

**Spring 2011  
Industry Study**

**Final Report  
Shipbuilding Industry**



**The Industrial College of the Armed Forces**  
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## SHIPBUILDING 2011

**ABSTRACT:** As the US grapples with its growing debt and increasing domestic budget requirements, a crucial question emerges: what changes should the US government make *now* to ensure it sustains the ability to build a powerful, yet *affordable*, maritime fleet? Several factors are critical in answering this question. These factors include US maritime concepts and doctrine that drive defense shipbuilding requirements, congressional oversight, Department of Defense (DoD) procurement practices, and the defense shipbuilding industry's ability to adapt to a more economically austere environment. In short, the continued viability of shipbuilding is not an issue of capability—but of cost. This report offers eight recommendations to improve the affordability of defense shipbuilding acquisitions through changes in oversight, management, and regulation.

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**PLACES VISITED:****Domestic:**

Offices of Senators Snowe and Webb, US Senate (Washington, DC)  
Austal USA (Mobile, AL)  
International Shipholding Corporation, Waterman Steamship Corporation (Mobile, AL)  
Carnival Corporation & Carnival Cruise Lines (Miami, FL)  
Bollinger Shipyard (Lockport, LA)  
Edison Chouest Offshore, North American Shipbuilding (LaRose, LA)  
US Coast Guard Shipyard (Curtis Bay, MD)  
General Dynamics Bath Iron Works (Bath, ME)  
Huntington-Ingalls Industries, Ingalls Shipyard (Pascagoula, MS)  
VT Halter Marine-Pascagoula Operations (Pascagoula, MS)  
Portsmouth Naval Shipyard (Portsmouth, NH)  
General Dynamics Electric Boat (Quonset Point, RI)

**International:**

Blohm + Voss Marine Systems GmbH (Hamburg, Germany)  
US Consulate General (Hamburg, Germany)  
Fincantieri-Monfalcone Shipyard (Trieste, Italy)  
Department of National Defence (Ottawa, Canada)  
Irving Shipbuilding Inc., Halifax Shipyard (Halifax, Canada)



No other nation projects maritime power on the same scale as the United States. Many nations are dependent upon the US to assure allies, dissuade potential adversaries, respond to crises, and protect global trade. In spite of recent debate about its future as a global leader, the US remains, and is projected to remain, a leader in maritime security and naval presence. America's ability to retain this unique capability depends upon its defense industrial base to build the world's most advanced navy and coast guard. Given the unquestionable superiority of the US maritime force, it is clear that the defense shipbuilding industry has historically succeeded in its mission. However, as the US grapples with its growing debt and increasing domestic budget requirements, the crucial question emerges: what changes should the US government make *now* to ensure it sustains the ability to build a powerful, yet *affordable*, maritime fleet?

Several factors are critical in answering this question. These factors include US maritime concepts and doctrine that drive defense shipbuilding requirements, congressional oversight, Department of Defense (DoD) procurement practices, and the defense shipbuilding industry's ability to adapt to a more economically austere environment. While the global shipbuilding industry includes commercial and non-commercial ships, this report focuses on the non-commercial sector and governmental changes to preserve domestic shipbuilding of military ships. This report offers eight recommendations to improve the affordability of defense shipbuilding acquisitions through changes in oversight, management, and regulation.

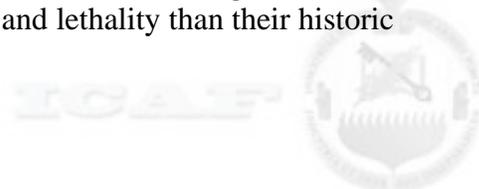
## THE FUTURE SECURITY ENVIRONMENT

The United States is a maritime nation, reliant on the world's vast oceans and waterways for transportation, resources, and defense. Shipbuilding and repair have historically been an essential domestic industry supporting both military and commercial interests. The defense shipbuilding industry has provided warships and support vessels that are vital to maintaining America's maritime supremacy and protecting its national security interests and key partners abroad.<sup>1</sup>

The unprecedented economic challenges facing the shipbuilding industry threaten the sustainability of America's primacy on the seas. The current US national debt profile is unsustainable and a clear threat to not only the national fiscal health but also the national defense maritime industry. Sustainment of a stable and healthy defense shipbuilding industry is critical to this nation maintaining its position as a global superpower, for which dominance of the maritime domain is so important.

US warships are acknowledged to be the best in the world. The American fleet is capable of missions centered on influencing events ashore by countering both land- and sea-based military forces of potential regional threats—including non-state terrorist organizations—using world class precision-guided air delivered weapons, tomahawk-capable ships, sophisticated C4ISR systems and networks, and unmanned vehicles.<sup>2</sup> Clearly, defense shipbuilding remains a key element of our military instrument of power, making the viability of the shipbuilding and repair industry a vital national security interest.

To support the current National Security Strategy, the Navy has determined that 313 ships are necessary to accomplish its missions. The 30-year shipbuilding plan indicates that roughly three-quarters of that inventory will be combatants, and the remaining will be transports and support ships—reflecting a continuing trend of fewer combatants. Although fewer in number, many of the combatants provide more domain awareness and lethality than their historic



predecessors; therefore, increased firepower may compensate for fewer ships. In addition, the Navy has recognized that in many evolutions and engagements, it will partner with other nations and the assets of those nations will provide greater breadth and depth of capability to meet the expanding range of naval operations. Proposed in 2006 by then-Chief of Naval Operations Admiral Mike Mullen, the “1,000-ship Navy,” embodies this patchwork concept of partner navies working together to create a force capable of standing watch over all the seas.

## STATE OF THE FLEET

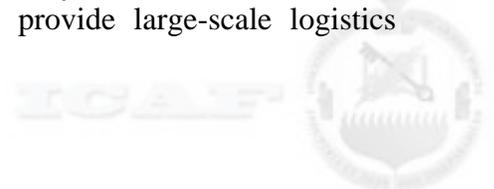
The current portfolio of US Navy (USN) battleforce ships consists of 286 vessels.<sup>3</sup> Battleforce ships are capable of sustained joint maritime military operations, specified combat or service support missions, and include aircraft carriers (11), surface combatants (126), submarines (72), amphibious warfare ships (30), mine warfare ships (14), combat logistics ships (29) and fleet support ships (4).<sup>4</sup> The current 30-year shipbuilding plan anticipates building 276 ships over that time frame—resulting in a fleet size of 304 ships.

The US Coast Guard (USCG) is this nation’s principal maritime law enforcement authority and the lead federal agency for the maritime component of homeland security. It is in the process of recapitalizing much of its fleet. USCG employs its fleet of approximately 211 aircraft, 1,400 boats, and 24 different cutter classes to protect the public, the environment, and US economic interests in the nation’s ports and waterways, along the coast, exclusive economic zones, and in international waters.<sup>5</sup> As part of its recapitalization, the USCG plans to build eight National Security Cutters, 58 Fast Response Cutters, and 25 Off-Shore Patrol Cutters over approximately 30 years.<sup>6</sup>

The USN supplements its battleforce ships with hundreds more support ships, service craft, non-self-propelled craft, and unclassified miscellaneous craft. None of these non-battleforce ships are included in the 30-year shipbuilding plan. Based on service life expectancy, approximately 79 of these ships will require replacement over the same period. Military Sealift Command (MSC) manages most of these support ships, enabling sustained joint military operations with its global maritime capability. In addition to its organic fleet of 180 ships, MSC has access to approximately 49 ships in the Ready Reserve Force and is able to charter additional commercial vessels as required to meet the requirements of a national emergency.<sup>7</sup>

To respond to the forecasted declining defense budgets, several alternatives to the current fleet are being considered that enable the USN to continue to meet its strategic objectives at lower cost but potentially higher risk. One alternative to the current US fleet plan would be to increase the quantity of smaller scale vessels like the Littoral Combat Ship (LCS) beyond the 55-ship purchase plan.<sup>8</sup> Smaller vessels operating in networked groups provide flexibility in executing certain missions across the range of military operations.<sup>9</sup> They also offer potential innovations in ship design and manufacturing. Smaller vessels can be purchased in larger lots, helping to stabilize production and reduce per unit costs to potentially boost domestic and foreign military sales. Furthermore, smaller vessels with reduced crews help lower total lifecycle costs.

