

**Spring 2012  
Industry Study**

**Final Report  
*Shipbuilding Industry***



**The Industrial College of the Armed Forces**  
National Defense University  
Fort McNair, Washington, D.C. 20319-5062

## **PLACES VISITED:**

### **Domestic:**

Aker Philadelphia Shipyard (Philadelphia, PA)  
Austal USA (Mobile, AL)  
General Dynamics, Bath Iron Works (Bath, ME)  
Bollinger Shipyard (Lockport, LA)  
Carnival Corporation (Miami, FL)  
General Dynamics Electric Boat (Quonset Point, RI)  
Guido Perla & Associates (Seattle, WA)  
Hodgdon Defense Composites/ Hodgdon Yachts (East Boothbay, ME)  
Huntington Ingalls Industries (Pascagoula, MS)  
North American Shipbuilding (LaRose, LA)  
Rockport Marine, Inc. (Rockport, ME)  
United States Coast Guard Curtis Bay Shipyard (Baltimore, MD)  
VT Halter Marine, Inc. (Pascagoula, MS)  
Waterman Steamship Corporation (Mobile, AL)

### **International:**

Arsenal de Marinha, Rio de Janeiro (Rio de Janeiro, Brazil)  
Keppel FELS Brasil S.A. (Angra dos Reis, Rio de Janeiro)  
SEASPAN Victoria Shipyard (Victoria, BC, Canada)  
Sindicato Nacional da Industria da Construcao e Reparacao Naval e Offshore (Rio de Janeiro, Brazil)  
Transpetro Petrobras S.A. (Rio de Janeiro, Brazil)  
Universidade Petrobras (Rio de Janeiro, Brazil)  
United States Consulate (Rio de Janeiro, Brazil)  
Universidade Federal Fluminense (Niteroi, Brazil)

## ABSTRACT

“An active commerce, an extensive navigation, a flourishing marine would then be the inevitable offspring of moral and physical necessity... Every institution will grow and flourish in proportion to the quantity and extent of the means concentered to its formation and support.”<sup>1</sup> As Alexander Hamilton argued in Federalist 11, a vibrant merchant marine and strong navy are vital to our economy and national security. Unfortunately, the commercial and naval shipbuilding industries have been experiencing decline and consolidation for decades. The U.S. Government must take action now to prevent a substantial gap in our ability to manufacture affordable ships and meet emergent security requirements in the future. Given the current economic environment, the U.S. is no longer able to “pay up” for warships as it has in the past, and simply taking action within the industry’s lifelines will be insufficient to reverse the current trend. In order to meet future national security requirements, we must rebuild the economy and modernize our national transportation infrastructure through the creation of a National Marine Highway System, revitalize our commercial and naval shipbuilding industries, and redesign the ship acquisition process to reduce the cost of warships.

CDR Drummond Boord, U.S. Navy  
CAPT Wayne Brown, U.S. Navy  
Mr. Daniel Corbin, Dept. of the Navy  
Mr. Mike de la Rosa, U.S. Agency for International Development  
CDR Pamela Dozier, U.S. Navy  
Ms. Evelyn Greene, Department of Defense  
COL Sean Keenan, U.S. Army  
CAPT Yong Un Lee, Republic of Korean Navy  
Ms. Tonya McNair, Dept. of Navy  
Ms. Olalani Kamakau, Dept. of Air Force  
Mr. David Pearson, Defense Acquisition University  
Ms. Barbara Robertson, Defense Logistics Agency  
CAPT Anurat Siriwong, Royal Thai Navy

CAPT John Lauer, U.S. Navy, Faculty  
Dr. Linda Brandt, Faculty  
Dr. Mark Montroll, Faculty  
Dr. Seth Weissman, Faculty

## Introduction

“For centuries a strong maritime presence—both military and commercial—has been essential for states with great power aspirations.”<sup>2</sup>

The commercial shipbuilding industry is vital to national security and specifically, necessary for the health of the industry sector engaged in military shipbuilding.<sup>3</sup> Both the commercial and naval shipbuilding sectors have been experiencing decline and consolidation for decades. We assess that current global market forces will not reverse this decline. Today the industry is still able to produce naval vessels, but the U.S. Government must intervene to reverse the decline. Over the intermediate and long terms, the industry will face significant challenges to meet emergent national security requirements. The U.S. Government must take action now to prevent a substantial gap in our ability to manufacture affordable ships and meet emergent security requirements in the future. Given the current economic environment, the U.S. is not able to “pay up” for warships as it has in the past. However, taking action within the industry’s lifelines will be insufficient; a whole-of-government approach that modernizes U.S. transportation infrastructure and includes a Marine Highway System will rebuild the economy, revitalize our maritime industries, and ultimately lower the cost of warships.

Rebuilding the economy, and with it the national strategic infrastructure, will preserve the U.S. shipbuilding industry, maintain and expand a highly trained workforce, and ensure surge capacity in times of national crisis. It will support growth of the national economy through job creation across multiple industry sectors, and provide efficient, environmentally sound transportation. This paper will address the challenges and provide specific recommendations for revitalizing the economy and the shipbuilding industry through the establishment of a National Marine Highway (NMH) system. While Congress directed the Department of Transportation (DOT) in 2007 to create the NMH, it has not properly resourced the initiative and as of 2012, the NMH has not been fully realized.<sup>4</sup> As part of modernizing the nation’s infrastructure, building a viable NMH will have a positive effect on the U.S. shipbuilding industrial base, improve the lifespan of ground-based infrastructure, reduce land-based congestion, reduce transportation costs for consumer goods, and ultimately rebuild the U.S. economy by increasing Gross Domestic Production (GDP).

The views and opinions expressed in this paper are informed by scholarly research and perspective gleaned through conversation with U.S. industry leaders, lawmakers, subject matter experts, and international shipbuilders and government officials. The paper is comprised of four primary sections: Current Outlook and Assessment, A Vision for the Future, Challenges to Realizing the Vision for the Future, and Recommendations. Three supporting appendices are also included: essays specifically addressing the NMH, the environmental considerations of building the NMH, and the acquisition process for Navy ships. It is our hope that the information and recommendations contained herein provide U.S. lawmakers and industry leaders with the tools and inspiration to develop the NMH and revitalize the shipbuilding industry in support of national security and economic objectives.

## Current Outlook and Assessment

“America has grown to be the world's greatest trading nation and 95% of its overseas trade travels by ship. U.S. imports and exports make up a fifth of all ocean-borne trade around the world.”<sup>5</sup> The U.S. has been a maritime nation since its birth; however, our ability to participate globally in the shipbuilding and shipping industries is on the wane, presenting challenges to our economy and national security.

Early on, the U.S. Government enacted several laws to protect the fledgling industries against competition from well-established foreign maritime powers. The Merchant Marine Act of 1920 regulates maritime commerce in U.S. waters and between U.S. ports. Section 27 of the Merchant Marine Act of 1920, known as the Jones Act, prohibits foreign-flagged ships from transporting goods between U.S. ports. Per the Jones Act, U.S.-flagged ships must also be U.S.-built, owned, and crewed. In 1954 Congress amended the Merchant Marine Act to include the Cargo Preference Act. This amendment mandates the transportation of waterborne government cargo on U.S. flag-vessels. The Cargo Preference Act requires items procured for, intended for use by, or owned by military departments or defense agencies be carried on U.S. flag-vessels if available at reasonable rates.<sup>6</sup> Lastly, the Department of Defense is required by law to buy only American-made warships as delineated in the Byrnes-Tollefson Amendment of Title 10, U.S. Code, Section 7309. These laws were designed to maintain a viable U.S. merchant marine fleet and heavy manufacturing industry to serve the nation in time of war or other national emergency, but may now be contributing to the industry's decline.

The U.S. is well behind international competitors by 15 to 20 years.<sup>7</sup> The U.S. currently ranks twelfth in the world in commercial shipbuilding of vessels over 1,000 gross tons compared to China (41 percent of the market), South Korea (31 percent); Japan (22 percent); and European countries Germany and Poland in the low single digits.”<sup>8</sup> The U.S. shipbuilding industry currently consists of over 250 privately owned and five publicly owned shipyards (Norfolk Naval Shipyard, VA, Portsmouth Naval Shipyard, NH, Pearl Harbor Shipyard, HI, Puget Sound Naval Shipyard, WA, and the Coast Guard yard at Curtis Bay, MD). These yards span 29 states and employ over 100,000 personnel, 42,100 of whom work for the publicly owned shipyards, which perform major repair work and no longer build ships.<sup>9</sup> The decline of this industry is of both economic and national security significance.

