **6 Austin (LPD-4) class ships**, commissioned between 1967 and 1971, each displacing about 17,000 tons.

## Amphibious Lift Goal<sup>15</sup>

**Expressed in Terms of MEBs.** The Marine Corps' goal for amphibious lift is to have a force of amphibious ships with enough combined lift capacity to simultaneously land the assault echelons (AEs) of two Marine Expeditionary Brigades (MEBs), or 2.0 MEB AEs for short. This goal, Marine Corps officials state, reflects responsibilities assigned to Marine Corps forces in U.S. regional war plans.

A MEB is a Marine air-ground task force (MAGTF) of 14,484 Marines and their equipment and supplies. The AE of a MEB is the initial part of the MEB to go ashore. The remaining part that goes ashore later is called the assault follow-on echelon (AFOE). Marine Corps doctrine calls for the AE to go ashore from amphibious ships, and for the AFOE to go ashore from less-survivable sealift (i.e.,

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<sup>12</sup> (...continued)

with the capacity to repair and service all ships, small craft, and aircraft assigned. Additionally, the GFS might provide classroom space, limited medical facilities, an information fusion center, and some combat service support capability. The GFS concept provides a leveraged, high-yield sea based option that achieves a persistent presence in support of national objectives. Additionally, it complements more traditional CSG/ESG training and deployment cycles.

<sup>13</sup> For comparison, a Nimitz-class nuclear-powered aircraft carrier displaces about 100,000 tons, and a cruiser or destroyer displaces about 9,000 tons.

<sup>14</sup> Of the nine LPD-17s procured through FY2008, three were in service and six were under construction as of the end of FY2008.

<sup>15</sup> Unless otherwise noted, information in this section is based on a briefing from Marine Corps officials to CRS on April 25, 2008, and on Marine Corps point papers provided to CRS in association with this briefing.

cargo-type) ships controlled by the Military Sealift Command (MSC). The AE of a MEB includes 10,055 of the MEB's Marines, plus equipment and supplies for these 10,055 Marines.

The amphibious lift goal as approved by the Secretary of Defense has changed numerous times since the Korean War, reflecting changes in strategic or budgetary circumstances. One such change occurred in 1991, as the Cold War was ending.<sup>16</sup> The most recent change occurred in 2006, when the goal was reduced from 2.5 MEB AEs to 2.0 MEB AEs. **Table 1** shows amphibious lift goals since 1980.

**Table 1. Amphibious Lift Goals Since 1980**

Year	Goal	Troops <sup>a</sup>
1980	1.15 MEFs <sup>b</sup>	66,252
1981	1 MEF AE + 1 MEB	53,240
1982	1 MEF AE + 1 MEB AE	46,810
1991	2.5 MEB AEs	33,793
2006	2.0 MEB AEs	23,016

**Sources:** For list of amphibious lift goals prior to 2006: Matthew T. Robinson, *Integrated Amphibious Operations Update Study, (DoN Lift 2+) — A Short History of the Amphibious Lift Requirement*, Center for Naval Analyses, Alexandria (VA), CRM D0005882.A3/Final, July 2002, p. 2 (Table 2). For troop levels associated with each lift goal: Marine Corps data provided to CRS on May 2, 2008.

- a. Troop totals shown include a Navy Support Element (NSE) consisting of Navy units that help to move the Marines' equipment and supplies from ship to shore. In the case of the 2006 goal for 2.0 MEB AEs, the total of 23,016 troops includes an NSE of 2,906 Navy personnel.
- b. MEF stands for Marine Expeditionary Force — a Marine air-ground task force with more than twice as many troops as a MEB.

In discussions of the current 2.0 MEB AE amphibious lift goal, the “AE” part is often dropped for convenience, even though the current requirement still relates to MEB AEs rather than complete MEBs.

Marine Corps officials state that the 2006 reduction in the amphibious lift goal to 2.0 MEB AEs is acceptable because the Navy and Marine Corps also plan to field a new squadron of 14 next-generation maritime prepositioning force ships called the Maritime Prepositioning Force of the Future, or MPF(F). The planned 14-ship MPF(F) squadron, which is to include three modified LHA/LHD-type ships and 11 sealift (i.e., cargo-transport) ships, is to have a capability for putting an additional MEB ashore. Unlike the amphibious ship force, the MPF(F) squadron is not intended as assault shipping — the sealift ships in the MPF(F) squadron have less survivability and self-defense capability than the Navy's amphibious ships, and are therefore considered unsuitable for use in forcible-entry operations. MPF(F) ships, however, are in general less expensive to procure than amphibious ships, and they are

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<sup>16</sup> Key events marking the end of the Cold War include fall of the Berlin Wall in November 1989 and the disintegration of the Soviet Union in December 1991.

designed to remain prepositioned at sea in a theater of interest for long periods of time before returning the port for maintenance. Together, the Navy's amphibious ship force and the MPF(F) squadron are to provide a total of 3.0 MEB AEs of lift, or 30,165 troops.

**Translated into Numbers of Amphibious Ships.** The Marine Corps states the 2.0 MEB AE amphibious lift goal translates into a requirement for a force of 33 amphibious ships, including

- 11 LHAs/LHDs,
- 11 LSD-41/49 class ships, and
- 11 LPD-17s.

In explaining how the requirement for 2.0 MEB AEs translates into this 33-ship requirement, the Marine Corps states the following:

- Given the lift capabilities of the Navy's current amphibious ships, each MEB AE would require 19 operational amphibious ships to lift: 6 LHAs/LHDs, 7 LSD-41/49s, and 6 LPD-17s.
- To arrive at a more fiscally constrained goal, the Marine Corps reduced the above 19-ship total to 17 operational ships: 5 LHAs/LHDs, 7 LSD-41/49s, and 5 LPD-17s. This 17-ship force requires about 11% of the MEB AE's vehicles to be shifted to the AFOE, which creates a degree of operational risk. This 17-ship force was presented to Navy officials in mid-2007.
- To arrive at a still-more fiscally constrained goal, Navy and Marine Corps officials in mid-2007 agreed to reduce the 17-ship total to 15 operational ships — 5 of each kind. This 15-ship force requires about 20% of the MEB AE's vehicles and about 12% of its cargo to be shifted to the AFOE, which creates an additional degree of operational risk.