A second alternative being considered is to increase the number of “connector” vessels like the Landing Craft Air Cushioned, Ship-to-Shore Connector, Mobile Landing Platform (MLP), and Joint High Speed Vessel (JHSV). Fifty-one percent of all US Navy ships built in the next five years are in the connector category, and they are most likely to be used to meet 21st century maritime challenges.<sup>10</sup> For example, the MLP can provide large-scale logistics



movements at sea or from sea to shore, without dependency on foreign ports in any contingency operation.<sup>11</sup>

## THE SHIPBUILDING INDUSTRY

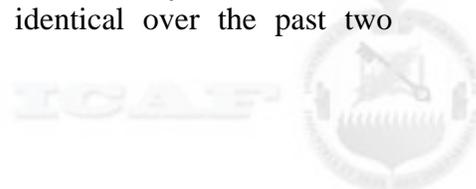
### Domestic US Industry

US defense spending drives the economic performance of domestic defense shipbuilding. With very little domestic commercial industry and a non-existent defense export market, the anticipated decline in US defense budgets creates strong economic and cost pressures. Reduced defense spending generates revenue pressure by threatening current production rates and placing future contract awards in jeopardy. In the most severe case, shipbuilders must manage production gaps, while minimizing the resulting drop in workforce skill and proficiency. Declining demand increases pressure on input costs such as labor and material as economies of scale go unrealized. Also, a result of declining demand, some domestic sub-tier suppliers may simply cease to exist. Reduced defense spending generates operating margin pressures by hyper-energizing industry competition as companies fight “tooth-and-nail” for the limited opportunities that remain. In an industry characterized by high capital investments, competing companies are more likely to trade away profit margins in pursuit of continued revenues. This factor significantly reduces the ability of companies to reinvest in infrastructure, necessary to make production improvements. So, while US shipbuilding continues to demonstrate the capability to satisfy the needs of the US Navy, a number of significant concerns exist. *In short, the continued viability of shipbuilding is not an issue of capability—but of cost.*

Defense industrial shipbuilding is divided into two tiers. Tier-one shipbuilders are those capable of constructing large and complex vessels; tier-two shipbuilders construct smaller ships and other craft, such as offshore rigs. Both industry categories are under significant pressure – but from different sources. The chronic challenges of excess capacity, manufacturing inefficiency, and increasing labor and material costs have converged with declining demand and growing competition. As a result, significant structural changes are now underway.

Two competing defense contractors dominate tier-one US shipbuilding. Of an estimated \$19.1B in total US shipbuilding industry revenues, the newly-established Huntington-Ingalls Industries (HII) and General Dynamics’ Marine Systems Division hold approximately 70% of the market. 2010 revenues were split almost equally between the two companies.<sup>12</sup> With the exception of General Dynamics’ NASSCO shipyard, revenues for both tier-one shipbuilders come exclusively from US Navy and USCG contracts.<sup>13</sup> As a precursor to the spin off, in 2008 Northrop Grumman Corp. (NGC) integrated its Pascagoula, MS and Avondale, LA shipyards with Newport News, VA and established Northrop Grumman Shipbuilding (NGSB). In April 2011, NGC began implementing two significant structural changes: first it spun off NGSB as HII, and HII moved forward with a previously announced consolidation of the gulf coast operations by announcing the closing of its Avondale shipyard. NGC divested itself of shipbuilding to better align NGC’s operating strategy.<sup>14</sup> NGC’s spin-off of HII and its implications for the defense industrial base are discussed in more detail in a companion essay to this report.

To help characterize the financial performance of the tier-one US shipbuilders, the following chart compares data from recent SEC filings for NGC and General Dynamics. Annual revenues from the shipbuilding business segments are nearly identical over the past two



reporting years. Operating margins, however, differ significantly. In 2008, NGC recorded a one-time charge of \$2.5B against its shipbuilding segment. Margins rebounded in 2009, but remain at less than half the performance level of General Dynamics' Marine Systems Division.<sup>15</sup>

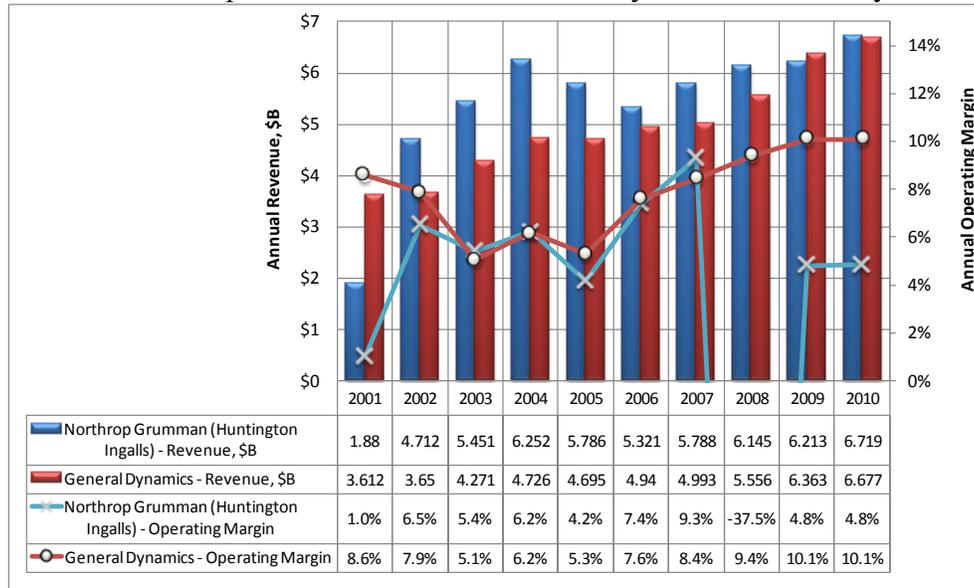


Figure 1. Annual Revenues and Operating Margins of NGSB (HII) and General Dynamics Shipbuilding Business Segments<sup>16</sup>

In contrast to the scale and focus of the tier-one suppliers, many tier-two US shipyards are privately held companies that compete for a wide variety of commercial and military contracts. Along the gulf coast, tier-two shipbuilders deliver offshore service and supply vessels, freight barges, and tugboats along with coastal patrol boats for government customers such as the USCG.<sup>17</sup> East and west coast shipyards are capable of limited new ship production and serve as key repair and service yards for commercial vessels operating domestic Jones Act routes as well as international ships transiting US ports.<sup>18</sup>

Following the Deepwater Horizon oil spill in April of 2010, the US government enacted a moratorium on deepwater oil and gas drilling in the Gulf of Mexico; the impact on gulf coast shipyards has been severe. Demand for new service vessels dropped sharply while companies were left to compete for a shrinking number of repair contracts. The effects will likely continue as offshore platforms leave the US gulf coast for operations off the shores of South America and West Africa.<sup>19</sup>

An even more significant structural change to impact tier-two US shipbuilders is the recent US expansion of international shipbuilders Austal USA and Fincantieri Marine Group. Partnering with General Dynamics and Lockheed Martin respectively, the companies have established themselves as legitimate US market competitors by winning joint production contracts for their designs of the LCS.<sup>20</sup> In the most recent contract award, Austal USA is now the prime contractor to the US Navy for its LCS design, and General Dynamics is no longer involved. At anticipated production rates, the LCS production contract combined with the JHSV program could push Austal USA's annual revenues well over \$1B.<sup>21</sup>



## International Shipbuilding Industry

Internationally, variance exists in nations' abilities to domestically construct naval vessels. Countries such as Brazil, Russia, India and China all possess navies and retain the domestic capability to construct naval assets. While Brazil and India's naval forces are a mixture of domestic and internationally constructed vessels, all four countries recently completed construction of their own ships. Additionally, while historically only building ships in support of regional objectives, China recently has initiated a three-step strategy in its modernization process. Step one, already completed, enables China to operate in the north from Japan and Taiwan southwards to the Philippines. Step two will develop a regional naval force capable of operating farther, reaching areas including Guam, Indonesia and Australia. In the third-stage, by mid-century, its plan is to develop a global naval force; a plan that is on track to realization.<sup>22</sup>

Italy, Germany, and South Korea offer three different approaches to naval shipbuilding. In Italy, extreme pressure from unions as well as recognition of the strategic nature of the shipbuilding industry resulted in the government's recent commitment to a significant naval shipbuilding program characterized by publicly funded contracts and export credits for government-owned shipyards (Fincantieri). The initial builds will go to the most vulnerable yards by government direction. In contrast, the German government refused union requests to purchase shipyards or artificially force contracts to yards to support a failing industry. This resulted is the purchase by Abu-Dhabi MAR of a significant number of yards, historically those responsible for building surface, sub-surface and merchant ships for the German Federal Ministry of Defense. This purchase will result in joint ventures between the company and the German government, but it leaves the government no longer in the position of having German ownership of any of the shipyards necessary to fabricate naval vessels.<sup>23</sup> Finally, within South Korea, the government awarded to Hyundai Heavy Industries the contract for design and build of its replacement frigate fleet, likely to be between 24-27 vessels. The commercial yard will build the ships based upon many of the lessons gained from its impressive list of builds within the commercial sector.<sup>24</sup>

These three examples mark distinctly different examples of future approaches for the US shipbuilding industry—foreign owned, government owned, or domestically owned commercial yards taking on naval-type builds.