Huntington Ingalls Industries (HII) and General Dynamics Marine Systems (GD) own the largest shipbuilders formerly, known as the “Big Six.” Bath Iron Works, the Electric Boat Company, and NASSCO, are part of GD, and Newport News Shipbuilding, Ingalls Shipbuilding, and Avondale Industries are part of HII. HII plans to close Avondale in 2013. These corporations have achieved near monopoly in naval construction; they produce our nation's aircraft carriers (HII), amphibious ships (HII), auxiliary and support ships (GD), and cruiser/destroyers (GD). Since the Cold War, the U.S. Navy's demand for warships has steadily declined. Despite protectionist policies, lack of innovation and incentives results in lower efficiency, more costly ships, and fewer purchase orders from government or private customers.

The U.S. government remains the shipbuilding industry's largest customer; however, the rising cost of warships will continue to constrain the Navy's shipbuilding program. Fewer ship builds over longer construction periods is contributing to the industry's death spiral, an example being the impending closure of Avondale Shipyard.<sup>10</sup> The Navy currently maintains the smallest fleet since 1916, and is able to buy just half as many ships as it did 30 years ago with the equivalent total obligation authority (TOA).<sup>11</sup> The Navy will likely see its ship construction

(SCN) budget decrease or remain at the current \$13.5 billion level. As a complicating factor, the procurement of 12 SSBN (X) between 2018 and 2035, at a cost of \$4.9 billion per copy, may crowd out funding for other ships. The combination of industry consolidation, increasingly expensive warships, and the SSBN (X) procurement plan may force the Navy to consider trade-offs between programs that could degrade its overall war-fighting capability.

Allowing the U.S. shipbuilding industry to fail will leave the Nation dependent upon others for maritime assets to support national security and our economy. It is still possible to reverse the current trajectory, but it will require a whole of government approach. The following section provides our vision for a future robust U.S. economy underpinned by a National Maritime Highway.

## A Vision For The Future

Do you want to live longer? Be healthier? Make more money? Spend less time in traffic? Then tell Congress that America needs a marine highway system! America's infrastructure is deteriorating and unable to support transportation requirements for future population and economic growth. Left untouched, it will ultimately render America uncompetitive in the global economy. America's highways are overly congested and America's rail system is operating near capacity.<sup>12</sup> However, the 41K KM of navigable waterways are underutilized and offer growth opportunities.<sup>13</sup> As the population continues to grow, America's ability to create new highways and rail lines or expand existing ones may become more difficult and more expensive due to population growth, rising interest rates, and imminent domain issues. Market forces alone are insufficient to create the impetus needed to develop a viable National Marine Highway (NMH) system. The U.S. faced a similar situation in the 1950's regarding commerce between states and invested in an extensive interstate highway system that catalyzed the economy. Today a similar opportunity exists with our maritime system. The U.S. is part of a global economy in which 90% of all imported goods arrive by sea, and U.S. infrastructure has not efficiently adapted to the new intermodal requirements. If America is to continue to lead the global economy and to provide economic opportunity, national security, and quality-of-life for its citizens, we must build a marine highway system. Central to developing our infrastructure and growing our economy is the recapitalization of our lagging shipbuilding industry.

The proposed marine highway includes revitalized and modernized ports integrated with rail and trucking hubs along the coastline. Existing rail lines and highways extend reach into the interior of the country, and are in need of expansion and modernization as well. A marine highway system enables America to ship our foreign and domestic goods *around* the country as opposed to across it, relieving significant congestion on our most traveled overland routes. In so doing, America can achieve significant gains in efficiency, economic growth, and a cleaner environment.

A marine highway system reduces the cost of goods for average Americans due to reduced transportation costs and economies of scale. As goods become cheaper purchasing power increases, increasing domestic consumption and hence, GDP growth. The same rationale applies to American exports; with reduced transport costs, exports will become less expensive to foreign consumers increasing the demand for American products. With the expansion of the Panama Canal, larger container ships capable of carrying 12K+ Twenty-foot Equivalent Unit (TEU) will have access to the gulf and east coasts of the United States. However, there are currently only a handful of ports in the United States capable of hosting such ships. These ports will become overburdened and congested. This will fundamentally constrain the amount of economic activity that can take place, limiting potential for future GDP growth. Building a significant fleet of lighter ships, coastal freighters, and barges to distribute goods to smaller ports and up America's rivers can alleviate the looming congestion. (See Annex 1 for expansion on the Marine Highway System)

Environmentally speaking, a marine highway will improve air quality, reduce noise pollution, and extend the life expectancy of our roads, tunnels, and bridges. Cars and trucks idling in traffic contribute significantly to smog, acid rain, carbon dioxide emissions, and deterioration of roads, bridges, and tunnels, and consume a significant amount of fuel in the process. Contrary to the current government narrative, a marine highway system will not "get trucks off the road." Heretofore, this narrative has mobilized resistance from the trucking

industry to the creation of a NMH. We propose that as overall shipping volume increases, more rail and trucks will be required to transport goods to their final destination. The trucking industry will transition from trucking along America's most congested, circumferential routes like I-5, I-10, and I-95, to routes from coastal freight hubs toward the interior of the country, with less traffic and population density. For truckers, this efficiency means more mileage travelled during a 10-hour trucking day, less fuel burned in traffic, which equates to higher wages. For America, this means safer, faster roadways. (See Annex 2 for details on the environmental considerations associated with the marine highway system).

In terms of national security, a modernized transportation infrastructure enables less dependence on foreign oil, the ability to quickly and efficiently move military troops and materiel, a strengthened economic base, and (due to the necessity of heavy manufacturing) increased surge capacity in manufacturing. Our national defense strategy emphasizes this point stating, "Global security and prosperity are increasingly dependent on the free flow of goods shipped by air or sea."<sup>14</sup> A strong economy and heavy manufacturing capacity have been the foundation of America's national power throughout the 20<sup>th</sup> century, and will be even more important as developing nations ramp up industrial production. Increased GDP growth will, in conjunction with judicious government spending, increase revenue and reduce the national deficit. All of this is essential to maintain a robust and capable United States military.

From a societal perspective, a vibrant and efficient transportation system benefits all Americans at a very basic level. Open roads, as opposed to congested highways, promote public safety. Roads, bridges, and other infrastructure will last longer, cost less to maintain for taxpayers, and provide for safer, smoother transportation. Americans will enjoy less highway noise, less smog in urban areas, less tire and other debris on highways, and less time stuck in traffic.

This vision for efficient 21<sup>st</sup> century infrastructure relies heavily on a revitalized commercial shipbuilding industry. America does not currently produce enough of the type of ships required to service the maritime highway system, and American shipyards are antiquated and uncompetitive relative to those of other countries. In order to invigorate demand, shipyards must be retooled and redesigned to produce cost-competitive ships that will attract American (and foreign) ship owners to recapitalize their fleets.

Today, naval and commercial shipbuilding are somewhat distinct, but blending the two provides clear advantages. Invigorating commercial shipbuilding will stimulate the supply base for materials and components. Across the board, greater efficiency in manufacturing, economies of scale and the implementation of best practices will result in less expensive, more technologically advanced, and environmentally friendly ships. Another consequence of revitalizing the commercial shipbuilding industry is increased demand for engineers and information technology. Lastly, collaboration between government and industry should focus on dual-use shipping to stimulate growth and provide for future national security needs in time of war (See Annex 3 Essay on Innovation for more detailed opportunities).

While not a small undertaking, creating American infrastructure for the 21<sup>st</sup> century is a prerequisite for future economic growth and national security. American shipbuilding is central to this effort and is in need of immediate direct investment, recapitalization, and support in order to create a vibrant, self-sustaining maritime industrial base. The current environment poses a similar challenge to that of the 1950s, as well as a similar opportunity. The time to act is now.

## Challenges To Realizing The Vision For The Future:

As previously mentioned, the shipbuilding industry has been in decline for decades. The U.S. shipbuilding industry internally faces a number of challenges, including a decreasing Navy fleet size, resource shortages, low commercial demand signal, competition from non-traditional players, thin profit margins, increased technological development, workforce retention, and an aging workforce among others. However, focusing specifically on the shipbuilding industry will not enable us to realize the Vision for the Future. Addressing more fundamental national-level problems - a lack of *leadership, innovation, trust, communication*, concentrated focus on *inefficiencies*, and a *compelling narrative*- are needed to rebuild the economy, modernize our infrastructure, and in so doing, revitalize our shipbuilding industry.