The Marine Corps testified in April 2008 that:

Each MEB AE requires seventeen amphibious warfare ships.... However, given current fiscal constraints, *the Navy and Marine Corps have agreed to assume a degree of operational risk by limiting the assault echelon of each MEB by using only fifteen ships per MEB...*<sup>17</sup>

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<sup>17</sup> Statement of Lieutenant General James F. Amos, Deputy Commandant of the marine Corps (Combat Development and Integration), Before the Senate Armed Services Committee Subcommittee on Seapower, Concerning Shipbuilding and Force Structure on April 08, 2008, pp. 6-7. Italics as in the original.

**Table 2** shows the five elements of the amphibious lift footprint, and how limiting each MEB AE to 17 or 15 operational ships results in some of the MEB AE's vehicles and cargo being shifted to the AFOE.

**Table 2. MEB AE Lift Elements**

Lift element	Operational ships per MEB AE			% of lift element shifted to AFOE	
	19 ships (full MEB AE)	17 ships (somewhat fiscally constrained)	15 ships (more fiscally constrained)	with 17 ships per MEB AE	with 15 ships per MEB AE
Troop berthing	10,055	10,055	10,055	—	—
Vehicle storage space (square feet)	352,340	312,601	281,694	11.3%	20.1%
Cargo storage (cubic feet)	553,009	553,009	486,638	—	12.0%
VTOL aircraft operating spots	254	254	254	—	—
LCAC operating spots	24	24	24	—	—

**Source:** Table prepared by CRS based on Marine Corps data provided by telephone to CRS on April 29, 2008.

**Notes:** VTOL means vertical takeoff and landing. LCAC means air-cushioned landing craft.

Using 15 operational ships per MEB AE, providing lift for 2.0 MEB AEs would require 30 operational ships: 10 LHAs/LHDs, 10 LSD-41/49s, and 10 LPD-17s. The Marine Corps states that, in light of ship maintenance requirements, maintaining a force of 30 operational ships (i.e., ships not in maintenance) would require having an additional 15% in total inventory, meaning a total of 34.5 ships (11.5 of each kind) for 2.0 MEB AEs. The figure of 34.5 ships, the Marine Corps states, was then rounded down to 33 ships (11 of each kind).<sup>18</sup>

**Table 3** shows the total number of amphibious ships that the Marine Corps states would be needed to lift 2.0 MEBs (the current goal), 2.5 MEBs (the goal from 1991 to 2006), and 3.0 MEBs (the broader current goal currently being met through a combination of amphibious and MPF[F] ships), using 15, 17, or 19 operational ships per MEB AE, and including an additional allowance to account for ships in

<sup>18</sup> As shown in **Appendix A**, the Marine Corps alternatively has stated that in light of ship maintenance requirements, maintaining a force of 30 operational ships would require having an additional 10% in total inventory, meaning a total of 33 ships (11 of each kind).

maintenance. The first column shows the current 33-ship requirement for 2.0 MEB AEs using 15 operational ships per MEB.

**Table 3. Ships Required for Various Potential Lift Goals**  
(including allowance for ships in overhaul)

	2.0 MEB AEs			2.5 MEB AEs			3.0 MEB AEs		
Operational ships per MEB AE <sup>a</sup>	15	17	19	15	17	19	15	17	19
LHA/LHD <sup>a</sup>	11	11	13	14	14	17	17	17	20
LSD-41/49 <sup>a</sup>	11	13	15	14	16	19	16	20	23
LPD-17 <sup>a</sup>	11	13	13	14	16	16	16	20	20
<b>Total<sup>a</sup></b>	<b>33</b>	<b>37</b>	<b>41</b>	<b>42</b>	<b>46</b>	<b>52</b>	<b>49</b>	<b>57</b>	<b>63</b>

**Source:** Table prepared by CRS based on Marine Corps data provided to CRS on May 1, 2008.

a. Required numbers of ships shown include additional allowance to account for ships in maintenance, so as to support 15, 17, or 19 *operational* ships per MEB AE.

**Relationship to Marine Corps End Strength.** The Marine Corps is currently implementing a plan to increase its active-duty end strength from about 180,400 at the end of FY2007 to 202,000 by the end of FY2011. Marine Corps end strength, like the amphibious lift goal, has changed over time. Changes in Marine end strength do not necessarily imply parallel changes in the amphibious lift goal. In discussions this year on the amphibious lift goal, Marine Corps officials have not argued that the current expansion in Marine Corps end strength calls for increasing the amphibious lift goal.

**April 2008 Marine Corps Testimony.** For additional discussion of the amphibious lift goal, see **Appendix A**, which presents April 2008 Marine Corps testimony on the topic.

## Programmed Amphibious Force

Although the Marine Corps states that a 33-ship amphibious force including 11 LPD-17s would be needed to fully meet the amphibious lift goal, the Navy's 313-ship plan calls for a 31-ship amphibious force including 10 LPD-17s. In discussing the 31-ship objective, the Navy's February 2008 report on the Navy's FY2009 30-year shipbuilding plan stated that the Department of the Navy "is reviewing options to increase assault echelon amphibious lift to 33 ships to meet USMC requirements."<sup>19</sup> The report also states:

The Commandant of the Marine Corps has determined that a minimum of 33 amphibious ships is necessary to support their assault echelon lift

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<sup>19</sup> U.S. Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009*, p. 5.

requirements; specifically, he has requested a force of 11 aviation capable amphibious ships, 11 LPDs and 11 LSDs. The Chief of Naval Operations supports the Commandant's determination.<sup>20</sup>

Although the Navy's planned 313-ship fleet includes a 31-ship force including 10 LPD-17s, the Navy's FY2009 30-year (FY2009-FY2038) shipbuilding plan, if implemented, would achieve and maintain an amphibious force of 32 or 33 ships (the number varies from year to year) including nine LPD-17s. This 32- or 33-ship force also includes the 12 existing LSD-41/49 class ships and assumes service life extensions for certain existing amphibious ships.<sup>21</sup>

**Table 4** shows the Marine Corps' calculation of the amount of amphibious lift, relative to the 2.0 MEB lift goal, resulting from this 32- or 33-ship amphibious force. The table presents the five different elements of amphibious lift. In the table, a figure of 1.0 in a cell would meet 100% of the 2.0 MEB lift goal for that lift element, a figure of 1.5 would exceed by 50% the 2.0 MEB lift goal for that element, and a figure of 0.75 would meet 75% of the 2.0 MEB lift goal for that element.