## Factors Affecting the Private Sector

Numerous factors influence the cost structure and returns of the defense shipbuilding industry including state and local support, workforce structure, design capacity, production rate/demand rate, ship service life, supply chain, facilities, production innovations, and first in class costs. Each of these factors creates tensions between various stakeholders in this critical industry.

**Economic and Regional Impacts.** The US shipbuilding industry generated \$19.1B in revenues in 2010.<sup>25</sup> Recent studies show a shipbuilding industry multiplier effect of 1:4, bringing the total domestic economic impact to approximately \$76B. The defense segment of the industry comprises \$12.5 billion, 66% of the industry's overall \$19 billion in revenues; the remainder of the industry's revenue is within the commercial segment.<sup>26</sup> Figure 2 below depicts the defense shipbuilding supply chain economic contributions per state. In 2009, 21 states had at least \$500 million worth of USN shipbuilding business.<sup>27</sup>



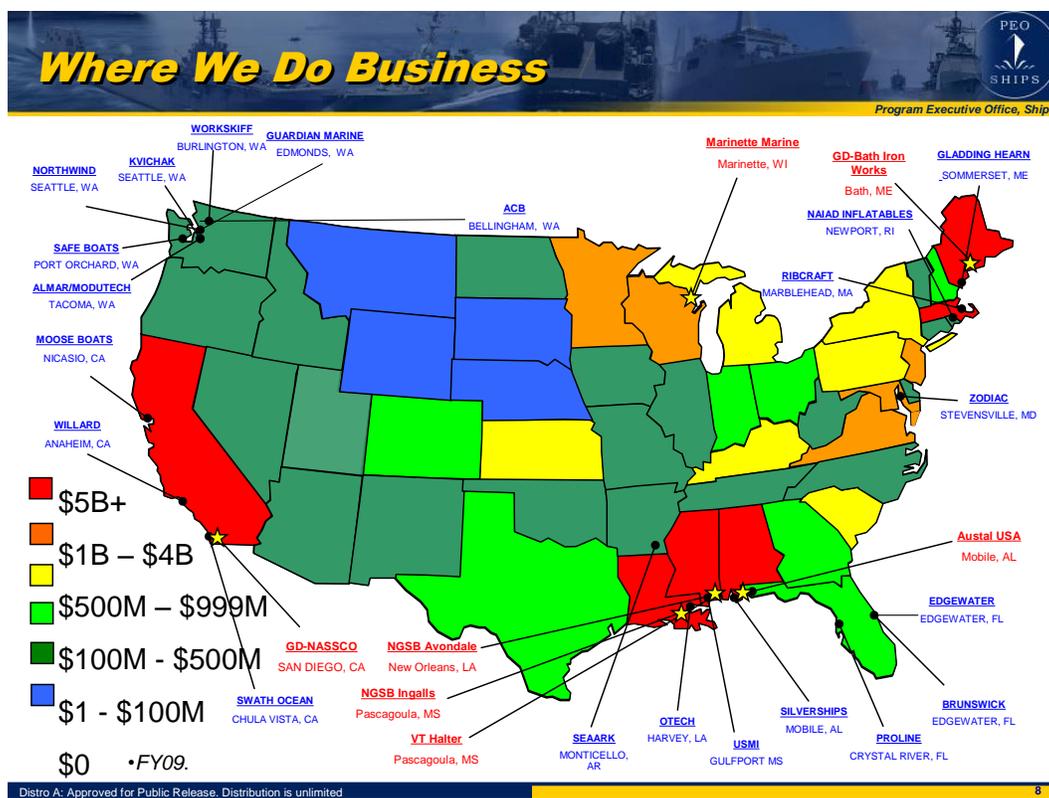


Figure 2. "Where We Do Business", Program Executive Office - Ships, Briefing to ICAF Shipbuilding Industry Study, 1 March 2011

The commercial segment of the industry consists of the Jones Act shipbuilding and ship repair segments, contributing to Jones Act-related employment of 499,676 jobs and a total economic output of \$100.3 billion.<sup>28</sup> The three states with the largest number of Jones Act related jobs are: (1) Louisiana, 61,656 jobs; (2) Texas, 44,112 jobs; and (3) California, 34,517 jobs. The US Department of Transportation's "Marine Highway System" program designed to increase commercial vessel production is addressed in a companion essay to this report.

**State and Local Government Support.** US state and local governments provide subsidies and incentives to the shipbuilding industry to increase employment, attract related industries, and support the industrial base for national security purposes. State and local governments are significant supporters of the US shipbuilding industry in terms of direct subsidies and incentives. For example, Aker Philadelphia Shipyard received approximately \$500 million in direct subsidies and leases its facility from the city for only \$1 per year.<sup>29</sup> Alabama contributed more than \$10 million to the development of Austal USA's facility in exchange for the employment and training opportunities offered by the company.<sup>30</sup> Similarly, the Mississippi Development Authority's Economic Development Program, sourced from the state's \$5.4 billion Hurricane Katrina Recovery Package to assist its shipyards' rebuild, granted \$5 million to VT Halter to support its expansion project.<sup>31</sup> The state also provides significant support to its shipbuilding industry through income tax credits for job creation, investment, retraining of employees, and research and development.

**Workforce.** An adequate, skilled labor pool to support the US shipbuilding industry is a strategic, national interest. The industry is currently threatened by a looming shortage of skilled domestic labor due to factors such as an aging labor force and inconsistent employment

opportunities due to frequent layoffs. The average annual wage in 2010 was \$58,252. Firms attempt to control labor costs by using temporary skilled workers and increasing the use of technology to automate processes.<sup>32</sup> Some firms are importing temporary, foreign labor to fill the gaps of worker shortages in some regions—either because these labor pools are less expensive or more readily available.

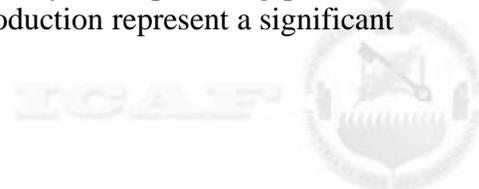
Numbering approximately 87,400 workers, the overall shipbuilding labor pool is predominantly non-union; 28% is unionized.<sup>33</sup> Organized labor is found generally in the large, tier-one shipbuilders, while the tier-two shipbuilders are mostly non-unionized. There does not appear to be any significant growth or intentions to increase union organization of the overall labor force. Labor organizations such as the International Brotherhood of Boilermakers and the Metal Trades Department provide representation for many organized portions of the labor force. Although representing approximately 28% of the total workforce, labor unions play an important role in promoting the importance of maintaining a shipbuilding industry within the US.

**First in Class Costs.** The high cost of first-in-class ships are difficult to avoid—there are no prototypes in shipbuilding. As a result of this learn-as-you-go, initial design and construction costs must necessarily help cover capital investments and production lessons learned. Historically, mismatches have existed between the scope of programs and the time and money resources allotted to execute them.<sup>34</sup> Of the last ten first-in-class ships built for the USN, all were over-budget and five had cost overruns greater than 100%. Low labor experience, process inefficiencies, design flaws, changing requirements, and programmatic disconnects with government furnished equipment are some of the contributing factors to high first-in-class production costs.<sup>35</sup>

**Design Capacity.** Recent changes to design requirements have also contributed to increased costs. Since the cancellation of the Navy's General Specifications in 1998, the Navy has teamed with the American Bureau of Shipping to develop and implement Naval Vessel Rules (NVR). The NVR apply commercial-like specifications to major structural elements of warships.<sup>36</sup> The new rules seek to maximize the use of appropriate commercial technologies and processes to achieve substantial savings in cost, schedule, and weight.<sup>37</sup> Both LCS and the DDG-1000 are being built to these new standards and include the use of open architecture and commercial products for their computing systems, electronics, and other components.