*Leadership.* Discussions with Congressional staffers and Industry spokesmen uncovered a dearth of leadership willing to catalyze a revitalization of American shipbuilding through the development of the NMH. The legislative process requires responsiveness, representation, and demonstrated interest in long-term solutions. Bureaucracy and special interests have been able to trump limited efforts to gain ground. Groups such as the Teamsters engage often and with great effect to thwart industries they believe to be competing with trucking- e.g., shipping. The shipbuilding industry needs a clear, unambiguous, and outspoken champion for its cause.

*Innovation.* A significant challenge to the nation and the shipbuilding industry is the escalating cost of Navy vessels. Competition, which often encourages lower costs, is limited to five shipyards. Stimulating the industry writ large can encourage both competition and innovation, reducing government procurement costs (For specific discussion relating to Naval acquisition strategies, please consult Annex 3). Programmatic cost cutting on a billion dollar ship is not enough anymore. Unfortunately, “Current U.S. DoD procurement policies do not adequately reward innovation in military ship construction practices, thereby indirectly encouraging shipbuilders to maximize labor hours.”<sup>15</sup> Modularity in shipbuilding, while part of the dialogue on innovation, could be increased. Likewise, while outsourcing some aspects of shipbuilding may make sense, security requirements preclude the military from doing so. The shipbuilding industry is ripe for innovations across the board – innovation in supply chain management, innovation in procurement policy, and innovation in workforce training to name a few.

*Trust.* Trust is lacking between the government and the shipbuilding industry. One relevant case study involves the elimination of government subsidies in the 1980’s. The Merchant Marine Act of 1936, as amended, established the government’s role in preserving a fleet of U.S. flag vessels, supporting commercial ship construction and providing operating subsidies. For thirty years, shipbuilders came to rely on these subsidies. During the Reagan administration, the subsidies were withdrawn contingent upon ramping up for a 600-ship Navy.<sup>16</sup> When the 600-ship requirement was abandoned, significant industry consolidation quickly followed- constituting a breach of trust between Government and industry. Additionally, unstable procurement shipbuilding plans and building one-off, custom vessels with a steady stream of design changes leads to confusion and creates instability.

*Communication.* A key challenge for the shipbuilding industry is the lack of clear communication. Clear communication at the beginning and throughout the acquisition process benefits the program by “creating an acquisition life cycle management environment that enables efficiency, flexibility, and innovation.”<sup>17</sup> During our visit with a defense contractor, it was apparent that not all of the stakeholders and decision makers collaborate at the outset of the

initial acquisition process. In some cases, this poor communication environment erupted into overt animosity. This environment contributes to increased cost throughout the process. Shipbuilding acquisitions represent one of the highest cost and most complex processes within the DoD. It is difficult to plan and project the detailed specifications for ships because these procurements range from five to ten years in development, and have a life expectancy averaging 30 years. Consequently, program managers and contracting officers must clearly communicate and articulate the requirements while being able to forecast and capture future advances in technology, projecting future needs while minimizing cost. Several program managers stress developing and defining requirements that have “tailorability and adaptability” to mitigate the effects of the lengthy acquisition process and lifecycle costs of the ship.

*Inefficiency.* The industry struggles with inefficiency, and Siemens offers some help in this regard. Siemens suggests that challenges associated with shipbuilding can be divided into three distinct areas: ship development, shipbuilding, and ship service lifecycle management.<sup>18</sup> Analyzing the components of ship development could lead to finding ways to reduce cost by improving efficiencies through increased ship production. Evaluating the components of shipbuilding will help to focus on inefficiencies related to the lack of competition, under-utilization of current facilities, and inefficient cost associated with production and capital investments. Lastly, analysis of lifecycle management could identify inefficiencies associated including outsourcing possibilities, partnerships, and geographic clustering of shipyards and supply chains.

The shipbuilding industry has a limited number of component suppliers, which affects both price and quality. In most naval ship subsystem and component categories there is only one U.S. manufacturer remaining. Production rates are not high enough to sustain more than one company and these firms are struggling. Because of the industry consolidation, there were 67,000 waivers from the Buy American Act restriction requested by DOD in 2008 granted by Congress.<sup>19</sup> There are at least 11 foreign built vessels operated by the Military Sealift Command (MSC) there are few commercial ships with high military utility that have been constructed in U.S. shipyards over the past 20 years.<sup>20</sup> Leasing ships has become a major cost-saving strategy for the Navy.

*Compelling narrative.* A Cooperative Strategy for 21st Century Sea power offers “90% of the world’s commerce travels by sea; the vast majority of the world’s population lives within a few hundred miles of the ocean; nearly three-quarters of the planet is covered by water; sea power protects the American way of life.”<sup>21</sup> Where is the same story for U.S. commercial shipbuilding? Ideas are great. Facts can sway. Unfortunately, without a compelling narrative that sells, little if anything productive will happen. During our discussion with Brazilian officials, they shared their view that the role of a leader is to make the workforce happy and that a happy workforce yields a healthy and productive workforce. Brazil offers a compelling story for shipbuilding as a way of improving the quality of life for their people. U.S. shipbuilding should develop a similar narrative.

## **Recommendations:**

The section presents a three-part vision of how the shipbuilding industry can better support the national security interests of the United States. First, we recommend a marine highway system to ensure future competitiveness of the U. S. economy. Secondly, we envision the diversification of traditional naval shipbuilding companies into more commercial work. Lastly, we recommend continued development of creative acquisition strategies to increase flexibility and reduce procurement costs. The following recommendations cross many domains and impact diverse constituencies and stakeholders, so a whole-of-government approach and strong leadership is required to implement this strategy.

### **RECOMMENDATION ONE: Develop and leverage public policy support with increased funding to accelerate the development of the National Marine Highway.**

The NMH incorporates an integrated logistics system including ships, ports, material handling facilities, and information systems. The demand for ships to supply the needs of a mature NMH will serve as a significant boost to the shipbuilding industry and more fundamentally, the economy. However, market forces alone are insufficient to grow the NMH. Proper funding for existing legislation is needed, coupled with the development of innovative public policy. Specific recommendations include:

- Establish a congressional oversight subcommittee to supervise and lead funding efforts for the Marine Highway's development and sustainment.
- Increase the funding and effectiveness of the Maritime Administration (MARAD) as an advocate for the marine industry.
- MARAD should develop an executive legislative agenda to garner support and effectively execute its mandate.
- Provide funding for the Port Infrastructure Development Program by requiring that for every federal dollar spent on highway improvements, a small percentage be allocated to port improvements.
- Consider user fees for over-the-road shippers to reflect the full cost of using the U. S. highway system.
- Waive the Harbor Maintenance Tax for non-bulk cargo shipments between U. S. ports.
- Provide tax incentives and mileage-based rebates to shippers who use domestic maritime routes.
- Permit accelerated depreciation on investments for port cargo handling equipment.
- Expand the scope of the Title XI Federal Ship Financing Program to include marine infrastructure investments, and target the standardized Marine Highway Vessel described above.
- Lower eligibility thresholds for credit assistance for borrowers qualified under the Marine Transportation Infrastructure Finance and Innovation Act.
- Establish an NMH Infrastructure Fund to provide long-term financial support to NMH terminal and port infrastructure equipment.
- Significantly increase funding for the Marine Highway Grants Program for investment in updating and standardizing port handling equipment.

- Encourage the transition to a short haul fleet for intermodal transport to and from ports to destination, vice long-haul trucking, though sponsorship of an inter-modal, hub and spoke network.
- In partnership with DoD, MARAD and ship owners/operators should design and build a standardized class of Dual-Use ships which would be commercially viable for domestic coastal service that meet DoD requirements for military mobilization. This standardization would complement cargo handling, port infrastructure requirements, training, ship construction, maintenance, and vessel operations, and facilitate integrated supply chains. Cost for dual-use ships could be shared between DoD and owners.<sup>22</sup>
- Further develop the intermodal network of roads, railways, and ports including the expansion and modernization of feeder ports to accommodate anticipated growth in maritime traffic.

### Supporting Background

A key enabler of all of these recommendations is an active, properly resourced Maritime Administration. Current program funding levels of \$7 Million in 2010 for the Marine Highways Grants Program is insufficient to drive the required change.<sup>23</sup> Without a strong and active Maritime Administration, key policies such as the NMH will continue to flounder.

