

SHIPBUILDING

ABSTRACT

The United States (U.S.) shipbuilding industrial complex—ship manufacturing, maintenance and repair, and component suppliers—builds, delivers and services the world’s most capable, most technologically-advanced sea-going military vessels. As capable as the U.S. shipbuilding industry is in responding to the world’s most demanding *National Security Strategy*, the same cannot be said in the global commercial marketplace. The combination of heavy subsidies in shipyards by foreign governments, U.S. labor rates that are as high as twenty times that of other international shipbuilders, a lack of economies of scale, inefficiencies from excess shipyard capacity, and less-than optimal manufacturing and management practices leaves the U.S. commercial shipbuilders incapable of competing in the global commercial marketplace, especially for large ships. Accepting this reality, the question then becomes what can and should be done through national policies and practices to foster commercial shipbuilding and help retain our global sea power projection capacities.

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PLACES VISITED

Domestic:

Newport News Shipbuilding, Northrop Grumman Ship Systems, Newport News, VA
Wärtsilä, Chesapeake, VA
Kvaerner Philadelphia Shipyard, Philadelphia, PA
Portsmouth Naval Shipyard, Kittery, ME
Rolls-Royce, Walpole, MA
Electric Boat, General Dynamics, Quonset Point, RI
Austal USA, Mobile, AL
VT Halter Marine, Pascagoula, MS
Ingalls Shipbuilding, Northrop Grumman Ship Systems, Pascagoula, MS
Naval Oceanographic Office, Stennis Space Center, MS
Avondale Shipyard, Northrop Grumman Ship Systems, New Orleans, LA
Textron Marine and Land Systems, New Orleans, LA
Bollinger Shipyard, Lockport, LA
Waterman Steamship Corporation, New Orleans, LA
National Steel and Shipbuilding Company, General Dynamics, San Diego, CA

International:

U.S. Consulate, St. Petersburg, Russia
Shipbuilding Industry Roundtable, St. Petersburg, Russia
University of St. Petersburg, Russia
Mayor, Kronstadt Island, Russia
U.S. Embassy, Helsinki, Finland
Kvaerner-Masa Shipyard, Turku, Finland
Aker Finnyards, Rauma, Finland
Presentation by Wärtsilä Corporation, Helsinki, Finland

*“Listen my children, and you shall hear
Of the midnight ride of Paul Revere...
One if by land, and two if by sea;
And I on the opposite shore shall be
Ready to ride and spread the alarm...”*
Henry Wadsworth Longfellowⁱ

INTRODUCTION

Henry Wadsworth Longfellow penned this famous poem describing the momentous night in the history of the United States (U.S.) when the staunch patriot Paul Revere roused his countrymen from their sleep. His task? To warn of an impending British attack from the sea. He rallied a sleeping group of citizens to action.

The nation of that time was dependent on the sea, just as the U.S. is today. Fully 95 percent of U.S. commerce moves through our national seaports.ⁱⁱ With over 95,000 miles of coastlineⁱⁱⁱ the livelihood of the U.S. is closely linked to water-borne trade and commerce. The marine transportation industry contributes nearly \$1 trillion to the gross domestic product. These imports and exports move through the 561 ports under the jurisdiction of the U.S. Coast Guard (USCG).^{iv}

In a five month long study of the shipbuilding industry, the 2004 Shipbuilding Industry Study Seminar of the Industrial College of the Armed Forces at the National Defense University was tasked to determine the status—the strengths and weaknesses—of this key strategic industry. In the studied opinion of this group of mid- and senior-level Department of Defense (DoD) officers and civilians, and two distinguished foreign military officers, it is time to signal an alarm for U.S. shipbuilding.

Although able to provide the minimum new construction, repair and maintenance of the Naval forces to support the current *National Security Strategy*, this national industry, as a whole, is in peril. Based upon historic comparison, industry definition and current condition analysis, examination of government goals and roles, and the study of current industry issues within both the commercial shipbuilding and the government shipbuilding sectors, a bleak picture is painted. The commercial industry has lost the ability to compete in all but a few niche markets, and both the commercial and government sectors continue to maintain, and pay the price for, uneconomical overcapacity.

The shipbuilding industry around the world is protected and subsidized. American shipbuilders bemoan the subsidies and other financial support given to foreign shipyards by their nations. The leadership of most of the U.S. shipyards say they can't compete in the global market, citing the need for additional government subsidies to counter their international rivals. Even the United States, a leading nation for free market enterprise in the world and vocal advocate for free trade, is not immune from protectionist actions in support of its shipbuilding industry.