**Table 4. Amphibious Lift Under FY2009 30-Year Plan**

	2008	2009	2010	2015	2020	2025	2030	2035
Troops	1.46	1.35	1.38	1.45	1.42	1.35	1.49	1.59
Vehicle (sq. ft.)	0.77	0.75	0.80	0.90	0.88	0.93	1.05	1.17
Cargo (cu. ft.)	2.02	1.90	1.92	2.07	2.04	1.95	2.28	2.49
VTOL aircraft	1.02	0.93	0.94	1.07	1.06	0.97	1.18	1.31
LCACs	1.81	1.75	1.79	1.79	1.75	1.77	1.65	1.50

**Source:** U.S. Marine Corps calculations provided to CRS, March 11, 2008. The calculations are based on a MEB that is sized to be carried aboard 15 amphibious ships.

As can be seen in the table, the Marine Corps calculates that the projected 32- or 33-ship amphibious force would

- roughly meet the lift goal for VTOL aircraft spaces;

<sup>20</sup> U.S. Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009*, p. A-3.

<sup>21</sup> Amphibious ships typically have service lives of 35 or 40 years. The Navy's report on the FY2009 30-year shipbuilding plan assumes service life extensions for four existing amphibious ships — two LPD-4s whose service lives are to be extended to 45 years and 47 years, and two LHA-1s, whose service lives are to be extended 43 years. (Department of the Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009*, Washington, 2008 (February 2008), p. A-3.) In addition, CBO testified in March 2008 that the plan also appears to assume an extension of the service lives of the 12 LSD-41/49 class ships from an earlier goal of 38 years to a new goal of 42 years. (CBO testimony, Statement of Eric J. Labs, Senior Analyst, [on] Current and Projected Navy Shipbuilding Programs, before the Subcommittee on Seapower and Expeditionary Forces, Committee on Armed Services, U.S. House of Representatives, March 14, 2008, p. 27.)

- exceed the lift goal for troops, space for cargo, and spaces for LCAC landing craft; and
- fall short of meeting the lift goal for space for vehicles.<sup>22</sup>

The projected shortfall in space for vehicles, the Marine Corps says, would mean that the 32- or 33-ship amphibious force would not be able, by itself, to simultaneously land 2.0 fully equipped MEB AEs.

The Navy's report on the FY2009 30-year shipbuilding plan states that:

While the mix of the 33 [amphibious] ships reflected in this plan differs slightly from the USMC requirement, it represents acceptable risk considering the amphibious ships planned for decommissioning are not scheduled for dismantling or sinking to permit mobilization at a later date if required. The decommissioning ships are being replaced with newer more capable LPD 17 and LHA 6 class ships. The Navy will maintain the 33-ship requirement for amphibious shipping through the FYDP while these new ships are integrated into the battleforce. Consequently, there will be no amphibious ship capability gaps through at least FY 2019.<sup>23</sup>

## LPD-17 Program

**Replacements for Older Amphibious Ships.** The Navy initiated the LPD-17 program in the 1990s to provide replacement ships for the Navy's aging Austin (LPD-4) class amphibious ships, which entered service between 1965 and 1971, and three other older classes of amphibious ships that have already been removed from Navy service.

**Construction Shipyards.** LPD-17s are built primarily by the Avondale shipyard near New Orleans, LA, and the Ingalls shipyard near Pascagoula, MS, that form part of Northrop Grumman Shipbuilding (NGSB).<sup>24</sup>

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<sup>22</sup> Although a surplus is projected in space for cargo, that surplus is not useable for storing vehicles because vehicles can't move into or out of that space.

<sup>23</sup> U.S. Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009*, p. A-3.

<sup>24</sup> Portions of LPD-17s are built at a fabrication facility at Gulfport, MS, that forms another part of NGSB. NGSB subcontracted portions of some early LPD-17s to a shipyard in Texas operated by Signal International ([www.signalint.com](http://www.signalint.com)), and more recently has subcontracted portions of LPD-24 (i.e., the eighth LPD-17) to General Dynamics' Bath Iron Works shipyard of Bath, ME. Parts of LPD-24 are also being built at Newport News Shipbuilding, of Newport News, VA, another yard that forms part of NGSB. (See Peter Frost, "Labor Market, Schedule Forces Outsourcing of Work," *Newport News Daily Press*, April 1, 2008; Holbrook Mohr, "Northrop Gets LPD Help From General Dynamics," *NavyTimes.com*, April 1, 2008; and Geoff Fein, "Northrop Grumman Awards Bath Iron Works Construction Work On LPD-24," *Defense Daily*, April 2, 2008.)

**Procurement Profile.** As shown in **Table 5**, the first LPD-17 was procured in FY1996, and a total of nine have been procured through FY2008. As of the end of FY2007, the first three had entered service.

**Table 5. LPD-17 Procurement, FY1996-FY2008**

96	97	98	99	00	01	02	03	04	05	06	07	08
1	0	0	1	2	0	0	1	1	1	1	0	1

**Cost Growth, Schedule Delays, and Construction Problems.** The LPD-17 program has experienced considerable cost growth, schedule delays, and construction problems, particularly on the earlier ships in the program. The first ship in the program experienced cost growth of about 70%, and later ships in the program were substantially more expensive to build than originally estimated. The design and construction of the first ship were delayed by about two years. Delays in building the first ships were a primary reason for the FY2001-FY2002 hiatus in LPD-17 procurement shown in **Table 5**. The first and second ships were delivered to the Navy in incomplete form, and numerous construction problems were identified on the first ship. After years of working to overcome these problems, Navy officials are now “cautiously optimistic” that the LPD-17 construction effort is stabilizing.<sup>25</sup> For additional details, see **Appendix B**.

**LPD-17 Program in Proposed FY2009 Budget.** As mentioned earlier, the Navy’s proposed FY2009 budget does not request funding for a 10<sup>th</sup> LPD-17 and instead requests \$103.2 million for LPD-17 program closeout costs. Procurement of a 10<sup>th</sup> LPD-17, however, is the Number 2 item on the Navy’s FY2009 Unfunded Requirements List (URL) and the Number 1 item on the Marine Corps’ FY2009 URL. Fully funding the procurement of a 10<sup>th</sup> LPD-17 in FY2009, the Navy and Marine Corps FY2009 URLs state, would cost \$1,700 million. This \$1,700 million would be in addition to the \$50 million in advance procurement funding for the ship that Congress provided as part of its action on the FY2008 defense budget, making the total estimated procurement cost of the ship \$1,750 million.