Employing public policy to accelerate the Department of Transportation's Marine Highway is required to promote the demand for commercial shipbuilding. Section 1121 of the Energy Independence and Security Act of 2007 directs the Secretary of Transportation to establish a short sea transportation program. While the cost, infrastructure, energy, and environmental benefit of maritime transportation over truck or rail is well documented, the potential of this program to promote the maritime mode of surface transportation has not been met. In 2008, only 11% of cargo (based upon weight) moved on the maritime highway routes, compared with surface transportation modes.<sup>24</sup>

Short Sea Shipping complements, but does not compete with, the trucking industry and provides reasonable opportunity for direct partnerships and alliances. Market forces alone are insufficient to account for externalities distorting the land transportation marketplace. Nor do they account for environmental, public safety, national security, and public health impacts of the nation's continued dependence on a deteriorating highway infrastructure. The key to the strategy is that it makes trucking more efficient by reducing congestion on circumferential routes, keeping goods and services flowing freely. To support this, efficient ports, rail hubs, and trucking hubs must be integrated and standardized to minimize cargo handling time and cost.

One potential avenue of approach to revitalizing American shipbuilding involves the Navy using the experience and knowledge of MSC to interface with MARAD, USCG, commercial vendors, and commercial shipbuilders to identify best practices. As the Navy's agent for commercial shipbuilding, MSC is well-positioned to work with stakeholders to identify commonalities between military and commercial configurations that could be cost-effective. This relationship would allow the shipbuilding industry to build ships that are suited for military or commercial applications (dual-use) without major modification or additional costs. This may result in increased demand for dual-use ships, using more efficient construction processes and common hulls. The Navy could require that these ships accommodate standardized mission modules. The result would be a ready source of commercial ships available to support Navy missions and Jones Act ships that meet the qualifications for the Maritime Security Program (MSP).

## **RECOMMENDATION TWO: Reinvigorate the Commercial Shipbuilding Industry to support U.S. National Security Objectives.**

While a healthy commercial shipbuilding industry is critical to national security, the projected state of the U. S. sector is bleak. The Jones Act fleet is aging and in urgent need of recapitalization. Foreign markets for ships provide another opportunity to reinvigorate the sector. Specific recommendations include:

- Promote the recapitalization of the Jones Act fleet.
  - ◆ Create and enforce environmental standards to accelerate vessel replacement.
  - ◆ Create tax incentives to build new ships.
  - ◆ Establish partial construction cost differential subsidies.
- In collaboration with the Department of Defense, Department of Transportation, Coast Guard, shipbuilders and ship operators, owners will design and construct a standardized class of dual-use vessels for the Marine Highway trade.
  - ◆ This standardization would complement and optimize cargo handling, port infrastructure requirements, training, ship construction, maintenance, and vessel operations.
  - ◆ The ships would incorporate National Defense Features required by DoD for military mobilization and in time of national emergency; the ships would operate in support of national security needs.
  - ◆ Develop a creative business arrangement between DoD, shipbuilders, MARAD and ship operators for funding, leasing and operating these ships. Additionally, business processes and partnerships are needed to develop an integrated national intermodal logistics network.
- Commit to U. S. leadership in the advocacy, development, and operation of technically advanced, efficient, environmentally friendly ships.
- Pursue strategic partnerships with international partners to promote U.S. shipbuilders in providing vessels for the emerging offshore energy market.

### Supporting Background

The Jones Act fleet is aging and in need of recapitalization. The 2010 average age of the ships in the Jones Act Fleet was 18.5 years. In contrast, the average age of foreign vessels is only 9 years.<sup>25</sup> Requirements to improve GHG emissions, ballast water cleanliness, and oily waste can force operators to make better choices. Surcharges on the operation of non-compliant ships can drive operating costs higher, forcing operators to search for cleaner alternatives. Section 4115 of OPA 90 requires vessels operating in U.S. waters to have double hulls by 2015 at the latest. Low interest loans for ship construction, partial construction differential subsidies and tax exemptions for new ship operations will provide impetus to recapitalize the fleets.

Field studies in Brazil revealed a strong demand for seagoing vessels to accommodate Brazil's emerging offshore energy market. Petrobras states that by 2020, it will need an additional 148 drilling platforms, 279 supply and off shore vessels and 45 production platforms. With domestic content laws and an immature shipbuilding industry, there are real risks that

Brazilian shipbuilders will not be able to meet the demand surge. Partnerships at the government and industry levels could find U. S. shipbuilders assisting to meet the Brazilian demand surge.

**RECOMMENDATION THREE: DoD, in conjunction with industry, should change the structural fabric of Naval shipbuilding and acquisition processes to reduce the cost of warship construction.**

Naval shipbuilding costs continue to escalate. Left unchecked, this escalation will further constrain future commercial and military fleet size. Years of cost containment efforts have proven ineffective in reversing the trend. Consequently, structural change in the way warships are developed, built, and acquired must be addressed. Specific recommendations include:

- Incentivize naval shipbuilders to diversify into commercial shipbuilding.
  - ◆ Expand the use of shipbuilding capability preservation agreements.
  - ◆ Team with naval shipbuilders on development and construction of the Dual-Use Marine Highway vessel.
- The U.S. government should invest in privately held naval shipyards in order to modernize them and increase productivity in light of the current monopsonistic environment.
  - ◆ Pursue shared cost basis between government and commercial contracts to ensure judicious expenditure of funds.
  - ◆ Promote loans (vice direct grants).
- Consider raising the pro-rated profit (percentage) basis for shipyards that modernize recognizing that as they modernize and become more capital intensive, the costs and labor hours to produce each ship will decrease (which is not always in the interest of shipyards). Increased savings for the Navy and increased profits for the shipyards will incentivize both parties to modernize and produce ships more efficiently.
- Shipyards should partner with local public and private schools to develop and fund technical and vocational training curricula for critical skill-sets.
- Develop realistic ship standards and acquisition strategies that drive down acquisition costs.
  - ◆ Use prototyping as a procurement strategy when fleet size permits.
  - ◆ Foster greater competition throughout the warship supply chain.
  - ◆ More extensively employ the use of modular designs.
  - ◆ Promote the geographic clustering of shipbuilders and marine suppliers.
  - ◆ Reexamine the application of military specs and standards.
  - ◆ Consider the Service Life Extension Program (SLEP) for ships such as the aging Dock Landing Ships (LSDs), to defer replacement cost.

#### Supporting Background

As globalization flourishes, countries continue to pursue protectionist policies for myriad reasons including national security and the development of an industrial base. Countries like Korea, Japan, China, and Brazil heavily subsidized their shipbuilding industries during the developmental stages, which resulted (in conjunction with global recession) in competitive market pricing and excess shipbuilding capacity. The expansion of our Capital Expenditure (CAPEX) program can increase shipyard productivity through modernization. This requires a

balanced approach between government and shipbuilders; weighing capital investment and future cost savings with the risks and benefits of competing in the current global environment.

It is in the best interest of naval shipyards to diversify into the commercial market to weather the fluctuations in government procurement. By expanding the use of shipbuilding capability preservation agreements, naval shipyards can compete for commercial work, increasing overall efficiency and deepening relationships with the supply base. As a result, the cost of commercial ship construction will decrease. “Once the low-end market is stable, it is the natural tendency of businesses to look up-market for their expansion. Over time, the low-overhead processes developed for the low-end market are shared with high-end manufacturers creating a vibrant industrial base capable of meeting the need of a full spectrum of customers.”<sup>26</sup> As a specific example, NASSCO built product carriers for U.S. Shipping Partners L.P. and American Petroleum Tankers while simultaneously building the Lewis and Clark class T-AKE, dry cargo/ammunition ship. The Shipbuilding Capability Preservation Agreement (SCPA) is designed to help shipyards like NASSCO obtain work from both private and public sectors. NASSCO demonstrates versatility in building ships for commercial and government customers, providing cash flow continuity. By seeking commercial customers during periods of low Navy demand, NASSCO has been able to prevent workload and cash flow fluctuations.

Locating suppliers and shipbuilders in close proximity is advantageous. Human capital and physical resources can be shared, duplication in facilities and equipment limited, transportation costs reduced, and powerful synergies leveraged. This strategy has worked very effectively in Asian shipbuilding, where economies of scale have essentially turned commercial ships into a commodity. We have seen the beginnings of geographic clustering in the U.S. In Mobile, Alabama, a state-sponsored training center supplies a qualified workforce for the adjacent shipyard. In Maine, the Maine Composites Consortium leverages state funding at the University of Maine to advance composite ship construction technology. Sharing prime movers (heavy transporters) between General Dynamics shipyards in New England saved each yard millions of dollars. These types of initiatives can advance the art of American shipbuilding.

Strategic partnering between high schools, junior colleges, and industry to develop vocational curricula is necessary to sustain critical skillsets. In the case of public schools, funding could come from the public coffers, and in the case of private schools, the costs could be born collectively by both school and shipyard. Maintaining a highly skilled workforce ensures that surge capacity exists for national emergencies and strengthens our nation’s economic base.