FOCUS OF STUDY

During this study, representatives of the U.S. Navy, USCG, commercial industry, labor, congress, and lobbying groups presented their views, concerns and recommendations. Throughout the visits and briefings, it became quickly obvious that there were three major areas that warranted attention:

1. Infrastructure, to include the tremendous facilities and large capital investment for dry docks, enclosed areas for erection of sections of vessels, automated steel cutting, welding and bending machines;
2. Personnel, including demographics, unions, and attracting and retaining skilled labor; and
3. Physical security at facilities with large waterfronts.

COMMERCIAL INDUSTRY IN THE GLOBAL CONTEXT

Shipbuilding is one of the oldest industries in the world. Developed countries rely on a capable shipping industry to promote commercial interests abroad. Sea transportation now accounts for over 80 percent of world trade.^v During the past two decades, world trade by sea has continually increased: 3.3 billion tons of cargo in 1980, to 4.3 billion tons in 1995, to a projected 5.5 billion tons in 2010.^{vi} Today, over 95 percent of U.S. imports and exports are transported via the sea.^{vii} Sea-borne transportation remains the cheapest way to move large quantities of commodities over long distances.

In response to these trends, a vast overseas capability for shipbuilding has emerged and continues to grow, and the U.S. domestic commercial shipbuilding industry is losing market share. Within the world's shipbuilding market there was a 137 percent increase in the number of commercial ships being built between 1988 and 1998.^{viii} Today, U.S. market share equates to less than one percent of the global market of ships produced as measured in gross tonnage.^{ix} China, Korea, and Japan are three of the top commercial shipbuilding countries within the global market; the U.S. and European markets continue to decline due to the explosive expansion of the Asian shipbuilding industry.^x

U.S. commercial shipbuilders continue to find it more and more difficult to compete within the global environment. One reason for the loss of market share is that foreign shipyards are directly supported by government subsidies. Because they control the bulk of the new commercial ship orders, foreign yards are able to reap the cost lowering benefits from economies of scale. Today, there are only four tankers under construction within two U.S. shipyards (two each), while the large overseas yards like Hyundai have an order book of 70 ships this year and continue to receive orders for construction to the point where they can't deliver on new orders until 2008.^{xi} Additionally, labor costs in China are so low that they can build an entire ship for less than the United States can purchase the materials alone. Finally, because U.S. yards have generally not been able to invest capital at the same levels as their rival overseas yards, the margins of efficiency and productivity between the two continue to grow even more disparate.

U.S. SHIPBUILDING INDUSTRY DEFINED

The U.S. shipbuilding industry consists of three segments—military, large commercial, and small commercial.

The military segment is mostly a market segment dominated by the “Big 6” shipyards. These “tier-1” large shipbuilders construct warships, and some have and are building large commercial vessels. Ownership of these shipyards has consolidated down to two major defense contractors—Northrop Grumman (NG) and General Dynamics (GD). NG's Newport News Shipbuilding and GD's Electric Boat build our nuclear class vessels. NG's Ingalls Shipyard and GD's Bath Iron Works build the destroyer class ships, and NG's Ingalls and Avondale build the amphibious warships. Finally, GD's

National Steel and Shipbuilding Company (NASSCO), the smallest of the “Big 6” and the only yard on the west coast, specializes in the smaller auxiliary and support ships.

The military segment of the U.S. shipbuilding industrial complex also includes four government-owned and government-operated shipyards: Portsmouth, Pearl Harbor, Puget Sound, and Norfolk Naval Shipyards, all of which are nuclear capable. These yards are used only for maintenance and repair of Naval vessels.

Second-tier shipyards engaged in building small commercial vessels such as tugs, pleasure craft, and sport craft dominate the commercial segment of the industry. These yards also build some of the smaller U.S. government vessels such as USCG craft, National Oceanographic and Atmospheric Administration (NOAA) research ships, and U.S. Army inter-theater transport vessels. They are also competing in future combatant ship procurements and may begin to play a larger role in military shipbuilding.

The large, tier-1, shipyards responsible for construction of large ocean-going vessels employ thousands of people at each location with millions (and at some billions) of dollars of infrastructure, including property and equipment. However, these shipyards represent only a portion of the business. Literally thousands of suppliers and sub-contractors are needed to build a single large vessel. Companies specialize in the design, production and servicing of propellers, seals, and generators.