Another consideration that may influence future shipbuilding costs is the availability of engineers and naval architects to design future ships. The US engineering capacity has thus far proven sufficient to design and produce the nation's naval ships. Two circumstances threaten the future capacity: long breaks in new designs of particular classes of ships and a shortage of US graduates in the science, technology, engineering, and math fields (STEM). Britain lost its nuclear powered submarine design capacity by allowing gaps of over ten years between first of class designs, leading to dramatically increased costs and schedule for its current class of subs.<sup>38</sup> The US now faces this same fate for its nuclear powered submarine design capacity—the first gap in new sub design since the dawn of the nuclear age.<sup>39</sup> With the decrease in the number of students graduating with STEM degrees, the US will likely face a shortage of capable engineers when it does design its next nuclear powered submarine.

**Production Rate / Demand Rate.** Production and demand rates for ships produced in the US will continue to be dominated by military shipbuilding and repairs. The demand for defense-related ships is sensitive to changes in government defense spending, which is expected to decline over the next decade. The delay of even one ship in the 30-year shipbuilding plan can have dramatic effects on a labor force in a region. Decreases in production represent a significant



threat to the industry, because shipbuilders must scale back to manage overcapacity. The currently anticipated US commercial production will not be able to compensate for decreased military orders because that sector faces prohibitive foreign competition, except in the production of Jones Act vessels.<sup>40</sup>

**Ship Service Life.** “For every dollar the Navy spends on buying a new ship, it pays an average of two dollars to operate and maintain the vessel throughout its 35-year service life.”<sup>41</sup> Maintenance and repair of vessels is growing in importance as the Navy seeks to extend ship service lives by five years. Historically, however, the contrary has been the norm; the Navy used to retire its surface combatants 10 to 15 years before the end of their expected service lives.<sup>42</sup> Although not the only factor, maintenance is one determinant of whether or not a ship will remain in service for its entire expected life. Sustainability, maintainability, and affordability design considerations account for 75% of the lifecycle costs of a ship.<sup>43</sup> These factors in the design stage of shipbuilding significantly impact whether or not ships reach or extend their service lives and influence how long a ship is out of service for regular maintenance. With increased pressure on defense budgets and longer times in between builds, 35-year service lives may not be practical in the future. As an example, the LHA AMERICA is currently under production with a design service life of 35 years but based on the current shipbuilding plan, it will need to remain in service for 55 years—how the America is designed, built, *and maintained* will be a significant factor in achieving this longevity until her replacement is built.

**Supply Chain.** Supply chain management is particularly complex within shipbuilding. In 1999, in its “Shipbuilding Supply Chain Management Integration Project” final report, the Office of Naval Research identified best practices in supply chain management. Included were strategy, planning, systems effectiveness and performance measurement. The report concluded that supply chain management in shipbuilding lags other industries and lacks consensus on required people, processes, and technologies to integrate ship production and supply chain management.<sup>44</sup> Though US shipbuilders advocate for multi-ship production contracts to take advantage of economies of scale and lessons learned from first-in-class as well as previous ships, currently limited opportunities exist to leverage these advantages across the shipbuilding industry. Generally, shipyards and shipbuilders are supported by numerous yet different suppliers for commodities, assemblies, and services. For example, the General Electric LM2500 gas turbine engine is the engine of choice in three of the seven classes of planned conventional surface ship new builds. An integrated supply strategy would allow the Navy to manage its marine main propulsion procurement strategy based upon enterprise-wide requirements; thus, encouraging long-term contracts and volume discounts for the LM2500 gas turbine engine. The lack of sound supply chain management processes within the US shipbuilding industry contributes to significant affordability barriers to the US government.

**Facilities:** Successful shipbuilding programs rely on a balanced triad of three industrial constituents. First, shipyards must possess modern and optimized layouts to maximize flow of people and materials with automated tooling and machinery to maximize quality, precision, productivity, and speed. Second, they must employ a modest and diversely-trained work force with minimum overhead and immediate access to engineering expertise. Finally, successful yards use modern and environmentally-controlled module fabrication facilities (enabling year-round operations) with easy access to materials, equipment, support services, and employee facilities that meet current regulatory requirements. US shipbuilders are beginning to adopt these best practices to varying degrees. They are constrained, however, by space limits and financial disincentives such as low order quantities and defense budget instability.



**Production Innovations.** Recent innovations in the production processes employed by shipbuilders have improved the speed and efficiency of ship construction. One such innovation is the increasing use of CAD engineering drawing software tools that allow programmable Computer Numerical Control machines to cut, weld, fasten, and bend metal materials more consistently and to more precise tolerances than hand processes. Shipbuilders have also increased modular construction, performing more construction and outfitting on the shop floor or in the module rather than on the ship where construction time can be up to eight times greater. Completed modules are then welded together with other finished modules. This minimizes the final and very inefficient shipboard outfitting process. Finally, modern naval ship specifications incorporate new integration methodologies and facilitate quick, inexpensive, and easy capability changes and updates throughout the ship's lifecycle.

**Surge Capacity.** Two conflicting defense policies are in play at the same time with shipbuilding. On one hand is the desire to preserve surge capacity; on the other is the desire to achieve savings through efficiencies. US yards only invest in infrastructure based on projected contracts and ship orders. Military ship order projections are historically unreliable. Ship building firms face significant barriers to rationalize large investments in support and yard materiel that would otherwise allow them to significantly expand their capabilities. Some yards have been able to invest in modest plant modernizations based on stable projected orders, such as for the LCS, but these are the exception instead of the rule. Increasing shipyard "surge" capacity (if required) necessitates major investment by shipbuilders along with stable order quantities and federal government assistance or guarantees to incentivize the initial expenditure.

**Best Practices from Overseas.** Commercial shipbuilding best practices in South Korea, Japan, Singapore, and other leading shipbuilding countries in Europe offer insights on cost reduction methods in defense shipbuilding. The commercial shipbuilding industry is structured on shared priorities and risks between buyer and shipbuilder, a healthy industrial base, maintenance of in-house expertise, willingness to invest in new technologies. The objective of the commercial model is to produce ships of high quality, while keeping costs down and delivering on schedule.<sup>45</sup> As in every business model, the need to sustain profitability drives incorporation of best practices across all areas of discipline in the industry.

To ensure ship design and construction can be executed as planned, commercial shipbuilders and buyers only move forward after critical knowledge is attained.<sup>46</sup> Before a contract is signed, a full understanding of the effort needed to design and construct the ship is reached, enabling the shipbuilder to sign a contract that fixes the price, delivery date, and ship performance parameters.<sup>47</sup> To minimize risk, buyers and shipbuilders re-use previous designs to the maximum extent possible and attain an in-depth understanding of new technologies included in the ship design.<sup>48</sup> Before construction begins, shipbuilders complete key design phases that correspond with the completion of a three-dimensional product model.<sup>49</sup> Final information on the systems that will be installed on the ship are set to allow efficient design work to proceed.<sup>50</sup> *Variance in design is an exception—not common practice.*

During construction, buyers maintain a presence in the shipyard and at key suppliers to ensure the ship meets quality expectations and is delivered on schedule.<sup>51</sup> Defense shipbuilding cannot fully implement all of these best practices from the commercial industry. Nonetheless, even partial or gradual application of some of them could significantly improve the affordability of military shipbuilding.



## OVERSIGHT AND BUDGETING

### Congressional Oversight

Legislative oversight of defense shipbuilding comes in various forms and from various Congressional committees and subcommittees, but is performed primarily by the Senate Armed Service Committee's Subcommittee on Seapower and the House Armed Service Committee's Seapower and Projection Forces Subcommittee.<sup>52</sup> For the Coast Guard, oversight is provided by the Senate Committee on Commerce, Science, and Transportation's Oceans, Atmosphere, Fisheries, and Coast Guard Subcommittee and the House Committee on Transportation and Infrastructure's Subcommittee for Coast Guard and Maritime Transportation. In both the Senate and the House, the Appropriations Committees play a role as well.