The Navy testified in March 2008 that:

By addressing the 10<sup>th</sup> LPD in the FY 2010 budget development process, the Navy will still be able to leverage a warm [LPD-17] production line, albeit with inherent inefficiencies. However, with competing priorities within DoD there is no guarantee that this 10<sup>th</sup> ship will be appropriated. Significant efforts are required to begin planning for the possibility that the [production] line will be closed as we near the LPD 25 delivery [i.e., the delivery of the ninth ship] in 2012. Starting in FY 2009, the Navy will begin to cover infrastructure like costs related to the LPD 17 production design. Closeout costs would also be used for shutdown/disposal of special tooling and/or test equipment, particularly for unique Contractor Furnished Equipment/Government Furnished Equipment items. Environmental impact assessments will be required as Northrop

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<sup>25</sup> See, for example, Zachary M. Peterson, “Troubled Amphib Program Appears On Track,” *NavyTimes.com*, December 24, 2007.



Grumman Shipbuilding looks to consolidate excess infrastructure across the yard.

The FY 2009 President's Budget request includes funding for program closeout efforts required after delivery of the last LPD 17 Class ship.<sup>26</sup>

## Issues for Congress

### FY2009 Funding for LPD-17 Procurement

In assessing the issue of whether to provide additional funding for LPD-17 procurement in FY2009, Congress may consider several factors, including those discussed below.

**Potential Operational Implications of Not Meeting Lift Goal.** Falling short of the 2.0 MEB amphibious lift goal could preclude or increase the operational risk associated with attempting a larger-scale amphibious landing, which could in turn affect U.S. military options in major regional conflict where the U.S. objective is to evict significant opposing conventional military forces from a land area that borders onto the sea. A potential example of such a situation would be a conflict on the Korean Peninsula — a scenario that has a low likelihood of occurring on any given day, but which could have significant implications for U.S. security if it were to occur. Falling short of the 2.0 MEB AE goal could also reduce the Navy's ability to use amphibious ships for conducting other kinds of operations that are more likely to occur on a day-to-day basis, such as those listed earlier in the section on functions and uses of amphibious ships.

**Potential Impact on Other Programs.** Reducing funding for one or more other Navy or DOD programs so as to make funding available for LPD-17 procurement could have its own resulting operational implications, which might then be weighed against the operational benefits of additional LPD-17 procurement.

**Service Life Extensions for Amphibious Ships.** As mentioned earlier, the Navy's projected 32- or 33-ship amphibious force assumes service life extensions for certain existing amphibious ships. If the Navy is not able to achieve all of these service life extensions because of limits on ship maintenance funding or future discoveries of significant problems in the ships' material condition, then the total number of amphibious ships in service in certain future years will be lower than the Navy projects, and the amount of amphibious lift capability in certain future years will be less than that shown in **Table 4**. Conversely, if the Navy is able and chooses to extend the lives of these ships even further than currently planned, then the amount

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<sup>26</sup> Statement of Vice Admiral Barry McCullough, Deputy Chief of Naval Operations for Integration of Capabilities and Resources, and Ms. Allison Stiller, Deputy Assistant Secretary of the Navy (Ship Programs), Before the Subcommittee on Seapower and Expeditionary Forces of the House Armed Services Committee on Navy Force Structure and Shipbuilding, March 14, 2008, pp. 7-8.

of amphibious lift capability in certain future years will be less than that shown in **Table 4**.

**Planned MPF(F) Squadron.** As discussed earlier, the 2006 reduction in the amphibious lift goal to 2.0 MEB AEs is acceptable to the Marine Corps in part because the planned MPF(F) squadron is to provide a capability for putting an additional MEB ashore. If, because of budget constraints or other factors, some or all of the MPF(F) ships are not procured, shortfalls in combined amphibious ship/MPF(F) lift could be greater than what would be suggested by looking solely at the amphibious ship figures in **Table 4**.

**Industrial Base.** Procuring a 10<sup>th</sup> LPD-17 would provide additional LPD-17-related work to the shipyards and supplier firms involved in building LPD-17s. Although LPD-17s are built primarily by the Avondale and Ingalls shipyards that form part of NGSB, other shipyards, such as General Dynamics' Bath Iron Works (GD/BIW) of Bath, ME, are capable of building them.<sup>27</sup> If additional funding for LPD-17 procurement is made available by reducing funding for other Navy or DOD procurement programs, that could reduce workloads for the firms involved in those programs. An April 2008 press report stated that:

Congressional approval of the 10th LPD-17 amphibious assault ship would be a huge help to getting Northrop Grumman's Gulf Coast shipbuilding workforce fully back on its feet after the Hurricane Katrina disaster, the company's president of shipbuilding said last week.

It has been nearly three years since the hurricane wrecked the Gulf Coast, damaging the company's Ingalls Shipyard in Pascagoula, MS, and displacing members of the yard's workforce from their homes. To date, that workforce is "not yet at full strength," said Mike Petters, president of Northrop Grumman Shipbuilding, in a brief interview April 24 with *Inside the Navy*....

An additional ship will be essential for the maturation of the workforce, Petters said.

"We are working our way through several ship deliveries over the next 24 months," he said. "The challenge that I see is, as we come through those deliveries, what then?"

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<sup>27</sup> The Navy in 1996 awarded the contract to design and build the first LPD-17 to an industry team that included Avondale Shipbuilding (which was then independently owned by its employees) and GD/BIW. Under the team's arrangement, Avondale was to have built eight of a then-planned class of 12 LPD-17s, while GD/BIW was to have built four. In 1999, Avondale was acquired by Litton Industries, and in 2001, Northrop purchased Litton, becoming Avondale's owner. On June 17, 2002, the Navy signed a Memorandum of Understanding (MOU) with GD and Northrop under which GD/BIW's four LPD-17s were transferred to Northrop and GD/BIW in exchange received four additional DDG 51-class destroyers that were to have been built by Northrop. (See DOD press release No. 311-02 of June 17, 2002, "Navy Signs MOU to Transfer Ship Construction," available online at [<http://www.defenselink.mil/releases/release.aspx?releaseid=3384>].)

He added that putting a lot of energy into increasing the workforce's capability in building ships and then taking away its work a few years down the road would not be good for either the company or the Navy.