CURRENT CONDITION OF THE U.S. SHIPBUILDING INDUSTRY

The current condition of the shipbuilding industry is one characterized by a number of trends.

Excess Capacity

The greatest feature of the industry is that it produces the most capable and complex warships in existence. The U.S. shipbuilders are also world leaders in designing and producing safe and environmentally friendly ships, for both military and commercial markets. Despite these qualities, the current state of the industry in the U.S. is that the shipbuilding capacity in the U.S. far outstrips the need for the foreseeable future.

National Security Requirements. The legacy of the industry’s response to the Regan-era 600-ship Naval fleet now translates to roughly 50 percent over-capacity, as the current national security target is around a 300-ship fleet.^{xii} Coupled with the shrinking national security requirement is a highly volatile acquisition plan which forces commercial suppliers of Naval ships to operate at sub-optimized levels, unnecessarily retaining capabilities to respond to future delivery demands.

National Assets. Another contributor to the over-capacity in the military sector is the need to retain critical skill sets and infrastructure. Newport News Shipbuilding and Electric Boat are the only remaining commercial facilities capable of constructing nuclear class vessels. A national asset that must be preserved, retaining two yards that are operating at far less than half of their potential nonetheless translates into high overhead. All government contractors legitimately pass on the cost for maintaining capital equipment and facilities, including people. The highly skilled personnel that are required to construct these vessels are assets that these companies cannot afford to lose if they are to remain viable shipbuilders. The low rate of construction, however, does not enable these companies to maintain high productivity levels for these personnel. In response to this collective concern, the Naval Sea Systems Command (NAVSEA) developed the

“One [Nuclear] Shipyard” concept to help balance nuclear-class shipbuilding workload between the Newport News Shipbuilding and Electric Boat shipyards, sharing the construction of a single nuclear submarine each year.^{xiii}

Protectionism. Over-capacity also exists in the commercial sector, albeit to a lesser degree. The primary contributor to this imbalance is due in large part to government intervention – cabatoge laws and subsidies. The most notable of the cabatoge laws, which generates international complaint, is the *U.S. Merchant Marine Act of 1920*, more commonly known as the *Jones Act*.^{xiv} This law specifies that ships carrying cargo between U.S. ports must be built in the U.S., owned by a U.S. company, flagged in the U.S., and be crewed by Americans. A similar law, the *Passenger and Ferry Act*, states the same for ships carrying passengers. These laws cover everything from large ocean-going tankers to the small barges and tugs seen on the waterways of the U.S.

The other contributor to the systemic overcapacity in the industry is government intervention in the form of subsidies. The City of Philadelphia, the State of Pennsylvania, and the Federal Government contributed almost one-half billion dollars to turn parts of the old Philadelphia Naval Shipyard into a viable commercial shipbuilding operation. Kvaerna, a Norwegian company, and a giant in the large commercial shipbuilding global industry, received the contract to build three *Jones Act* ships for the west coast to Hawaii trade.^{xv} Despite the subsidies, Kvaerna is having difficulty selling these ships, as they still cost up to three-times that of a similar ship built overseas.

Politics

The industry is also influenced by politics. As one non-U.S. industry executive stated, “shipyards are always highly political issues.”^{xvi} Newport News Shipbuilding is the largest employer in the state of Virginia. Shipyards in Mississippi, of which there are several, represent thousands of jobs in an economically challenged region of the country. The economic viability of the many areas of the nation where shipyards exist is a strong and persistent factor.

Single Ship Class Yards

With industry consolidation over the past two decades, many of the U.S. shipyards have evolved to single-product suppliers, completely dependent upon building a single class of ship for business,^{xvii} leaving those shipyards highly vulnerable to the delivery demand and even fate of that class of vessel. Specialization can yield advantages to the customer, enabling optimization of practices and refinement or development of tailored procedures to increase productivity; unfortunately, since the volume of work required to operate efficiently often does not exist, such benefit is effectively canceled.

Technology

Advances in information technology (IT) have contributed to the overall cost-effectiveness in this market sector—in the U.S. in support of the defense market and internationally in support of the commercial market—and can again. This sentiment is acknowledged in a study sponsored by the Carderock Division of the Naval Surface Warfare Center and conducted by the Department of Commerce (DOC) in 2001. In that study, one of the conclusions was that “productivity-enhancing technologies and processes” were needed to sustain the national strategic asset of shipbuilding and repair.^{xviii}

Until the advent of computer technology, shipbuilding was a labor-intensive, linear, time-consuming process. Hand-drawn and drafted engineering and design, machining, assembly, fitting and finishing of primarily custom parts contributed to lengthy production life cycles and high production costs. Even after the introduction of computer technology into shipbuilding, many of the processes remained linear in cycle and dependent upon highly-niche trade skills. The earliest advantages gained by IT were in database management of the, literally, millions of parts that were manufactured for the assembly on a single large vessel. As confidence in information technology grew, industry cultures began to soften toward new and better ways of employing IT for the purposes of increasing quality, shortening production cycles and lowering costs.