Congress imposes spending limits on defense shipbuilding in three ways – *purpose, time and amount*. The Navy can only spend Shipbuilding and Conversion, Navy (SCN) funds to construct a new ship or improve an existing vessel; it cannot use SCN to pay for operations or maintenance (*purpose*). Congress usually designates SCN funds as five-year funds, while USCG Acquisition Construction and Improvement are three-year funds; unspent funds expire after the end of the fifth or third fiscal year respectively (*time*). These limits prevent the Executive Branch from accumulating and spending additional funds without Congressional oversight. Congress can also rescind funds previously appropriated if it no longer supports the program or dislikes how the agency previously spent funds. The Anti-Deficiency Act requires full funding of each ship unless Congress enacts exceptions such as multiyear procurement authority, incremental funding authority, or advance procurement funding for items such as long lead time materials; that is, the military can only procure something if it has full funding, upfront when the contract is signed for a usable end item, such as a ship (*amount*). Aircraft carriers receive incremental funding, while most other combatants receive advance procurement funding and then full-funding during the first year of a ship's build.

A noteworthy difference between support vessels and combatant vessels is the way in which Congress funds procurement. Congress appropriates money to the National Defense Sealift Fund (NDSF) to purchase sealift and combat logistics force vessels. Created in 1993, NDSF is not a specific procurement appropriation but rather a non-expiring fund. Dollars appropriated by Congress to NDSF are not appropriated to purchase specific vessels. As a result, NDSF funding provides greater flexibility for the Navy, allowing it to shift funds to higher priorities without the additional process and restrictions involved in reprogramming funds. Additionally, the Navy can accumulate NDSF funds from one year to the next to meet larger funding year requirements in some years without fear the funding will be lost.

Congress also provides oversight of US shipbuilding through legislative requirements, primarily to support the domestic maritime industry. A series of requirements affecting domestic shipping (US port-to-US port) exist under the popularly named Jones Act, (consolidated under the Merchant Marine Act of 1920 § 27).<sup>53</sup> The Jones Act's purpose is to "foster a strong domestic maritime industry which can be mobilized rapidly in time of war or national emergency."<sup>54</sup> Specifically, the Jones Act requires any ship engaged in US domestic trade is built in a US shipyard as well as US-flagged and crewed by US mariners. A similar statute governing the transportation of passengers between US ports is the Passenger Service Vessel Act of 1886 now codified in Title 46.



The Jones Act does not apply to military ship construction; however, Congress enacted specific legislation impacting military shipbuilding and ship repair. Title 10 US Code § 231 requires the Secretary of Defense to submit with the DOD Budget, an annual long-range 30-year plan for the construction of naval vessels. This report provides Congress an oversight tool to understand the Navy's forecast of the future fleet's size and composition. Several laws (10 US Code § 7309 (construction), § 7310 (repair), and 14 US Code § 665) impose restrictions on construction or repair of military vessels in foreign shipyards.

### **Acquisition & Budgeting**

From the perspective of the Department of Defense, the US defense shipbuilding industrial base exists exclusively to construct warships in sufficient quantities to meet the requirements of the National Security Strategy as interpreted in the Naval Force Structure Assessment. The 30-year shipbuilding plan makes every effort to “[take] into account the importance of maintaining an adequate national shipbuilding design and industrial base and strives to be realistic about the cost of ships.”<sup>55</sup> However, the tension between affordability, maintaining the industrial base, and procurement of technologically superior vessels is always evident. The volatility of the 30-year shipbuilding plan also reduces predictability and increases the cost of ships. Changes in acquisition strategy changes could help implement Undersecretary of Defense Ashton Carter’s charge to “Do more without more.”<sup>56</sup>

The Navy could implement an acquisition strategy procurement process consisting of an industrial base characterized by preferred shipbuilder status (PSS), multi-year procurement (MYP) structure, and design-then-build (DTB) process—all advocated by industry representatives. *These changes attempt to increase predictability for specific yards and align shipbuilding milestone decision authorities with other defense programs.* For instance, reducing the number of selected yards in which ships would be built down-select competitors earlier in the process, thus allowing yards to amortize capital costs over a longer build period. Further, providing a longer term contract allows shipbuilders to engage in longer term arrangements with their suppliers, presumably passing along lower unit costs to the government. Lastly, locking in design specifics prior to commencing the build of the vessel creates further saving opportunities. Understanding that first-in-class ships often cannot delay until 100% design is achieved, a reasonable goal of 80% design provides a closer actual cost estimate upon final completion.



## RECOMMENDATIONS

All of the above factors influence the ability of the defense shipbuilding sector to provide the US with an affordable fleet, able to meet the continuing demands of being the global maritime leader. Competing tensions— such as low production rate and production efficiencies as well as excess capacity and continued desire for competition in acquisitions—are difficult to mitigate with so many competing stakeholders. However, there are strategies that could increase the affordability of the future fleet.

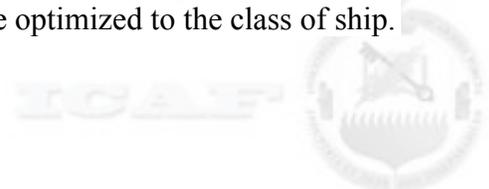
**1. Congress and DOD should enact an acquisition strategy that establishes shipbuilding centers of excellence by designation of preferred shipbuilder status (PSS).** Preferred shipbuilder status would enhance cost, schedule, and performance. This procurement structure would contractually guarantee sustained, extended ship production to specified shipbuilders in a limited number of dedicated combatant class shipbuilder pairings. These shipbuilders would be eligible to receive contract awards on essentially a sole source basis. This relationship would result in repeated value delivery by providing incentive for the shipbuilder to make capital investments in improvements and new equipment. PSS would also allow employers to improve long term employee stability and productivity through better human resource planning and increased investment in training and education.

**2. The Secretary of Defense should establish a Shipbuilding Committee to create a consolidated 30-year shipbuilding plan that reflects DoD planned purchases.** The committee should include members from each of the services, with the Navy serving as Secretariat, as well as representatives from the shipbuilding industry to ensure that opportunities to leverage economies of scale are maximized and investment decisions are made with a fully informed view of both demand and supply factors. This single, integrated plan should include not only the battleforce ships projected by the current plan, but also the full complement of auxiliary, sealift, and reserve ships as well as Army and Special operations watercraft. Finally, the committee should be empowered to make trade-off decisions in the timing and design of ships and watercraft to optimize the DOD shipbuilding effort for economy, efficiency and value.

**3. The Under Secretary of Defense for Acquisition, Technology & Logistics (USD AT&L) should establish minimum Design then Build (DTB) requirements for shipbuilding.** A DTB process is the best mechanism for achieving a stable design. With a DTB requirement, construction shall not begin until the design has been finalized to a certain percentage. Core to the DTB approach is the fact that design changes will erode any expected savings. A DTB process supports the use of modular construction practice and is well suited for the use of an open architecture design. The majority of the technological innovations and associated risk should be transferred by design out of the platform to the mission packages.

**4. Congress should enact funding and budgeting reforms that better represent the unique requirements associated with ship construction.**

**A. Title 10 US Code § 2306 (Multiyear contracts: acquisition of property) should be changed to allow Ship Construction Multiyear contracts to be based on number of units or “blocks” vice number of years.** The construction process for a ship is much longer than other defense industry products. For the industry to effectively pass the benefits of MYP on to the customer, a sufficient number of “units” must be ordered and produced to take advantage of the economic order quantities and to better utilize facilities. The exact length of construction can vary depending on the type of ship. For this reason, MYP based on “block” purchases makes more sense than the current five-year limit. “Block” size would be optimized to the class of ship.



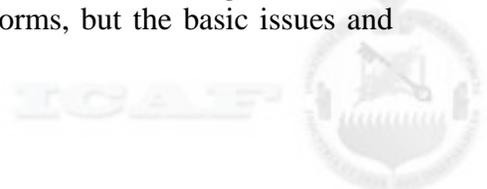
The MYP contracts, as proposed, could dramatically reduce Congressional funding control and DOD budget flexibility, raising legitimate concerns among top acquisition stakeholders; however, an appropriately structured and executed MYP contract can overcome these concerns through sustained on-time production within or below program budgets.