"The issue for me is, let's think about what's the workload in 2011 and 2012," he said. "That's why we've been interested in getting the next LPD funding, because I think you have to do that now so you can actually have it there to be built in 2011 or 2012."<sup>28</sup>

The cost of a 10<sup>th</sup> LPD-17 could be affected by when the ship is procured. If the interval between the 9<sup>th</sup> ship (which was procured in FY2008) and the 10<sup>th</sup> ship grows beyond a certain point, the procurement cost of the 10<sup>th</sup> ship could increase because of a break in the LPD-17 production learning curve and the incurring of LPD-17 production line restart costs. The Navy testified in April 2008 that:

If you look at the industrial base and where we are in the LPD production, I would say that you could wait until FY[20]10 to buy that [tenth] ship with a little bit more risk [than if you were to procure it in FY2009], but beyond that you would definitely end up with a cold production line.<sup>29</sup>

Some observers have proposed using the basic LPD-17 hull design as the basis for building other kinds of ships for the Navy, such as the Navy's planned JCC(X) joint command ship, which the Navy wants to procure in FY2012; the LSD(X), the Navy's projected replacement for the LSD-41/49 class ships; or a naval gunfire support version of the basic LPD-17 hull, which is an option that has been suggested by both CBO and Robert Work of the Center for Strategic and Budgetary Analyses (CSBA).<sup>30</sup> Advocates of building such ships might argue that their procurement costs could be minimized by keeping the LPD-17 production line open and avoiding a break in the learning curve for producing the basic LPD-17 hull.

## Amphibious Lift Goal

In assessing the issue of whether the Marine Corps' amphibious lift goal is appropriate, Congress may consider several factors, including those discussed below.

**Future Security Environment.** Changes in the international security environment could affect future demands for amphibious ships for performing various missions. Changes in the political or military situation on the Korean Peninsula, for example, could affect demands for amphibious ships for potential use in Korean Peninsula conflict scenarios, while changes in population patterns, weather

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<sup>28</sup> Dan Taylor, "Tenth LPD-17 Could Help Mississippi Shipyard Get Back On Its Feet," *Inside the Navy*, April 28, 2008.

<sup>29</sup> Transcript of spoken remarks of Allison Stiller, Deputy Assistant Secretary of the Navy (Ship Programs), at an April 8, 2008, hearing on Navy force structure requirements and programs before the Seapower subcommittee of the Senate Armed Services Committee.

<sup>30</sup> For more on the option of a naval gunfire support version of the LPD-17 hull, including citations from CBO and CSBA reports, see CRS Report RL32109, *Navy DDG-1000 Destroyer Program: Background, Oversight Issues, and Options for Congress*, by Ronald O'Rourke.

patterns, commodity prices, or the policies of foreign governments could affect future demands for amphibious ships for performing disaster-response or humanitarian-assistance operations.

**Potential to Meet Demands with Other Forces.** It is possible that certain demands for U.S. Navy amphibious ships might be met in other ways — for example, by other U.S. forces or by allied or coalition military forces. The U.S. Army has forcible-entry forces such as such as the 82<sup>nd</sup> Airborne Division, and the U.S. Army and U.S. Air Force have substantial logistics capabilities for conducting disaster-response and humanitarian-relief operations. The capabilities and limitations of amphibious ships, however, differ from those of other U.S. forces. Consequently, depending on the military or geographic circumstances, using amphibious ships might be the preferred option (or the only option) for conducting certain operations. In addition, other U.S. forces have their own mission responsibilities and consequently might not always be available to act as substitutes for amphibious ships.

Some allied or coalition navies include amphibious ships that are potentially suitable for meeting demands that might otherwise be met by U.S. Navy amphibious ships. The number of amphibious ships in these navies, however, is relatively small, and the capabilities of these ships are not always equal to that of U.S. Navy amphibious ships. In addition, foreign amphibious ships might not always be available to perform operations of interest to the United States, either because they are in maintenance or already committed to performing other missions, or because the allied or coalition governments for their own reasons do not want their amphibious ships to be used for the missions in question. Even when foreign amphibious ships are available for conducting an operation, U.S. officials might still prefer to conduct it with U.S. Navy amphibious ships so that the United States can receive the political credit for conducting it.

**Reduction in Operational Ships per MEB.** As mentioned earlier, the Marine Corps testified in April 2008 that, in limiting each MEB AE to 15 ships, the Navy and Marine Corps agreed to assume a degree of operational risk. As shown in **Table 3**, using 17 or 19 operational amphibious ships per MEB AE, so as to reduce operational risk, would generate a goal for an amphibious force of more than 33 ships, including more than 11 LPD-17s.

**Competing Demands for Funding.** In a situation of constrained defense resources, increasing the amphibious lift goal could reduce the amount of funding available for other Navy or DOD funding priorities. Conversely, reducing the amphibious lift goal could increase the amount of funding available for other Navy or DOD priorities. Constraints on defense resources could require making tradeoffs between various defense program goals.

## Options for Congress

### Options Regarding FY2009 for LPD-17 Procurement

Potential options for Congress regarding FY2009 funding for LPD-17 procurement include but are not limited to the following, some of which might be combined:

- approve the proposed FY2009 budget request for the LPD-17 program;
- provide a second increment of advance procurement funding in FY2009 to support the procurement of a 10<sup>th</sup> LPD-17 in a fiscal year after FY2009;
- procure a 10<sup>th</sup> LPD-17 in FY2009 with partial funding (i.e., incremental funding), and defer the remainder of the ship's procurement cost to one or more fiscal years after FY2009;
- procure a 10<sup>th</sup> LPD-17 in FY2009 with full funding;
- provide an initial increment of advance procurement funding in FY2009 for an 11<sup>th</sup> LPD-17 to be procured in a fiscal year after FY2009;
- procure both a 10<sup>th</sup> LPD-17 and an 11<sup>th</sup> LPD-17 in FY2009 with partial funding (i.e., incremental funding), and defer the remainder of the ship's procurement cost to one or more fiscal years after FY2009; and
- procure both a 10<sup>th</sup> LPD-17 and an 11<sup>th</sup> LPD-17 in FY2009 with full funding.

### Options Regarding the Amphibious Lift Goal

Potential options for Congress regarding the amphibious lift goal include but are not limited to the following, some of which might be combined:

- take no action regarding the goal;
- raise the issues at hearings concerning Navy or Marine Corps budgets and programs;
- request a study on the amphibious lift goal from the Navy, the Marine Corps, the Government Accountability Office (GAO), or another organization; and

- establish a different goal, perhaps by amending Title 10 of the U.S. Code, and direct the Department of the Navy to program and budget for that goal.

## Legislative Activity for FY2009

### FY2008 Defense Authorization Bill

**Senate.** The Senate Armed Services Committee, in a May 1, 2008, press release summarizing its markup of the FY2008 defense authorization bill, states that the markup “adds \$170 million for LPD-17 advance procurement, which is combined with other funds for a total of \$323 million in advance procurement. Full funding for this [tenth LPD-17 class] ship (at a cost of \$1.7 billion) was number one on the Commandant’s Unfunded Priorities List and number two on the CNO’s list.”<sup>31</sup>

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<sup>31</sup> Senate Armed Services Committee press release dated May 1, 2008, entitled “Senate Armed Services Committee Completes Markup of National Defense Authorization Bill for Fiscal Year 2009,” p. 22.