An IT-driven process and suite of applications called enterprise resource planning (ERP) is a broad set of processes supported by customized software used for the management of critical functions of a business. These critical functions often include product planning, parts purchasing, inventory control, supplier interface, customer service, finance, and order tracking. The “enterprise” of ERP can, and often does, extend beyond the bounds of a company.

When Newport News Shipbuilding decided that they wanted to get back into the submarine business in 1997, they realized that they had to transform their processes to accommodate the Navy. At the time Newport News Shipbuilding left the submarine business, the U.S. Navy treated contract awards and acceptance of deliverables as two independent, unrelated functions. By the time they returned to building submarines, the Navy demanded to be an active partner in the development of ships to help reduce costs and ensure on-time deliveries. According to Steve Hassell, the Newport News Shipbuilding’s CIO, ERP was the means to engage the Navy in this new government-supplier partnership. This technology application also opened doors to collaboration with other shipbuilders.^{xix} ERP employed a sophisticated use of IT from stem to stern, facilitating a 50-50 sharing arrangement between Newport News Shipbuilding and their (at the time) principle competitor, General Dynamics’ Electric Boat, to build the Virginia-class attack submarine. “To compete in the modern market [Newport News Shipbuilding] had to move away from a system in which information was tightly held to one in which it can be shared easily,” Hassell observed.^{xx} ERP was the tool. An industry-wide adoption of ERP methods, processes and information technology should greatly improve U.S. shipbuilding business practices, resulting in lower costs and increased competitiveness in the global commercial markets.

For a successful transition from military-only to military-and-commercial, innovation in and enhancements from the application of IT can and should play an even greater role. One does not need to stretch to see the value that IT could have in the genesis of the virtual shipyard or simulation-based ship design and construction.

Jim Corgel, General Manager of IBM’s e-Business Hosting Services, summed it up in a statement he made in an April 2003 press release: “Access to the highest quality technology on demand is critical to helping U.S. shipbuilders increase efficiencies and compete in a global marketplace.”^{xxi}

Physical Security

Based upon a very general overview of security at the number of domestic locations visited during the study, the overall impression was that the defense shipbuilding infrastructure collocated with Naval facilities is well protected. There is probably

minimal risk of a terrorist incident occurring at these facilities due to the presence of military security, and at nuclear capable facilities a heightened level of corporate security in cooperation with interagency groups.

In the commercial sector, security measures varied widely. However, from an anti-terrorism viewpoint, the facilities, in general, are located in lightly populated areas. (NASSCO in San Diego being a notable exception). In addition, shipbuilding yards do not maintain large amounts of toxic chemicals on-site. Therefore, the potential threat of a terrorist incident at one of these locations is probably very low. Because of the excess capacity currently available within the industry as a whole, an incident, which might shut down any one location, would be insignificant to the overall economy of the nation.

Based upon these observations, the terrorist threat against this particular industry is assessed as LOW.

MAJOR CHALLENGES

There are challenges facing the U.S. industrial complex. These challenges fall into three broad categories: the industrial base for shipbuilding, the industrial base for maintenance and repair, and labor force.

Industrial Base for Shipbuilding

The greatest challenge for the shipbuilding industrial complex is in the large vessel market. Simply put, U.S. shipbuilders cannot compete globally. With less than one percent of the market share,^{xxii} with foreign governments' subsidy support, with labor rates that are on average twenty-times that of the Chinese shipbuilder,^{xxiii} and without economies of scale, the U.S. shipbuilders find themselves at a clear disadvantage. To demonstrate the degree of disadvantage to the U.S., the cost of materials alone now roughly equals the going rate for these ships on the global market. Accordingly, it's no surprise that of the roughly 3,000 commercial ships ordered worldwide over the past three years, only three are being built at American shipyards.^{xxiv}

Although there has been a wave of consolidations and shipyard closures over the past decade, there remain exorbitant excess capacities in the tier-1 yards, often to the tune of 40 percent to 50 percent excess capacity. These excesses directly result in overhead that drives up costs. Two of the root causes, we believe, are due to a combination of cabotage laws and fluctuating national security acquisition policies that force the shipbuilders of combatants to retain capacities to address required surges in coming years.