## Conclusion

Our founding fathers realized over 200 years ago that our nation needed a navy and merchant marine if we were to aspire to independence and greatness. Navies and merchant marines need ships, and it is clearly in the national interest not to have to rely on someone else to build them.<sup>27</sup> Our assessment of the shipbuilding industry led us to the conclusion that 1) it is in danger of not being able to meet future national security requirements, and 2) one cannot fix it by operating within its boundaries. Finding efficiencies in the manufacturing process, using less expensive materials in warship construction, and accountability amounts to good stewardship of taxpayer dollars, but will not result in an affordable warship or a healthy shipbuilding industry. Warships will continue to be expensive, so the question becomes how to pay for them, which led us to the U.S. economy.

One way to rebuild America's economy and revitalize our marine industry is to change the way we do *business* in America. Our infrastructure is how America gets goods and services to market; our future economic growth depends largely upon efficient and cost effective transportation. Our economy underpins our national security by generating revenues; revenues enable us to pay for ships and submarines to protect our economy and way of life. It follows that in order to dramatically improve our infrastructure, increase GDP, and expand heavy manufacturing, we must design and build a highly efficient, inter-modal, and integrated national transportation *system*. The maritime component of our national infrastructure is presently underutilized and offers the greatest opportunity for expansion, along with a host of ancillary benefits to job creation, the environment, and manufacturing base. If we undertake this initiative, it will drive demand for Jones Act ships and expand the shipbuilding industry. Combined with a redesign of acquisition practices, this may contribute to more competition and affordable warships in the intermediate to long-term. There is no quick fix to this problem.

As a national-level endeavor competing with other strategic imperatives, congressional and presidential sponsorship is a prerequisite for success. While the logic is easy to follow, the challenges associated with maintaining a navy and merchant marine have existed since Alexander Hamilton wrote Federalist 11. The requirement to modernize our infrastructure competes with other pressing national concerns including healthcare and entitlement reform, a rising national debt and deficit, and ongoing wars among others. Our recommendations also coincide with a global recession, a presidential election, and congressional gridlock. Even under these conditions, there will never be a better time to undertake this challenge.

## **Annex 1: Essay on The American Marine Highway**

The “American Marine Highway”, is a heavily debated issue. Over the past ten years, countless articles, texts, studies, symposiums, seminars and speeches have been devoted to assessing and discussing this topic. Despite the debate and well-articulated arguments, the American Maritime Highway is a good idea, still waiting to happen.

For several centuries, ships moved nearly all of the nation’s commerce. Beginning in the late 1800’s and through the 1900’s America increasingly turned away from use of the sea and waterways, preferring to invest in transportation via rail and roadways. In 2012, there is an opportunity to turn back to the waterways as a means to augment our heavily burdened rail and road infrastructure. In 2008, the Department of Transportation (DOT) estimated that in the U.S., only approximately 2% of domestic freight among the lower forty-eight states, moved by sea.<sup>28</sup> This stands in stark contrast to Europe, where 40% of their domestic freight moved by the sea.<sup>29</sup>

When the U.S. economy rebounds from the current economic slowdown and foreign commerce begins to increase, it is conceivable that there will be increasing commercial interest in efforts to advance alternate modes of freight distribution. DOT forecasts that by 2020, the international container trade will double from its current levels.<sup>30</sup> According to the American Association of Port Authorities, major coastal ports are currently operating near capacity with average dwell time of containers sitting idle in U.S ports at six to seven days.<sup>31</sup> The rapid growth of international container trade has created capacity problems and inefficiencies at a number of major U.S. container ports. In 2014, with the arrival of the post Panamax mega-containerships, this problem is only expected to worsen.

One solution to terminal inefficiency problems is to use smaller feeder ports or satellite terminals in a hub and spoke configuration, whereby the major hub ports receive the international containers and transship them immediately to smaller ports via the spokes using a fleet of smaller containership or container barges. In maritime circles, this is a form of Short Sea Shipping that is also known as “feeder”.<sup>32</sup> There obstacles include aging piers, ferry landings, and terminals in key port cities. The Federal government, in concert with State governments and regional port authorities must provide adequate funding and legislation to reinvigorate neglected elements of waterborne commerce. Although the U.S. Maritime Administration has begun a program to foster Short Sea Shipping initiatives through a limited infusion of financial resources, much work remains.<sup>33</sup>

To develop Short Sea Shipping in the U.S., the industry must make every effort to support and accommodate both containers and the trucking industry via the Ro/Ro system. Currently U.S. waterways carry substantial amounts of bulk commodities, such as grain, coal and fuel oil; they are seldom used to transport containerized cargo between points within the continental 48 states. Congress passed the Energy Independence and Security Act of 2007, which requires MARAD to identify waterways that could potentially serve as “short sea” shipping routes. Subsequently, in the National Defense Authorization Act of FY 2010, Congress authorized federal grants for financially viable short sea routes.<sup>34</sup>

Short Sea Shipping operations can create an intermodal transportation network that will shift cargo from the highways to the sea for medium and long haul distances. Roll on Roll Off (Ro/Ro) ships can provide an economical and reliable way for truck-trailer transportation, in geographical areas such as the U.S. East and West Coast, in the Gulf of Mexico and the Great Lakes. An advantage of the Ro/Ro concept is that they do not require expensive cranes to load and unload containers and can be loaded or unloaded quickly. Trucks will do the short haul pick

up and the delivery of the cargo to its final destination. Short Sea Shipping complements, but does not compete with, the trucking industry and provides reasonable opportunities for direct partnerships and alliances, vice direct competition with the existing trucking industry.<sup>35</sup>

One of the areas with significant potential is the creation of dual use ships that can be used for commercial and DOD uses. This concept is described as follows:

MARAD and CNO staffs are exploring a “dual use” ship concept that marries commercial capabilities and national defense features. These dual use vessels could contribute significantly to the America’s Marine Highway mission, trigger much-needed business for U.S. shipbuilders, be largely self-supporting, and – when activated for emergency – support the nation’s defense mission. The costs to the government of developing such vessels could be less than those involved in the construction, lay-up, maintenance, and mobilization costs involved in building capacity solely for contingency operations.<sup>36</sup>

The number one impediment to Short Sea Shipping services is the U.S. Harbor Maintenance Tax. The U.S. Harbor Maintenance Tax (HMT) was enacted by Congress in the Water Resources Development Act of 1986. The HMT is an “ad valorem” tax, meaning a tax on the value of cargo. The current tax is assessed at 0.125 percent of the value of the cargo. The tax is not paid by the vessel owner, nor the port, but rather by the owner of the cargo in each ship. Today, the HMT is assessed on cargo transported between any two U.S. coastal ports and against cargo imported to U.S. ports from other countries. The intended purpose of the HMT is to generate revenue from port users for port maintenance conducted by the U.S Army Corps of Engineers, in support of their efforts to maintain federal shipping channels through periodic dredging activities. Although the HMT conceptually plays an important role in supporting the nation’s marine transportation system, in practical application, it serves as a disincentive for companies to ship goods by water. Unless the Harbor Maintenance Fee is addressed in a constructive manner, development of a robust Short Sea Shipping system in the United States will be severely hampered.

For the past decade, policy makers have been discussing various options to shift freight from roads to rivers and coastal waterways. Waterways have the most available unused capacity and Short Sea Shipping remains a viable freight transportation alternative. There will be nothing automatic about the further development of this enterprise. In fact, the national debate will involve hard tradeoffs between entitlements for citizens vice infrastructure investment. It will require a level of intestinal fortitude rarely evidenced in our government to implement a Maritime Highway that will foster economic growth.

## **Annex 2: Essay on the Environmental Considerations related to the Marine Highway**

The natural environment is central to the discussion of the Marine Highway system and to the future of the U.S. shipbuilding industry. The environmental aspect the Marine Highway system provides several opportunities for the nation: better, healthier living conditions for all Americans, a compelling narrative for American lawmakers, economic opportunity for numerous sectors of the American economy, and the opportunity for American shipbuilding to leapfrog international competition by redefining the nature of shipping and shipbuilding. However, significant pitfalls exist, and civil engineers and legislators must address them in a nuanced approach to developing a Marine Highway system. .