## Appendix A. Marine Corps Testimony on Amphibious Lift Goal

Regarding the amphibious lift goal, the Marine Corps testified in April 2008 as follows:

### Shipbuilding Requirements

Based on strategic guidance, in the last several years the Navy and Marine Corps have accepted risk in our Nation's forcible entry capacity, and reduced amphibious lift from 3.0 MEB assault echelon (AE) to 2.0 MEB AE. In the budgetary arena, the value of amphibious ships is too often assessed exclusively in terms of forcible entry — discounting their demonstrated usefulness across the range of operations and the clear imperative for Marines embarked aboard amphibious ships to meet Phase 0 demands. The ability to transition between those two strategic goalposts, and to respond to every mission-tasking in between, will rely on a strong Navy-Marine Corps Team and the amphibious ships that facilitate our bond. The Navy and Marine Corps have worked diligently to determine the minimum number of amphibious ships necessary to satisfy the Nation's needs.

The Marine Corps' contribution to the Nation's forcible entry requirement is a single, simultaneously-employed two MEB assault capability — as part of a seabased MEF. Although not a part of the MEF AE, a third reinforcing MEB is required and will be provided through MPF(F) shipping. Each MEB AE requires seventeen amphibious warfare ships — resulting in an overall ship requirement for thirty-four amphibious warfare ships. However, given current fiscal constraints, *the Navy and Marine Corps have agreed to assume a degree of operational risk by limiting the assault echelon of each MEB by using only fifteen ships per MEB* — in other words, a Battle Force that provides thirty “operationally available” amphibious warfare ships.

### Amphibious Ships

In that thirty-ship Battle Force, ten aviation-capable big deck ships (LHA / LHD / LHA(R)), ten LPD 17 class ships, and ten LSD class ships are required to accommodate the MAGTF [Marine Air-Ground Task Force] capabilities. In order to meet a thirty-ship availability rate — based on a CNO-approved maintenance factor of ten percent — a minimum of eleven ships of each of the current types of amphibious ships are required — for a total of thirty-three ships. The CNO has concurred with this requirement for thirty-three amphibious warfare ships, which provide the “backbone” of our maritime capability — giving us the ability to meet the demands of harsh environments across the spectrum of conflict.

The LPD 17 San Antonio class of amphibious warfare ships represents the Department of the Navy's commitment to a modern expeditionary power projection fleet enabling our naval force to operate across the spectrum of warfare. The LPD 17 class replaces four classes of older ships — LKA, LST, LSD 36, LPD 4 — and will have a forty-year expected service life. It is imperative that eleven of these ships be built to meet the minimum of ten

necessary for the 2.0 MEB AE amphibious lift requirement. Procurement of the tenth and eleventh LPDs remains a priority.<sup>32</sup>

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<sup>32</sup> Statement of Lieutenant General James F. Amos, Deputy Commandant of the Marine Corps (Combat Development and Integration), before the Senate Armed Services Committee Subcommittee on Seapower, Concerning Shipbuilding and Force Structure, April 8, 2008, pp. 6-7. Italics as in the original.



## Appendix B. LPD-17 Cost Growth and Construction Problems

This appendix provides details on cost growth and construction problems in the LPD-17 program.

### Cost Growth

The Congressional Budget Office (CBO) testified in July 2007 that the first LPD-17 experienced cost growth of about 70% and is, on a per-ton basis, the most expensive amphibious ship ever built for the Navy.<sup>33</sup> When LPD-17 procurement began, follow-on ships in the class were estimated to cost roughly \$750 million each. Estimated procurement costs for the follow-on ships subsequently grew to figures between about \$1,200 million and about \$1,500 million. The Navy estimates the procurement cost of the ninth ship at \$1,782 million.

A relatively small portion of the cost growth in the program since its inception is attributable to the decision to reduce the program's sustaining procurement rate from two ships per year to one ship per year. Most of the program's cost growth is attributable to other causes.<sup>34</sup>

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<sup>33</sup> CBO Testimony, Statement of J. Michael Gilmore, Assistant Director for National Security, and Eric J. Labs, Senior Analyst, [on] The Navy's 2008 Shipbuilding Plan and Key Ship Programs, before the Subcommittee on Seapower and Expeditionary Forces, Committee on Armed Services, U.S. House of Representatives, July 24, 2007, pp. 13 and 20. CBO reiterated in March 2008 testimony that the first LPD-17 is, on a per-ton basis, the most expensive amphibious ship ever built for the Navy. (See CBO Testimony, Statement of Eric J. Labs, Senior Analyst, [on] Current and Projected Navy Shipbuilding Programs, before the Subcommittee on Seapower and Expeditionary Forces, Committee on Armed Services, U.S. House of Representatives, March 14, 2008, p. 27.)

<sup>34</sup> RAND estimates that halving a shipbuilding program's annual procurement rate typically increases unit procurement cost by about 10%. (Mark V Arena, et al, *Why Has the Cost of Navy Ships Risen? A Macroscopic Examination of the Trends in U.S. Naval Ship Costs Over the Past Several Decades*. RAND, Santa Monica (CA), 2006. p. 45. (National Defense Research Institute, MG-484-NAVY). The December 2006 Selected Acquisition Report (SAR) summary table, available at [<http://www.acq.osd.mil/ara/am/sar/2006-DEC-SST.pdf>], states that in then-year dollars, changes in the LPD-17 program's production schedule (including the reduction in annual procurement rate) account for \$768.1 million in increased costs for the program, or about 11.2% of the increased costs caused by all factors. The other factors leading to increased costs were economic errors (meaning errors in projected rates of inflation), which account for \$361.7 million; estimating errors, which account for \$4,648.8 million; and "other," which accounts for \$1,093.4 million. The LPD-17 program's total cost was also reduced by \$4,037.8 million because of the reduction in program quantity from an originally planned total of 12 ships to the currently planned total of 9 ships. The resulting net change in the program's estimated cost is an increase of \$2,832.2 million.

## Construction Problems

The first LPD-17, which was procured in FY1996, encountered a roughly two-year delay in design and construction. It was presented to the Navy for acceptance in late June 2005. A Navy inspection of the ship conducted June 27-July 1, 2005, found numerous construction deficiencies.<sup>35</sup> The ship was commissioned into service on January 14, 2006. In April 2007, it was reported that the first LPD-17 had thousands of construction deficiencies.<sup>36</sup>

The Navy accepted delivery of LPD-17 with about 1.1 million hours of construction work remaining to be done on the ship. This equated to about 8.7% of the total hours needed to build the ship, and (with material costs included) about 7% of the total cost to build the ship.