As a result of the excess capacities and resulting overhead, the U.S. Navy and the taxpayer pay a premium for our national security vessels.

Industrial Base for Maintenance and Repair

The maintenance and repair yards in the U.S. face much the same challenge. The repair and rework yards pricing structure greatly exceeds that of their international competitors. Again, the high costs are generally attributed to a combination of overhead from excess capacity, the lack of an equal playing field due to the foreign government subsidies, labor rate disparities, and a lack of economies of scale.

Within the maintenance and repair yards, the capability to service nuclear class ships poses a unique challenge. Regardless of the cost, national security demands that we

retain this national asset, and consolidation that under-addresses the surge requirement poses unacceptable risks.

Labor

U.S. shipbuilders today face three fundamental challenges with their labor force. First, it is difficult to recruit, educate, and retain skilled workers. The cyclical nature of the U.S. shipbuilding industry results in workforce layoffs. When business surges, the shipyard employers have difficulty in rehiring the laid off workers and in hiring new skilled workers.^{xxv} Unrelenting job insecurity is the norm in this industry, so shipyard workers tend to move on to more stable industries. Shipbuilders are forced to either hire unskilled labor, resulting production delays, or forego opportunities to bid for new work. Both of these options negatively affect profits and future work.^{xxvi}

Second, the workforce continues to age. Industry experts estimate the average age of their work force is late 40's to early 50's. There is the potential for the industry to lose an entire generation of the skilled workforce in the next 15 years.

Third, U.S. productivity ranks almost last among international shipbuilders. When compared to their international competitors, U.S. shipbuilders' production processes and labor and management practices are far less efficient.^{xxvii} The more efficient of the U.S. and European shipyards were those that embraced cross-training of their workforce—welders that were skilled in standards for military as well as commercial ships, welders that were proficient in aluminum and steel, laborers that could pipe-fit and run electrical. Unfortunately, diversified labor skill sets in the U.S. shipyards are more an anomaly than the norm.

IMPLICATIONS FOR NATIONAL SECURITY

The national security of the United States is highly dependent upon the maritime industry. We have historically been dependent upon ocean-borne commerce, and that commerce has always required robust Naval protection. The shipbuilding industry is a key component, and has been designated as part of the nation's key/critical infrastructure. The reasons are obvious when we look at the maritime impact upon both the commercial and military viability of the U.S.

Water-borne shipping is key to the economic stability and growth as 95 percent of U.S. international commerce travels via the sea.^{xxviii}

Historically, we have committed to the building and sustainment of a capable naval force to protect these vital commercial interests. Whether defending our global commerce from the Barbary Coast pirates in the 1800s, or performing international Freedom of Navigation missions ensuring our ability to carry on commercial trade and military operations through internationally agreed sea lanes, a strong Navy and Coast Guard have always been essential pieces of our national defense infrastructure.

The ability to project American power around the world is dependent upon sea power. Roughly 95 percent of sustainment supplies for Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) transited to the Middle East via sealift and this level of support is to be expected for future long-term contingencies.^{xxix} Commercial shipping sources and the government-controlled fleets of Military Sealift Command and the U.S. Army provides the preponderance of immediate fast sealift, afloat pre-positioning, and Ready Reserve capabilities.

The need to sustain a powerful fleet of carrier battle groups has been proven by the need to project power ashore from secure and independent bases, and the vast number of non-combatant evacuations of U.S. and foreign nationals from global “hot spots” over the last 50 years.

The need for the U.S. to maintain a strong maritime industry and naval force structure is undisputed. However, we believe some significant policy changes must be implemented to maintain this national asset.

POLICY RECOMMENDATIONS

Policy recommendations, addressing each of the three challenges posed earlier, fall into three categories: shipbuilding industrial base, maintenance and repair industrial base, and labor.

Shipbuilding Industrial Base

It is the government’s responsibility to ensure that major acquisitions result in maintaining combat superiority at the lowest effective cost. For the shipbuilding industrial base, rescinding the U.S.-build provision of the *Jones Act*, refining the national security acquisition strategy and policies, and refining the NAVSEA “One [Nuclear] Shipyard” concept are recommended.