**B. Congress should grant greater funding flexibility to the Navy and USCG for combatant ships and cutters and convert each service's shipbuilding funds into a flexible, non-expiring fund along the lines of the NDSF.** A non-expiring fund enables the Navy or USCG greater flexibility to address its shipbuilding requirements. Instead of a specific hull-by-hull appropriation, each service can more flexibly address its current shipbuilding needs and be poised to rapidly take advantage of production synergy and potential savings. A non-expiring fund enables the Navy or USCG to rapidly shift funds to higher priorities without additional processes and restrictions involved with reprogramming. By making the money non-expiring, it provides the additional ability of avoiding expensive, unwise procurement decision in the interest of spending money before funds expire. It also enables the Navy or USCG to accumulate NDSF-like funds from one year to the next to meet larger or unexpected emerging requirements in later years without fear funds will be lost due to funds expiring or Congress canceling programs.

**5. The Secretary of Defense should task the Defense Logistics Agency (DLA) as the lead in establishing a collaborative supply chain management network for the US shipbuilding industry in support of the Department of Defense.** The purpose of this effort is to benefit from economies of scale, strategic shipbuilder-supplier relationships, and material and assembly standardization leveraged by DLA. Intended to drive down the cost of shipbuilding material and assemblies across the DoD, this collaborative supply chain management effort will support selective shipbuilding production as well as ship repair and will include the warfighter, the government program management or program enterprise office, the shipbuilding industry, shipbuilding suppliers, and DLA. This centrally-managed supply chain effort will be opportunistic, vice directive, for the shipbuilder. DLA will champion the supply chain transformation effort for shipbuilding material procurement by establishing and implementing a standardized Supply Chain Operations Reference model based supply chain framework. This advocacy will help cultivate strategic supplier alliances and track agreed upon performance measures to allow the shipbuilding industry to focus on building ships.

**6. DoD through the Assistant Secretary of the Navy, Research, Development and Acquisition and USD AT&L Manufacturing and Industrial Base Policy Team) should initiate and coordinate efforts to update the Committee on Foreign Investment in the United States (CFIUS) review and approval process to promote beneficial foreign investment in US shipbuilding.** Recent efforts related to the CFIUS have pushed the balance-point further away from foreign ownership of businesses that provide capabilities to the US military. As the global economy has changed during the past decade, these policies have become increasingly out of date, especially with such significant industry expertise existing internationally. In particular, current policies are likely to limit industry restructuring involving international companies such as Austal and Fincantieri that currently supply weapons systems to the US Navy.

**7. DoD through the Navy International Programs Office should work to accelerate current reform efforts related to US export controls focusing on opportunities to increase demand for tier-two US shipbuilders.** Much like the industry restructuring policies outlined above, military export controls have not kept pace with changes in the global environment. In August of 2009, the White House initiated a review to identify needed export reforms, but the basic issues and



struggles remain. Oversight and authority for export controls continue to be redundant and, in the assessment of the Government Accountability Office, overly restrictive and ineffective. In the case of tier-two shipbuilders, both capacity and capability exist to produce patrol-class vessels to compete in the broader international defense market.

**8. USD AT&L should submit a change recommendation to the Federal Acquisition Regulation (FAR) Council requiring Program Managers to identify/estimate the “inefficiency premium” associated with their programs.** A program’s “inefficiency premium” is the cost attributable to complying with socio-economic programs, political sourcing pressures, forfeited economic order quantity benefits and diminished collaborative and alliance relationships resulting from short-term transactions and excessive competition. This FAR revision informs intelligent debate and manages expectations regarding some causes of program performance and the basis for some cost overruns. Visibility into “inefficiency premiums” should lead to increased cost transparency. Stakeholders may react differently if, for example, 25% of a cost overrun is purely the result of an “inefficiency premium.” This knowledge may reduce the disruptive churn associated with cost increases, contract renegotiations, withheld funds, and cut production quantities. Moreover, this transparency permits stakeholders to determine whether the benefits appurtenant to the “inefficiency premium” are worth their added costs. In instances where they are not, stakeholders may decide to eliminate the premium in favor of reduced production unit costs. Accordingly, it is recommended that the following language be added as FAR 7.105(3)(iv):

*Inefficiencies and Cost.* Describe and quantify all costs that are directly attributable to socio-economic program compliance, political sourcing pressures, forfeited economic order quantity benefits and diminished collaborative and alliance relationships resulting from short-term transactions and excessive competition.

## CONCLUSION

Currently, the US faces no near peer competitor with regards to projecting maritime power. The current and future security environment demands that the US remain engaged in assuring allies, dissuading potential adversaries, responding to crises, and protecting global trade. Through its ability to design, produce, and maintain its sea services, the US maintains its global reach and power. Unfortunately, the excess capacity of the US defense shipbuilding industry and a continued desire for competitiveness in federal acquisition practices create tensions that must be mitigated if the fleet is to be affordable in the long-term.

Transparency in cost analysis, improved regulatory frameworks, and partnerships with Congress to provide production predictability are some of the improvements that can be implemented in the near-term to preserve the fleet in the long-term. Affordability of the fleet must guide all stakeholders’ actions in the development and sustainment of America’s premiere sea services.



## ESSAYS

### **NORTHROP GRUMMAN SHIPBUILDING'S PROPOSED SPIN-OFF: "UPSIDE VS. DOWNSIDE"**

In 2001, Northrop Grumman established its shipbuilding business segment by acquiring Newport News and Litton Industries. These purchases quickly launched Northrop Grumman as one of the two prime shipbuilders for the US Navy competing head-to-head with General Dynamics.<sup>57</sup> It now appears the enthusiasm that existed in 2001 has faded. In 2010, Northrop Grumman's CEO Wes Bush announced the company's intent to divest its shipbuilding business to better align the company's operating strategy.<sup>58</sup> Northrop Grumman completed the spin-off of its shipbuilding operations in early 2011 to form Huntington Ingalls Industries.<sup>59</sup>

The intent of the following discussion is to evaluate Northrop Grumman's comparative financial performance, to assess the company's potential motivation for divesting its shipbuilding business, to outline the possible impact of the Northrop Grumman's actions, and to offer a set of relevant actions and recommendations.

#### **Comparative Performance Data**

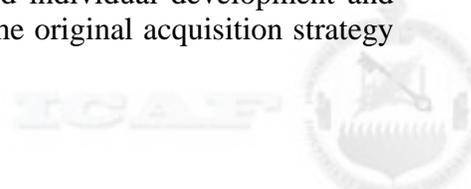
Based on financial data of the five largest US defense contractors compiled from the past ten years' annual 10K earnings reports (2001-2010), Northrop Grumman ranks third in annual revenue and last in annual operating margin for the period. The most notable factor in the comparison data is the \$2.5B charge Northrop Grumman recorded in 2008 against its shipbuilding business segment.<sup>60</sup> Next, looking across the company's primary business segments, Northrop Grumman's shipbuilding operations rank last in annual revenue and last in operating margin.<sup>61</sup> Then evaluating the company's shipbuilding business segment against its direct competitor, General Dynamics' shipbuilding, annual revenues are comparable in recent years and nearly identical in 2010. Operating margins, however, have only recovered to approximately half that of General Dynamics shipbuilding after Northrop Grumman's \$2.5B charge in 2008.<sup>62</sup>

#### **Potential Motivation**

First, building on the comparisons developed above, Northrop Grumman's shipbuilding business is the weakest of the company's operating segments. While revenues and operating margins demonstrated rapid growth to over \$6.7B in 2010, the company's other operating segments outpaced shipbuilding with aerospace recording revenues of \$10.9B in 2010. As for annual operating margins, electronics outpaced all other business segments with performance of 13.4% in 2010 compared to 4.8% for shipbuilding.<sup>63</sup>

Second, Northrop Grumman faces increasing competition as a prime shipbuilder for the US Navy. Split-production awards of the Virginia class submarine and Arleigh Burke class destroyer were awarded to General Dynamics and Northrop Grumman.<sup>64</sup> In addition, the US Navy recently awarded dual production contracts that included two non-US shipbuilders – Italy's Fincantieri and Australia's Austal. As part of the LCS program, Lockheed Martin established itself as a prime systems integrator for the Fincantieri designed Independence-class ship.<sup>65</sup>

Third, Northrop Grumman faces declining demand. Shortly after forming its shipbuilding business, Northrop Grumman launched a joint venture with Lockheed Martin to successfully compete for the US Coast Guard's Deepwater recapitalization program. In 2006, the Deepwater program was restructured and de-scoped to award individual development and production contracts. This marked a significant departure from the original acquisition strategy



where Northrop Grumman and Lockheed Martin would manage the entire USCG recapitalization effort.<sup>66</sup> Also during this same period, the US Navy's next generation DDG-1000 destroyer program was well into design development with an anticipated production quantity of 32 ships and first delivery in 2012.<sup>67</sup> In 2008, the US Navy restructured the program and capped the total production of the Zumwalt-class destroyer at three ships.<sup>68</sup>

#### **Possible Impact: Benefits and Risks**

For Northrop Grumman, upside benefits follow the discussion outlined in the prior sections. Improved financial performance and increased strategic alignment characterize the upside benefits for the company. However, the most significant downside risk from a failed spin-off is the potential to severely damage the company's relationship with its prime customer, the US Government.