The Navy accepted delivery of LPD-18 with about 400,000 hours of construction work remaining to be done on the ship. This equated to about 3.3% of the total hours needed to build the ship.

The Navy accepted delivery of LPD-19 with about 45,000 hours of construction work remaining to be done on the ship. This equated to about 0.4% of the total hours needed to build the ship.

The Navy stated that it accepted LPD-17 in incomplete condition for four reasons:

- It permitted the fleet to begin sooner the process of evaluating LPD-17 through operational use so as to identify problems with the LPD-17 class design that need to be fixed in follow-on LPD-17s.
- It avoided further delays in giving the LPD-17's crew an opportunity to conduct post-delivery tests and trial events that are intended to identify construction (as opposed to class design) problems with LPD-17 itself.
- It permitted LPD-17 to leave the shipyard sooner and thereby mitigated schedule and cost impacts on other ships being built at the shipyard (other LPD-17s, LHD-8, and DDG-51s) that would have resulted from having LPD-17 remain in the shipyard longer.

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<sup>35</sup> Associated Press, "Shipbuilder: Navy Will Accept New Vessel," *NavyTimes.com*, July 21, 2005; Christopher J. Castelli, "Naval Inspection Report Finds Numerous Problems With LPD-17," *Inside the Navy*, July 18, 2005; Dale Eisman and Jack Dorsey, "Problems On New Ship A Bad Sign, Analyst Warns," *Norfolk Virginian-Pilot*, July 14, 2005; Nathan Hodge, "Navy Inspectors Flag 'Poor Construction' On LPD-17," *Defense Daily*, July 14, 2005. A copy of the Navy's inspection report, dated July 5, 2005, is posted online at [<http://www.coltoncompany.com/newsandcomment/comment/lpd17insurv.htm>]

<sup>36</sup> See, for example, Louis Hansen, "New Navy Ship San Antonio Found To Be Rife With Flaws," *Norfolk Virginian-Pilot*, April 14, 2007; Christopher P. Cavas, "Thousands of Problems Found On New Amphibious Ship," *DefenseNews.com*, April 23, 2007.

- It reduced the cost of the remaining construction work to be done on LPD-17 because the work in question could be performed by repair shipyards that charge lower rates for their work than the construction shipyard.

Of the approximately \$160 million in post-delivery work performed on LPD-17, \$108 million was for the 1.1 million hours of construction work remaining to complete the ship. (The rest was for post-shakedown and other work that normally occurs after a ship is completed and delivered to the Navy.) This \$160 million in work was funded through the post-delivery part of the outfitting/post-delivery (OF/PD) line item in the Shipbuilding and Conversion, Navy (SCN) account. Because OF/DP costs are not included in ship end cost, the reported end cost of LPD-17 will understate the ship's actual construction cost by \$108 million.

The Navy planned to fund post-delivery construction work on LPD-18 and LPD-19 through the completion of prior-year shipbuilding line item in the SCN account — a line item that is included in ship end cost.

The Government Accountability Office (GAO) testified in July 2007 that:

The Navy moved forward with ambitious schedules for constructing LPD 17 and [the Littoral Combat Ship] despite significant challenges in stabilizing the designs for these ships. As a result, construction work has been performed out of sequence and significant rework has been required, disrupting the optimal construction sequence and application of lessons learned for follow-on vessels in these programs.

In the LPD 17 program, the Navy's reliance on an immature design tool led to problems that affected all aspects of the lead ship's design. Without a stable design, work was often delayed from early in the building cycle to later, during integration of the hull. Shipbuilders stated that doing the work at this stage could cost up to five times the original cost. The lead ship in the LPD class was delivered to the warfighter incomplete and with numerous mechanical failures, resulting in a lower than promised level of capability. These problems continue today — 2 years after the Navy accepted delivery of LPD 17. Recent sea trials of the ship revealed problems with LPD 17's steering system, reverse osmosis units, shipwide area computing network, and electrical system, among other deficiencies. Navy inspectors noted that 138 of 943 ship spaces remained unfinished and identified a number of safety concerns related to personnel, equipment, ammunition, navigation, and flight activities. To date, the Navy has invested over \$1.75 billion constructing LPD 17.<sup>37</sup>

In late June and early July 2007, it was reported that Secretary of the Navy Donald Winter had sent a letter to the chairman and chief executive officer of Northrop Grumman, Ronald Sugar, dated June 22, 2007, expressing deep concerns

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<sup>37</sup> Government Accountability Office, *Defense Acquisitions[:] Realistic Business Cases Needed to Execute Navy Shipbuilding Programs*, Statement of Paul L. Francis, Director Acquisition and Sourcing Management Team, Testimony Before the Subcommittee on Seapower and Expeditionary Forces, Committee on Armed Services, House of Representatives, July 24, 2007 (GAO-07-943T), p. 10.

about NGSS's performance, particularly in connection with the LPD-17 program. According to these news reports, Winter's letter contained the following statements among others, although not necessarily in the order shown below:

- "I am deeply concerned about Northrop Grumman Ship Systems' (NGSS) ability to recover in the aftermath of Hurricane Katrina, particularly in regard to construction of LPD 17 Class vessels."
- "I am equally concerned about NGSS' ability to construct and deliver ships that conform to the quality standards maintained by the Navy and that adhere to the cost and schedule commitments agreed upon at the outset by both NGSS and the Navy."
- "... even prior to Katrina [NGSS's performance] was marginal, resulting in significant cost overruns that forces the Navy to take delivery of the LPD-17 with numerous outstanding deficiencies...."
- "NGSS' inefficiency and mismanagement of LPD 17 put the Navy in an untenable position."
- "By taking delivery of ships with serious quality problems, the Fleet has suffered unacceptable delays in obtaining deployable assets. Twenty-three months after commissioning of LPD 17, the Navy still does not have a mission-capable ship."
- "These delays create further problems as work must be completed or redone by other shipyards that are not as familiar with the ship's design."
- "The Navy also took delivery of LPD-18 (USS New Orleans) in an incomplete fashion, albeit more complete than LPD-17."
- "... persistent shortcomings at the NGSS yards are troubling and causing me not only grave concern about the LPD program, but also the LHA and DDG-1000 programs."
- "The Navy does not wish to find itself in the same situation [with other ships that] it faces with LPD 17 & 18."
- "It is imperative that NGSS deliver future ships devoid of significant quality problems and that it meet its cost and schedule obligations."
- One press report stated: "'Continued, focused management' is necessary to successfully deliver the remainder of the class, according to Winter."