The two primary environmental issues one can argue in favor of the Marine Highway system are fuel consumption and greenhouse gas (GHG) emissions, both of which benefit immensely from its development. While the tonnage of goods that transit our nation's waterways is not insignificant, it is but a small fraction of the American transportation industry. America relies primarily on trucking and rail, which are the two least efficient and highly polluting methods of transport. (Air cargo represents a small portion that would be least affected from an environmental standpoint.) According to the Department of Transportation's website, in 2009 16.1 billion tons of freight moved in the United States; of this, 10.9 billion tons moved by truck, as compared to 1.7 billion tons by rail or 734 million tons by water.<sup>37</sup> According to a recent MARAD report:

The highest growth in energy consumption as measured both in absolute and relative terms will be for heavy-duty highway vehicles, particularly freight trucks. Freight trucks are expected to account for 38 percent of the expected overall increase in energy consumption in the transportation sector by 2035, even though freight trucks currently account for less than 17 percent of total energy consumption in this sector.<sup>38</sup>

In spite of stringent efficiency measures delineated in the Energy Act, the transportation industry will be the second largest consumer of petroleum (only surpassed by power generation) in the nation through 2035. GHG emissions from all transportation sources are predicted to increase by 195 metric tons (10% growth from 2008 levels) in 2035.<sup>39</sup> Of the 195 metric tons, 116 (59%) will be from heavy trucking.<sup>40</sup> Lastly, the noise and vibration induced by heavy trucking in particular contribute to shortened maintenance intervals of infrastructure such as roads, bridges, tunnels, and buildings in close proximity to highways.

In terms of fuel efficiency, trucks can carry one ton of freight for approximately 155 miles on a gallon of diesel fuel. Rail achieves 413 ton-miles of freight per gallon, and a tug-and-barge operation can get as much as 576 ton-miles of freight per gallon of fuel. Oceangoing vessels can have significant energy efficiencies over land-based modes, particularly in the case of larger vessel sizes.<sup>41</sup> It follows that in cases other than short haul, shipping would be a cost effective choice.

The commercial shipping industry also needs improvement in terms of fuel efficiency and GHG emissions. Commercial ships burn bunker oil, which is the residual sludge left over from the refining process, once the lighter substances like diesel, gasoline, and kerosene are removed.<sup>42</sup> It contains a number of harmful contaminants such as asphaltenes, sulfates,

Vanadium, Lead, salts, heavy molecules, and other trace metals.<sup>43</sup> The bunker fuel that ships use contains up to 2000 times the amount of sulfur as compared to automotive diesel. The shipping industry produces over 1000 million tons of CO<sub>2</sub> per year, 60% of which comes from bulk and oil tankers. Globally, ship emissions make up from 2.7% (IMO's Estimate) to 4.5% of worldwide CO<sub>2</sub> emissions. Because bunker fuel is so sulfuric, the world's 90,000 ships pump 20 million tons of sulfur oxides into the air annually, which is roughly 260 times that produced by the world's population of automobiles.<sup>44</sup>

One must also consider the potential environmental impact of transitioning from our current transportation system to one more reliant upon the nation's waterways. As the Marine Highway system is developed, civil engineers will need to concern themselves with the risks posed by significantly increased maritime traffic, including hazardous materials that can be released through the harbor dredging process, affecting wetlands. Channels and harbors must be well marked to minimize risk of collision and spills. Any strategy needs to prevent invasive species from entering fragile rivers, streams, estuaries, and coastal regions. In addition, the port infrastructure must not adversely affect American life more than the congested highway system already does. Since such a significant portion of the population lives along the coast, one must address these concerns in the design of the Marine Highway system.

From a legislative standpoint, the United States and the International Maritime Organization have made significant strides in improving fuel consumption and emissions standards. The United States' Clean Air Non-road Diesel Rule decreased the allowable levels of sulfur in fuel used in marine vessels by 99 percent.<sup>45</sup> These fuel improvements, which went into effect in 2007, have significantly reduced particulate matter (PM) emissions from new and existing engines.<sup>46</sup> MARPOL, with its 168 signatory countries, has enacted several rules in MARPOL ANNEX VI, which reduce emissions of ozone depleting substances, nitrogen oxides, sulfur oxides, and volatile organic compounds.<sup>47</sup>

It is in this environment that true opportunity for the American shipbuilding industry, and indeed the American economy. Industry leaders like Cargill and Wartsila are aware of the changing political and legislative landscapes and are exploring new technologies, but the industry as a whole is operating in the margins. While estimates vary, the industry can achieve 25% - 75% efficiency in emissions and fuel consumption using existing technology.<sup>48</sup> Efficiencies begin with ship design, including speed, length, draft, beam, superstructure, and adaptability, given the 30+ year lifespan of most ships. Power and propulsion systems come next, beginning with the industry standard - low and medium-speed diesel engines - and extending to auxiliary renewable systems including biofuels, wave power, wind, and solar. Lastly, there is tremendous efficiency to be gained through operational management and logistics; route planning, traffic management, and voyage optimization.<sup>49</sup>

In spite of the global and national consolidation of the heavy manufacturing base, the United States is still in a unique position with its mature economy, first-rate universities, advanced technology industries, and intellectual capital to take advantage of the next phase of global, commercial maritime operations. By intelligently developing the U.S. Marine Highway system and, essentially, kick starting the American shipbuilding industry and associated suppliers and engineers, the United States can exert transformational influence for global good. This endeavor will be neither easy nor inexpensive, but the United States can ill afford to do otherwise. With significant political support, direct government investment, and commitment from the American people, we can once again be the leading maritime nation in the world.

### **Annex 3: Essay on Innovative Acquisition Strategies**

“Our challenge is to apply seapower in a manner that protects U.S. vital interests even as it promotes greater collective security, stability, and trust. While defending our homeland and defeating adversaries in war remain the indisputable ends of seapower, it must be applied more broadly if it is to serve the national interest.”<sup>50</sup> When asked how does *he* measure seapower, Assistant Secretary of the Navy Robert Work answered, “In this town, the way you measure sea power is by the number of ships you buy.”<sup>51</sup> Evolving threat capabilities, unstable procurement plans, limited competition in Navy ship acquisitions, inefficient government acquisition processes and a lack of synergy between commercial and military procurements all contribute to the cost, schedule and performance risks in ship acquisition programs that impact the Navy’s ability to deliver cost effective capability to the men and women charged with securing our seas. This essay will propose changes to the Navy’s ship acquisition system and offer opportunities where the government and commercial shipbuilding can be better integrated.

#### **PROTOTYPING SHIPS AS AN INTEGRATED STRATEGY**

Naval ship acquisition practices should be modified to promote full prototyping and testing of the lead ship of a class prior to contracting for subsequent ships. Further, subsequent ship acquisitions within that class of ship should be bought and built in flights of multiple ships of identical configuration. The lifecycle of a navy ship may involve 5-17 years of design and lead ship development, then 10-20 years of follow on ship production leading to a 30-50 year service life. Construction of follow-on ships begins before the first ship is completed and prior to the results of any operational testing. The absence of prototypes prevents a robust system level developmental test program, introducing technical risk. The lack of design maturity and stability prior to production contract award makes the scope of work hard to define, leading to increased cost and schedule risk. Not having an LRIP program denies the shipbuilder the opportunity to mature his production methods, apply learning curve, remap his manufacturing plan, and establish supply chains.

Using the lead ship of a class as a prototype has the potential to drive down the cost, schedule and performance risk out of acquisition programs for smaller class ships with higher procurement quantities. Building a prototype and then fully testing it prior to the award of subsequent ship construction contracts provides an alternative approach to our current costly process. When combined with tightly coupled flights of several ships of identical configuration, overall program savings can result.

This strategy allows for tight configuration control of all the ships in the flight leading to many benefits. A relatively short construction period minimizes technology obsolescence. Tight configuration across the flight facilitates crew swaps and rotations increasing the overall availability of the platform. Work packages for life cycle maintenance can be standardized, ship checks minimized, and special tools developed to more effectively support the flight of ships over its 30-50 years of service life. Finally, software for the ships navigation, combat systems and machinery control systems can be easily managed at significantly lower costs.

If the Navy adopts the ship prototype concept it will create a production gap at the yards as the plan will require significantly longer time between the prototype and the standardized production run. This gap will require a build and planning program that crosses USG platforms to including Navy, USCG and MARAD build requirements in addition to building ships to

support the Maritime Highway. A comprehensive ship build plan that embraces all facets of the industry is the most likely method to assure the industrial becomes strong and does not succumb to the inefficient feast or famine production planning that currently exist.