For the new company, Huntington Ingalls Industries, the upside benefits include a strong understanding of the business environment, a current backlog of contracts, and significant interest by Northrop Grumman, the US Navy, and US Coast Guard in their success. Downside risks are typical of any new operating company - inability to access capital, insufficient cash flow, and unstable cost structure. The net result could be unfavorable financial performance. In the extreme, poor financial performance could result in additional restructuring actions and sizeable requests for financial assistance.

For the US Navy and US Coast Guard, the strongest upside benefit is that Huntington Ingalls will be able to pursue a business strategy focused solely on shipbuilding. Investment decisions, partnering arrangements, and other key actions will all be driven by the needs of the company's core shipbuilding business. The most significant downside risk is that the new company will not be able to meet its cost and schedule commitments during the transition from Northrop Grumman. Previous contracts for material, labor, and services could experience cost and schedule growth as suppliers negotiate less favorable terms.

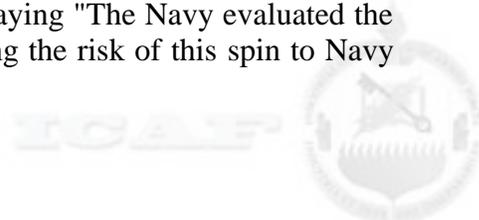
#### **Relevant Actions and Recommendations**

1) The US federal review process of industry restructuring actions should be updated with lessons learned from the spin-off of Northrop Grumman's shipbuilding business. Largely developed during the early 1990s defense industry consolidation, typical federal reviews strongly emphasize antitrust concerns relative to mergers and/or acquisitions with the intent to sustain adequate industry competition and cost effectiveness. The spin-off of Northrop Grumman's shipbuilding business segment is neither merger nor acquisition. Capturing relevant lessons learned, the federal review process should be updated to address the scenario of a potential spin-off divestiture.

2) The Department of Navy should establish a focused monitoring and risk mitigation program for Huntington Ingalls Industries. As co-producer of nuclear submarines and the sole producer of nuclear powered aircraft carriers and amphibious assault ships, the newly independent operating company holds significant risk as it transitions from the corporate structure of Northrop Grumman. Potential areas of monitoring include adequate capital investment, effective cash flow, manageable debt levels, and stable cost structure. Possible mitigation efforts include an assessment of potential follow-on restructuring actions, evaluation of alternate sourcing strategies, and development of financial assistance options.

#### **Conclusions and Last Comments**

Recently, the US Navy issued a news release in support of Northrop Grumman's actions. In the statement, Assistant Secretary Sean Stackley is quoted as saying "The Navy evaluated the extent of considerations made by NGC as appropriately addressing the risk of this spin to Navy



shipbuilding. The Navy regards HII as a responsible contractor and is proceeding to finalize the negotiations with the intent to award the contracts for construction of LPD 26 and DDG 113 to HII." <sup>69</sup>

Northrop Grumman's spin-off of its shipbuilding business marks a significant opportunity for the companies involved as well as the US Department of Defense. As described in the sections above, the scenario introduces a number of unique risks along with a broad set of potential benefits. The intent of this short discussion is to highlight opportunities to maximize the upside benefits while emphasizing actions to mitigate the downside risks. —*Bryan Riley*

### **THE EFFECT OF THE CURRENT ECONOMIC CONDITION/ POTENTIAL CONGRESSIONAL MANEUVERS ON THE SHIPBUILDING INDUSTRY**

**Federal Deficit Budget Pressures.** With soaring Federal deficits and debts threatening the economic well-being and security of the country, a crisis is rapidly arising if federal spending is not brought under control. The US Treasury projects the national debt at \$14.1 Trillion (T) which is approaching 100% of US Gross Domestic Product (GDP). <sup>70</sup> Economists warn 100% of GDP is where countries face economic challenges. According to President Obama's debt reduction commission:

Our nation is on an unsustainable fiscal path. Spending is rising and revenues are falling short, requiring the government to borrow huge sums each year to make up the difference. We face staggering deficits. . . Federal debt this high is unsustainable. It will drive up interest rates for all borrowers – businesses and individuals – and curtail economic growth by crowding out private investment. <sup>71</sup>

Joint Chief's Chairman, Admiral Mike Mullen said: "*the national debt is the biggest threat to our national security.*" <sup>72</sup> On April 18<sup>th</sup> Standard & Poors downgraded the long-term US debt rating outlook from "stable to negative." <sup>73</sup> This could lead to increased borrowing cost to service the debt and worsen the situation. Both parties proposed \$4T in cuts over twelve and ten years respectively. Budget and defense cuts are inevitable.

**Possible Congressional Changes to Foreign Shipyard Restrictions.** In an effort to meet budget cuts and make defense spending more affordable, Congress might revise Title 10 (DOD) and Title 14 (USCG) restrictions on constructing military vessels in foreign shipyards. <sup>74</sup> The most often cited reason for these restrictions is to preserve the US shipbuilding defense industrial base. The US is a maritime power and as a maritime power it must have a large capable Navy. To be a credible maritime power the US must have the domestic capability to build a large and technologically capable Navy. Even though it is expensive, Congress in the past willingly paid the premium for ships to be built by US shipyards to maintain that capability and preserve the US as the dominant maritime power. Lurking below the surface, are Congress' other rationales, to preserve jobs and US companies. With soaring deficits and debt, Congress might revise the statutes requiring military vessels to be built in US shipyards.

**Preserve Industrial Base and Savings.** Repealing all these restrictions is not in the best interests of the US National Security and the President should discourage drastic steps. If Congress revises these statutes it must do so carefully to preserve the shipbuilding base.

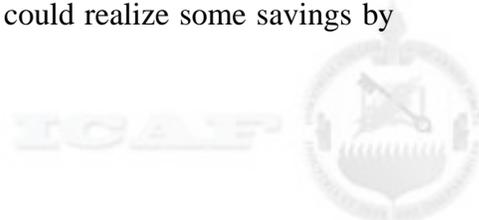


Discussed below are some steps Congress could take short of repeal that help preserve the defense shipbuilding base while achieving some savings that Congress desires.

***Congress could repeal foreign shipyard restrictions but only as it applies to the commercial-type sealift vessels that the Military Sealift Command (MSC) procures.*** The current Jones Act US shipbuilding restrictions, as applied to interstate domestic US commercial ship traffic, should help maintain the domestic commercial shipbuilding industrial base's capability to construct sealift vessels until such time as the Federal Government gets its fiscal house in order. Sealift vessels remain a key national security asset. The US will not want sealift built in shipyards of a potential adversary. Limiting foreign shipyards to countries with which we have "reciprocal defense agreements" similar to the Buy American's qualifying countries, would be a good hedge.<sup>75</sup> Opening up sealift competition to foreign shipyards should provide competitive pressure for US shipyards to be more affordable. The US could also enjoy diplomatic benefits by demonstrating that the US is committed to full and open trade with its allies. Strategically, this could increase incentives for aligned countries to remain aligned with the US thereby helping enhance US national security.

***Congress could repeal restrictions for the USCG until such time as the Federal Government gets its fiscal house in order.*** The lower complexities of USCG Cutters are not comparable to Navy ships. Cutters' onboard combat systems are not as robust as on Navy ships. The logic for maintaining the defense industrial base capability presumes that military ships contain certain complex on-board combat systems. It is precisely these systems for which the defense industrial base paradigm should have US shipbuilders maintain the technical expertise to integrate and construct highly complex systems into combatant ships. Cutters are uniquely designed for homeland security missions, as well as non-defense missions such as law enforcement, counter drug, search and rescue, environmental compliance, natural resource protection and immigration and customs operations. While Cutters are designed to sail with naval vessels, they do not possess the complex combat systems or robust offensive or defensive systems or munitions storage challenges. As the smallest military service, the Coast Guard also has small budgets with little impact on maintaining the shipbuilding base.