- “[Navy acquisition executive] Dr. [Delores] Etter will be closely monitoring metrics with NGSS and the acquisition team as we move forward.”<sup>38</sup>

Sugar reportedly sent a reply letter to Winter dated June 29, 2007. According to one press report, Sugar stated in the letter: “I share your concern regarding the need to fully recover and improve our shipyards, and produce completed LPD 17 class vessels of the highest quality with increasing efficiency.... Irrespective of Hurricane Katrina, Northrop has much work to do to meet the needs of the U.S. Navy.”<sup>39</sup> Another press report stated:

Northrop Grumman Corp (NOC) has ‘much more work to do’ to improve its performance on Navy ships, but problems with a \$13.6-billion amphibious ship program were not solely the contractor’s making, Chief Executive Ron Sugar said in a June 29 letter.

“The original acquisition strategy was changed after contract award, there was funding instability, limited early funding for critical vendor information, and the ‘integrated’ Navy/contractor design team produced constant design churn and thousands of design changes,” Sugar wrote, responding to a tersely worded letter from Navy Secretary Donald Winter.

Northrop “certainly had performance problems,” but the unprecedented effects of Hurricane Katrina, which severely damaged Northrop’s three shipyards in the Gulf region in August 2005, “only served to greatly exacerbate the situation....”

Sugar said he shared Winter’s concerns and vowed that Northrop would invest, train and manage its operations to produce Navy ships of the highest quality with increasing efficiency. “Irrespective of Hurricane Katrina, Northrop has much more work to do to meet the needs of the U.S. Navy.”

“We are not happy with this history,” Sugar added in the letter obtained by Reuters, “but we are incorporating the lessons from this experience into our operational plans going forward for new ships in the design, planning and production stages.”

He noted that Navy recently praised Northrop’s work on a destroyer that was damaged by Hurricane Katrina, and termed it “one of the best ships ever delivered.”

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<sup>38</sup> Sources for these reported passages from the June 22 letter: Louis Hansen, “Navy Ship \$840 Million Over Budget And Still Unfinished,” *Norfolk Virginian-Pilot*, June 30, 2007; Tony Capaccio, “Northrop Grumman Criticized For ‘Mismanagement’ By U.S. Navy,” *Bloomberg News*, July 2, 2007; Geoff Fein, “Navy To Monitor Work At Northrop Grumman Gulf Coast Shipyards, Official Says,” *Defense Daily*, July 5, 2007; Christopher P. Cavas, “U.S. Navy Furious Over LPD-17,” *DefenseNews.com*, July 9, 2007. *InsideDefense.com* on July 9, 2007, posted on the subscribers-only portion of its website a copy of what it says is the June 22 letter.

<sup>39</sup> Christopher P. Cavas, “U.S. Navy Furious Over LPD-17,” *DefenseNews.com*, July 9, 2007.

Sugar said Northrop officials had given the Navy a list of efforts under way to improve training, quality, processes, productivity and facilities at the Gulf Coast shipyards. He promised “substantial investment,” but gave no details.

He said Northrop was aggressively reworking schedules for delivery of all ships affected by the hurricane. “We know we must do our part,” Sugar said.<sup>40</sup>

After many years of working to overcome construction problems, Navy officials are now “cautiously optimistic” that the LPD-17 construction effort is stabilizing. A December 24, 2007, press report stated:

As the Navy gears up for the first deployment of the new San Antonio-class amphibious transport dock slated for next year, a senior service shipbuilding official is “cautiously optimistic” the once-beleaguered program is on track....

On Dec. 15, the Navy commissioned the third ship, the Mesa Verde, in Panama City, Fla. It was the first ship in the class to be delivered without significant problems.

The San Antonio class faced difficulties beginning in late 1998, when the initial construction contract was awarded to Avondale Industries in New Orleans. Avondale beat out Litton Ingalls Shipbuilding primarily because it planned to use a new computer program to design the ships — the first time a Navy ship was designed entirely using computer tools. But the computer systems didn’t work, the Navy kept making design changes, costs escalated and major delays ensued.

Litton Ingalls bought Avondale in 1999, its owners mistakenly thinking they could fix the program, and in late 2000 the shipyards were acquired by Northrop Grumman.

Meanwhile, a succession of service program managers and acquisition executives struggled to hold down the design changes and manage costs, which have more than doubled from the \$750 million per ship the Navy forecast in the late 1990s.

All those problems and more affected the first two ships of the class. The San Antonio was delivered, incomplete, in mid-2005. The Navy accepted the ship knowing it had numerous construction defects, many of which would need to be fixed at extra costs after the shipyard’s obligation period ended. The next ship, the New Orleans, was delivered in December 2007, also with incomplete spaces. To make things more challenging, Hurricane Katrina had wreaked havoc on the New Orleans-based Avondale shipyard in 2005.

Nevertheless, construction on the Mesa Verde, the third new ship, went more smoothly. The Mesa Verde was built at Northrop Grumman’s Ingalls shipyard in Pascagoula, Miss....

The Mesa Verde “sets a new standard for the LPD class as far as being a complete ship,” Capt. Beth Dexter, the Navy’s supervisor of shipbuilding in

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<sup>40</sup> Andrea Shalal-Esa, “Northrop Says Katrina Exacerbated Ship Problems,” *Reuters*, July 10, 2007.

Pascagoula, told Military Times in September. “My Navy team is proud to present it.”

Robert Work, a naval analyst at the Center for Strategic and Budgetary Assessments in Washington, said it looks like the LPD 17 program is pulling away from its “checkered past.” He said it appears the program is “getting back on track” and that it will be exciting to see the first ship as it enters the fleet.

American shipbuilders have historically had difficulties with lead ships, he said....

Stiller told Navy Times that after Hurricane Katrina the Navy re-established new milestones to measure the new ships’ progress. So far, each ship under construction is meeting these marks, she said.

“I believe we are turning the corner,” Stiller said. In 2008, she said, she hopes the service and industry will be able to “not just meet but beat” these milestones.<sup>41</sup>

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<sup>41</sup> Zachary M. Peterson, “Troubled Amphib Program Appears On Track,” *NavyTimes.com*, December 24, 2007. See also Dan Taylor, “Contract Awarded For Ninth LPD-17 As NGC Addresses Concerns,” *Inside the Navy*, January 7, 2008; and Christopher P. Cavas, “Third Time Could Be the Charm for LPD Program,” *Defense News*, September 10, 2007.