## **FOSTERING COMPETITION**

Competition in defense procurement programs can provide benefits for the government by controlling costs, improving product quality, ensuring compliance with delivery dates, and fostering innovation. As DoD grapples with industry to find ways to maintain its naval shipbuilding infrastructure, it also struggles to invent better acquisition models to create efficiencies as budgets decrease. The Under Secretary of Defense for Acquisition Technology & Logistics (USD AT&L) Better Buying Power Memo (Sept. 2010) provides guidelines to implement more business savvy strategies in military procurements. USD AT&L specifically directs in this memo to promote real competition: Real competition is the single most powerful tool available to the Department to drive productivity. Real competition is to be distinguished from a series of directed buys or other contrived two-source situations, which do not harness the full energy of competition. Competition is not always available, but evidence suggests that the government is not availing itself of all possible competitive situations.<sup>52</sup>

Despite the advantages of competition, the consolidation of the naval shipbuilding industry and limited ship procurements limit competition. During the past decade, the Navy has had to use a series of innovative acquisition strategies to foster real competition. “Winner take all”, “Compete for Work,” and “Profit Related Offers” are all competitive strategies used by the Navy to control costs, improve product quality, and foster innovation. These strategies have resulted in infrastructure investments, lower costs, and improved quality in the destroyer class ship programs; unlikely partnerships between Electric Boat and Huntington Ingalls for submarine programs and new entrants into the industry like Austal, Inc. and Marinette Marine, Corp through their partnerships with U.S. corporations General Dynamics and Lockheed Martin respectively. The Littoral Combat Ship (LCS) competition between Austal, USA and Lockheed Martin provided significant cost savings allowing dual awards to both shipbuilders for 10 ships each increasing the number of ships procured and stabilizing shipyard workload plans.<sup>53</sup>

General Dynamics and HII have emerged as the “Big Two” shipbuilding entities. Both are large corporations with General Dynamics having a very diversified portfolio in aerospace, combat systems, information systems and marine programs. The Navy encounters differing overhead rate structures, competition for corporate resources between government programs...some of which result in conflicting priorities, as well as inconsistency in quality of material and workmanship. The Navy should consider a strategy of awarding one contract to each corporation for that year’s ship procurements and in addition to the performance criteria assessed at specific milestones, evaluate each shipbuilder’s performance annually based on metrics established by the government. Coordination at this level would allow the companies to leverage economies of scale through procurement of common commodities and components across ship programs. Efficiencies derived from competition can result in lower procurement costs for the taxpayer, ability to procure more ships and create even greater economies of scale, steady workforce due to greater chances of stable shipbuilding procurement plans and greater potential for new entrants into the industry thereby increasing competition. Stable order books can result in innovation and new technology investment adding to GDP growth. Competition fosters innovation and those companies that do not innovate, do not remain viable.

## LEVERAGING COMMERCIAL WORK

The current competitive strategies notwithstanding, the Navy should “think outside the box” to modify and/or create new competitive strategies that include blending commercial shipyards into the design, plan and build mix. It seems evident that competition has a positive impact on Navy procurements but focusing on competition on a ship class by ship class basis fails to address the needs of the entire industry and may be shortsighted for the industries long term survival. It is time to explore more innovative options that look across the shipbuilding portfolio to foster integration of the commercial portion of the industry while taking advantage of economies of scale.

Today the acquisition of government and commercial ships exist in parallel processes. The Shipbuilding Industry in the United States is dominated by government procurement. Commercial procurement leans towards specialized ships vice the low tech cargo ships that are efficiently churned out of yards in Korea and China. The U.S. commercial shipbuilding industry includes facilities which build self-propelled and non-self-propelled ships and barges and clean, repair, and convert ships and barges. The Maritime Highway would ensure a constant demand signal to ensure the commercial shipbuilding sector could begin to thrive. This would add stability to shipyard operations when Navy procurements are variable, provide the potential to share overhead costs between government and commercial work. Development of dual-use ships can also provide opportunities to exploit commonality across platforms and reduce costs. In conceptualizing the LCS, the Navy has introduced the concept of delinking the payload from the transportation platform. If the ships can truly evolve into a “Plug and Play” payload, there is a potential for development of payloads and use of the generic basic ship concept for commercial purposes.

The Department of Navy acquisition community recognized the benefit of commercial shipbuilding on the industry as a whole and worked with Congress to establish the Shipbuilding Capability Preservation Agreement (SCPA). “The purpose of a shipbuilding capability preservation agreement is to broaden and strengthen the shipbuilding industrial base by providing an incentive for a shipbuilder to obtain new private sector work, thereby reducing the Navy's cost of doing business.” This authority allows for the allocation of indirect costs for commercial shipbuilding to Navy contracts and requires an approved plan and agreement in advance.<sup>54</sup> Expanded use of the SCPA authority would complement blending of the government and commercial production schedules.

Agreements like the SCPA provide incentives for Naval shipbuilding firms to obtain commercial work, but barriers to efficient program management must also be removed. Today’s shipbuilding firms receive fixed and cost plus contract awards from a variety of government agencies. Federal government regulations not only require firms to account for programs separately for price determination, it is also required that entirely separate accounting systems be established for government acquisition programs that employ cost plus type contracts.<sup>55</sup> Blending production plans and accounting systems at shipyards producing government and commercial work would help the taxpayer benefit from lower shared overhead costs.

Notes:

<sup>1</sup> Alexander Hamilton, James Madison and John Jay, *The Federalist Papers*, ed. Clinton Rossiter (New York, NY: Signet Classic, 2003).

<sup>2</sup> Scott G. Borgerson, *The National Interest and the Law of the Sea* (New York: Council of Foreign Relations,[2009]).

<sup>3</sup> Stephen Baker et al., *National Security Assessment of the U.S. Shipbuilding and Repair Industry* (Washington, DC: U.S. Department of Commerce,[2001]).

<sup>4</sup> U.S. Department of Transportation Maritime Administration, *America's Marine Highway; Report to Congress* (Washington, DC: U.S. Department of Transportation,[2011]).

<sup>5</sup> Loren B. Thompson. "Stormy Seas: U.S. Shipbuilders Face Big Challenges," *Lexington Institute*, <http://www.lexingtoninstitute.org/stormy-seas-us-shipbuilders-face-big-challenges?a=1&c=1129>, April 24, 2012.

<sup>6</sup> "Cargo Preference," *U.S. Department of Transportation Maritime Administration*, [http://www.marad.dot.gov/ships\\_shipping\\_landing\\_page/cargo\\_preference/cargo\\_military\\_cargoes/Military\\_Cargoes.htm](http://www.marad.dot.gov/ships_shipping_landing_page/cargo_preference/cargo_military_cargoes/Military_Cargoes.htm), April 23, 2012.

<sup>7</sup> "National Security Assessment of the U.S. Shipbuilding and Repair Industry," *Bureau of Industry and Security*, [http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/shipbuilding\\_and\\_repair.pdf](http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/shipbuilding_and_repair.pdf), April 23, 2012.

<sup>8</sup> Nicholas A. Meyers, "AN ECONOMIC ANALYSIS OF INVESTMENT IN THE UNITED STATES SHIPBUILDING INDUSTRY" (Naval Postgraduate School), .

<sup>9</sup> The Free Library. "Shipbuilding sector remains uncompetitive: U.S. government should take action to make the nation's shipyards more efficient," <http://www.thefreelibrary.com/Shipbuilding+sector+remains+uncompetitive%3A+U.S.+governmen+t+should...-a083665163>, April 23, 2012.

<sup>10</sup> Charles Goddard, Howard Fireman, and Christopher Deegan. "A question of cost," *Armed Forces Journal*, <http://www.armedforcesjournal.com/2007/06/2615388/>, April 24, 2012.

<sup>11</sup> Mackenzie Eaglen. "The State of the U.S. Military," *The Heritage Foundation*, [http://s3.amazonaws.com/thf\\_media/2010/pdf/Military\\_chartbook.pdf](http://s3.amazonaws.com/thf_media/2010/pdf/Military_chartbook.pdf), April 24, 2012.

<sup>12</sup> C. James Kruse et al., *A Modal Comparison of Domestic Freight Transportation Effects on the General Public* (College Station, TX: Texas Transportation Institute,[2009]).

<sup>13</sup> Anonymous, *Review of Maritime Transport 2011* (Geneva, Switzerland: United Nations,[2011]).

<sup>14</sup> Anonymous, *Sustaining US Global Leadership: Priorities for 21st Century Defense* (Washington D.C.: Department of Defense,[2012]).

<sup>15</sup> U.S. Department of Commerce, Bureau of Export Administration, *U. S. Shipbuilding and Repair* U.S. Department of Commerce, Bureau of Export Administration,[2001]).

<sup>16</sup> Ibid.

---

<sup>17</sup> John Warner National Defense Authorization Act Fiscal Year 2007/Section 804 “Defense Acquisition Transformation Report to Congress,” (July 2007), 7, [http://www.defense.gov/pubs/pdfs/804JulFinalReport\\_to\\_Congress.pdf](http://www.defense.gov/pubs/pdfs/804JulFinalReport_to_Congress.pdf) (accessed March 12, 2012).