***Congress could permit construction of commercial-like ship segments in allies' shipyards.*** This can reduce construction costs while supporting the US shipbuilding base by maintaining the restrictions on the vessels' ever important defense-related portions. Ships are built in modules/blocks/assemblies. It is possible to have non defense-related modules, blocks, or assemblies manufactured in one yard and transported to a US shipyard for final assembly. It is critical for the US to maintain shipbuilders with the technical expertise to integrate and construct highly complex combat systems into combatant ships. Key blocks where critical components reside, such as the propulsion, propulsion control, information surveillance and reconnaissance, communications, weapons systems and munitions storage must be built in the US. Less complex commercial-like areas such as crew berthing, galley and storage areas or commercial-like areas can be built outside the US. This requires repeal of the "Tollefson Amendment." Since 1964 Congress has restricted construction of major component, hull, or super-structure in foreign shipyards.<sup>76</sup> Congress enacted the amendment when the Navy constructed midbody sections of ships in foreign shipyards and towed them across the ocean to finish the ship in domestic shipyards. Congressman Tollefson intended on imposing the same limits on naval vessels that applied to commercial vessels under the Merchant Marine Act of 1936 [build in US shipyard].<sup>77</sup> If this is repealed (for all or just MSC or USCG) ships Congress could realize some savings by avoiding full construction in US shipyards.



***Congress could provide preferences to US shipyards.*** These preferences could be similar to the current preferences. The Federal Acquisition Regulations' (FAR) 25.1 Buy American Act provisions give a price preference if a US-sourced offer is more expensive than a foreign one (6 percent for large business domestic offer or 12 percent for small business domestic offer). Congress could establish a higher percent pricing preference for US shipyard for MSC and USCG vessels. Another preference in conjunction with requiring final assembly in the US and defense-related block construction in US shipyards would be to require a strict 50% of the vessel's construction costs be done in US shipyards similar to the Buy American Act's 50% US cost content requirement.

**Conclusion.** Outright repeal of all foreign shipyard restrictions is not in the interests of US National Security. Congress must carefully revise the restrictions to preserve the shipbuilding industrial base. The options discussed are not exclusive of each other. Congress could combine these options and achieve the objective of making military vessels more affordable while maintaining the combatant shipbuilding industrial base. —*Andrew Squire*

### AMERICA'S MARINE HIGHWAY SYSTEM - GREENER PASTURES

"U.S. industry set the benchmark for shipyard efficiency around the world during World War II, with the construction of 2,700 Liberty ships between 1941 and 1945 – the largest number of ships ever produced to a single design and at a rate of more than one ship per day... In stark contrast, today U.S. shipbuilding accounts for less than one-quarter of one percent of the tonnage produced worldwide."<sup>78</sup>

There is an opportunity for the US to improve domestic demand for commercial vessels through the increased use of coastal and inland waterways by fully embracing America's Marine Highway System program. Increasing the use of the nation's waterways for freight, and to a lesser degree passenger transport, can provide both a stimulus for increased production of commercial vessels within the US and a reduction in Green House Gas (GHS) emissions by shifting more freight from roads and rails to the nation's waterways. Increased US commercial shipbuilding can also mitigate some of the adverse effects of future declines in US defense shipbuilding.

The US Department of Transportation's (DOT) Maritime Administration (MARAD) has been promoting the Marine Highway System (MHS) in order to balance the load on the nation's transportation infrastructure as well as reduce reliance on imported sources of energy. The Energy Independence and Security Act of 2007 directed the Secretary of Transportation to "establish a short sea transportation program and designate short sea transportation projects to be conducted under the program to mitigate surface congestion".<sup>79</sup> The general concept of the MHS is to obtain greater use of the nation's nearly 26,000 miles of waterways. The MHS will also increase demand for vessels which in turn will benefit the US commercial shipbuilding industry and strengthen the industrial base.

The MHS has the potential to provide a "Liberty ship" type of stimulus to the US commercial shipbuilding industry -- given appropriate levels of federal, state, and local support as well as private industry investments. This initiative, in one forum or another has been discussed by the US maritime policy community for nearly 30 years, and more recently in an April 2011 DOT report to Congress titled "America's Marine Highway - Report to Congress".<sup>80</sup>



However, economic, market, and political forces have prevented the concept from gaining wide spread support due in large part to prohibitive cost barriers resulting from the burden of taxes and regulations, low profit margins, and the high cost of capital to enter the market. For example, the Harbor Maintenance Tax (HMT), which imposes a 12% tax on the value of goods transiting the nation's ports, should be modified or repealed in order to level the competition with truck and rail transportation modes. This tax is imposed at each water port a shipment transits and often results in making marine transport cost prohibitive when compared to truck or rail modal options. The primary purpose of the HMT is to fund US Army Corps of Engineer dredging of the waterways. As an example of the disproportion of taxation, the HMT account currently has a nearly *six billion dollar surplus* due to the excessive taxation in relation to the actual dredging activity performed by the Corps of Engineers.<sup>81</sup> This surplus could be better spent by re-appropriating funds to support shipbuilding innovations that provide "greener" power for vessels such as natural gas powered engines or other innovative technological advancements of marine vessels.

The increased use of the MHS will also lower GHGs. For example, barge transports or ships produce approximately seven times less CO2 emissions than trucks and four times less than trains *per ton-mile*.<sup>82</sup> The increased use of the MHS can provide a tremendous impact to the nation's efforts to reduce GHGs. As the volume of truck traffic increases and the resulting traffic congestion increases across the nation, air quality concerns will continue to gain national as well as global attention.

The US can look toward Europe for a successful model to improve increased maritime commerce. The European Union has successfully implemented a short sea shipping and inter-modal transportation program titled *Marco Polo*. Over the past two decades, EU nations have been able to shift freight from roads and rails to waterways with approximately 40 percent of Europe's non-bulk freight currently moving on coastal and inland waterway shipping. This is triple the percentage of goods shipped via waterways in the United States. The EU's program, with a 2011 budget of 450 million euros provides grants to businesses in order to continue shifting freight movement from trucks to marine and rail modes in order to relieve traffic congestion and wear and tear on road and rail infrastructures.<sup>83</sup>

In the DOT's recent report to Congress on the MHS, it appears progress is beginning to be made with this initiative; however, the level of federal investment to fund innovation, start-ups, and infrastructure improvements remains low when compared to Europe. Therefore, the US government should provide increased levels of support to the MHS in terms of both funding and national leadership. The DOT's Marine Highway System report is comprehensive, informative, and optimistic and should be required reading for all federal, state, and affected local elected officials, as well as select US Chamber of Commerce members. The US government should aggressively promote the MHS concept through appropriate policies and provide adequate incentives to spur significant increases in the use of the MHS.

Even a nominal ten percent increase in MHS traffic will in turn generate an increase in the demand for vessels such as mid-size roll-on roll-off, coastal container vessels, as well as car and even passenger ferries. "In a recent study, Professor John Curtis Perry of the Institute for Global Maritime Studies at Tufts University concluded that as many as 200 ships, built over a period of many years, would be necessary to support an efficient American Marine Highway system."<sup>84</sup> With fuel prices and traffic congestion continuing to increase, and environmental concerns growing, the conditions are ripe for a steady expansion of the nation's MHS and a resulting increase in demand for commercial vessels within the US. As a result, there may be greener pastures ahead for the US commercial shipbuilding industry. —**Rob Wiley**



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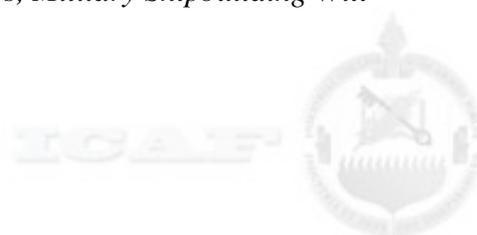
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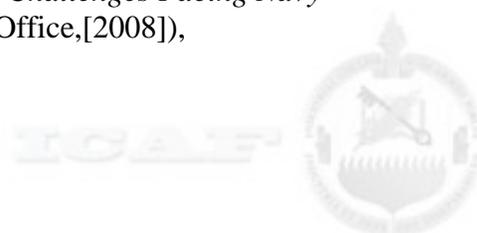
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