<sup>18</sup>Siemens Product Lifecycle Management 2012. “How do we transform the process of innovation for shipbuilding?” Siemens.com/plm [http://www.plm.automation.siemens.com/fr\\_be/Images/21064\\_tcm661-95832.pdf](http://www.plm.automation.siemens.com/fr_be/Images/21064_tcm661-95832.pdf) (accessed 28 April 2012)

<sup>19</sup> Metal Trades Department. “Save our Shipyards,” [http://www.metaltrades.org/?zone=/unionactive/view\\_page.cfm&page=Avondale20SOS](http://www.metaltrades.org/?zone=/unionactive/view_page.cfm&page=Avondale20SOS), April 24, 2012.

<sup>20</sup> Metal Trades Department. “Save our Shipyards,” [http://www.metaltrades.org/?zone=/unionactive/view\\_page.cfm&page=Avondale20SOS](http://www.metaltrades.org/?zone=/unionactive/view_page.cfm&page=Avondale20SOS), April 24, 2012.

<sup>21</sup> *A Cooperative Strategy for 21st Century Seapower* (Washington,DC: Government Printing Office,[2007]).

<sup>22</sup> U.S. Department of Transportation Maritime Administration, *America's Marine Highway; Report to Congress*

<sup>23</sup> Ibid.

<sup>24</sup> Ibid.

<sup>25</sup> Ibid.

<sup>26</sup> *STATEMENT OF DR. MARK L. MONTROLL PROFESSOR INDUSTRIAL COLLEGE OF THE ARMED FORCES NATIONAL DEFENSE UNIVERSITY BEFORE THE HOUSE ARMED SERVICES COMMITTEE SUBCOMMITTEE ON PROJECTION FORCES HEARING ON U.S. SHIPBUILDING INDUSTRIAL BASE, .*

<sup>27</sup> Hamilton, Madison and Jay, *The Federalist Papers*

<sup>28</sup> (Perry September 2008)

<sup>29</sup> (Perry September 2008)

<sup>30</sup> (Denisis, Athanasios and Anastassios N. Perakis 2008): 591

<sup>31</sup> (Denisis, Athanasios and Anastassios N. Perakis 2008): 591

<sup>32</sup> (Denisis, Athanasios and Anastassios N. Perakis 2008): 594-595

<sup>33</sup> (Reichgott 2009): 95.

<sup>34</sup> (Kiern 2009): 316

<sup>35</sup> (Denisis, Athanasios and Anastassios N. Perakis 2008): 595-596

<sup>36</sup> U.S. Department of Transportation Maritime Administration, *America's Marine Highway; Report to Congress*

---

<sup>37</sup> Research and Innovative Technology Administration (RITA), "Bureau of Transportation Freight and Data Statistics," U.S. Department Of Transportation, [http://www.bts.gov/programs/freight\\_transportation/](http://www.bts.gov/programs/freight_transportation/) (accessed April 28, 2012).

<sup>38</sup> U.S. Department of Transportation Maritime Administration, *America's Marine Highway; Report to Congress*

<sup>39</sup> Ibid.

<sup>40</sup> Ibid.

<sup>41</sup> Kruse et al., *A Modal Comparison of Domestic Freight Transportation Effects on the General Public*

<sup>42</sup> Anonymous, "Bunker Fuels," Liquid Minerals Corp, <http://www.liquidminerals.com/fuels.htm> (accessed March 18, 2012).

<sup>43</sup> Ibid.

<sup>44</sup> Paul Evans, "Big Polluters: One Massive Container Ship Equals 50 Million Cars," *Gizmag* (April 23, 2009, 2009).

<sup>45</sup> U.S. Department of Transportation Maritime Administration, *America's Marine Highway; Report to Congress*

<sup>46</sup> Ibid.

<sup>47</sup> International Maritime Organization, *Second International Maritime Organization Greenhouse Gas Study 2009* (London, England: International Maritime Organization,[2009]).

<sup>48</sup> Ibid.

<sup>49</sup> Ibid.

<sup>50</sup> *A Cooperative Strategy for 21st Century Seapower*, 1

<sup>51</sup> "SEAPOWER." November 2011, 34.

<sup>52</sup> *Under Secretary of Defense Acquisition, Technology and Logistics to Acquisition Professionals, Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending* (Washington, DC: Department of Defense, 2010), 9.

<sup>53</sup> Paul L. Francis, *Defense Acquisitions GAO Report: Realizing Savings Under Different LCS Acquisition Strategies Depends on Successful Management of Risks* (Washington, DC: Government Accountability Office, [2010]).

<sup>54</sup> "Shipbuilding Capability Preservation Agreements," *Code of Federal Regulation Title 48, Chapter 5231 Subpart 205.90* (Washington, DC: Government Printing Office, 2011).

<http://law.justia.com/cfr/title48/48-7.0.6.31.2.1.1.2.html>.

<sup>55</sup> "Fixed Priced Contracts Limitations" *Code of Federal Regulations Title 48, Chapter 16 Subpart 205-3(b) and "Cost Reimbursement Contracts Limitations," Title 48, Chapter 16 Subpart 301-3(a)* (Washington, DC: General Printing Office, 2011).

[https://www.acquisition.gov/far/html/Subpart%2016\\_3.html](https://www.acquisition.gov/far/html/Subpart%2016_3.html).

---

## Bibliography

- "Fixed Priced Contracts Limitations" Code of Federal Regulations Title 48, Chapter 16 Subpart 205-3(b) and "Cost Reimbursement Contracts Limitations," Title 48, Chapter 16 Subpart 301-3(a)*  
. Washington, DC: General Printing Office, 2011a.
- "Shipbuilding Capability Preservation Agreements," Code of Federal Regulation Title 48, Chapter 5231 Subpart 205.90.* Washington, DC: Government Printing Office, 2011b.
- A Cooperative Strategy for 21st Century Seapower.* Washington,DC: Government Printing Office, 2007.
- Anonymous. "Bunker Fuels." Liquid Minerals Corp, accessed March 18, 2012,  
<http://www.liquidminerals.com/fuels.htm>.
- . . *Review of Maritime Transport 2011.* Geneva, Switzerland: United Nations, 2011.
- . . *Sustaining US Global Leadership: Priorities for 21st Century Defense.* Washington D.C.: Department of Defense, 2012.
- Baker, Stephen, Chris Degnan, Josh Gabriel, and John Tucker. *National Security Assessment of the U.S. Shipbuilding and Repair Industry.* Washington, DC: U.S. Department of Commerce, 2001.
- Borgerson, Scott G. *The National Interest and the Law of the Sea.* New York: Council of Foreign Relations, 2009.
- Evans, Paul. "Big Polluters: One Massive Container Ship Equals 50 Million Cars." *Gizmag* (April 23, 2009, 2009).
- Hamilton, Alexander, James Madison, and John Jay. *The Federalist Papers*, edited by Rossiter, Clinton. New York, NY: Signet Classic, 2003.
- International Maritime Organization. *Second International Maritime Organization Greenhouse Gas Study 2009.* London, England: International Maritime Organization, 2009.
- Kruse, C. James, Annie Protopapas, Leslie E. Olson, and David H. Bierling. *A Modal Comparison of Domestic Freight Transportation Effects on the General Public.* College Station, TX: Texas Transportation Institute, 2009.
- Meyers, Nicholas A. "AN ECONOMIC ANALYSIS OF INVESTMENT IN THE UNITED STATES SHIPBUILDING INDUSTRY." Naval Postgraduate School, 2010.

---

*STATEMENT OF DR. MARK L. MONTROLL, PROFESSOR, INDUSTRIAL COLLEGE OF THE ARMED FORCES NATIONAL DEFENSE UNIVERSITY, BEFORE THE HOUSE ARMED SERVICES COMMITTEE SUBCOMMITTEE ON PROJECTION FORCES HEARING ON U.S. SHIPBUILDING INDUSTRIAL BASE.* April 4, 2006, .

Research and Innovative Technology Administration (RITA). "Bureau of Transportation Freight and Data Statistics." U.S. Department Of Transportation, accessed April 28, 2012, [http://www.bts.gov/programs/freight\\_transportation/](http://www.bts.gov/programs/freight_transportation/).

U.S. Department of Commerce, Bureau of Export Administration. *U. S. Shipbuilding and Repair*. U.S. Department of Commerce, Bureau of Export Administration, 2001.

U.S. Department of Transportation Maritime Administration. *America's Marine Highway; Report to Congress*. Washington, DC: U.S. Department of Transportation, 2011.