First, by removing the U.S.-build requirement in the *Jones Act* for intra-coastal U.S. shipping, U.S. shipyards will be forced to become more competitive in the commercial industry—they will either right size, consolidate, or close. The resulting elimination of excess capacities and overhead should result in efficiencies that would allow for competition in new markets such as short-sea shipping. Increased efficiencies should also spillover into the government shipbuilding sector, reducing costs for delivering the combatant fleet.

Second, refining the national security acquisition strategies and acquisition policies is recommended. The advertised military shipbuilding requirements of the past have been cyclical, highly volatile, and un-fundable—generally unrealistic and unattainable. In trying to respond to these demands, shipyards unnecessarily retain surge capacities at a great cost to their own efficiency and the customer’s price. With respect to acquisition policies, a multi-year acquisition program, which fixes the delivery schedule and funding availability, will help the shipyards to better manage assets—people and materials—and better negotiate supply-chains.

Third, by looking at the broader U.S. shipbuilding industrial complex as the base from which to build “one shipyard” for all naval national security needs, efficient retention of critical capabilities (such as nuclear class work) while expanding to leverage commercial technologies (such as the high-speed ferry for littoral combat use) should result. Many of the ship designs being evaluated for short-sea shipping could be converted to military configurations, providing dual-purpose vessels for the government to use in times of national emergency. The main role for these ships would be during the initial or surge phase of transoceanic transport. A secondary role would be for intra-theater support, involving shorter ranges. Improved deck handling weights and increased overhead space are the most common improvement most ships in the short-sea fleet would require to support DoD’s needs.^{xxx}

The U.S. government partially subsidizes the maintenance of the transportation network—rail, air, highway, and sea. However, the current market conditions and governmental policies have resulted in a lack of affordable sea transportation to both complement and, in some cases relieve, the stress on rail or highway carriers. Expansion of the current Maritime Security Program and Voluntary Intermodal Sealift Agreements, or VISA, are two ways the U.S. government could promote partnerships between short-sea shipbuilders and operators and the U.S. government for strategic lift, facilitating entry into new markets.^{xxxii} Leveraging the Title XI Maritime Loan Guarantee Programs or similar type government guaranteed loans, could also provide incentives for potential short-sea shipping and fast ferry ventures.^{xxxii}

Maintenance and Repair Industrial Base

For the maintenance and repair industrial base, we recommend modifying the NAVSEA “One [Nuclear] Shipyard” concept to also include all U.S. shipyards for all government maintenance and repair requirements. This should encourage further industry consolidation and efficiencies.

Labor

Finally, the industry needs to implement changes in the labor force. Incentives that attract, educate, and retain skilled workers are needed. The industry must be proactive if it is to replace an aging workforce. The U.S. shipbuilders, the unions, and their workers must embrace cross-training of critical skill sets to yield the efficiencies and effectiveness of the work forces of their international competitors. If the government truly intends to support this industry as part of a vital infrastructure, cost sharing or incentivized programs should be developed, funded, and implemented to boost training opportunities.

Issues

With these recommendations come some issues that the policy makers must be aware of.

First, consolidation and “right-sizing” most often leads to layoffs. Loss of manufacturing jobs is always politically charged, especially in locations like those of the major shipyards where the affected companies are among the largest employers in the city, state, or even region.

Second, rescinding the U.S.-build provision of the *Jones Act* will likely result in further abandonment of large commercial shipbuilding, maintenance and repair. As long as international governments commit to subsidizing this market, U.S. shipbuilders cannot compete. As a result, new niche commercial markets must result. Again, two of the more promising markets are the short-sea shipping and fast ferry.

Third, to sustain U.S. military shipbuilding without the economy of scale advantages of a commercial shipbuilding market for large vessels in the U.S. and without government subsidies to equal the playing field, the U.S. market is becoming, in effect, a bilateral monopoly and should be managed accordingly.

And finally, we recommend that additional Congressional Budget Office (CBO) sponsored studies be undertaken to determine the second- and third-order effects, especially in the long-term, of rescinding the U.S.-build provisions of the *Jones Act*. We believe that our balanced approach should mitigate much of the negative impacts of such a law change, but further study is warranted to determining full impact.

SUMMARY

The U.S. must retain the organic capability to produce the world's best Naval forces to provide for our national security. Since we don't have the capability to build combatants in government-owned shipyards, our partnership with industry is essential.

The U.S. shipbuilding industry is not commercially competitive in the global market for large ships and the protections currently in place do not provide incentives needed for efficient production.

With the elimination of some of the negative incentives and development of realistic policies and practices that help drive efficient production,

- the shipbuilding industry may become more commercially viable, especially in niche markets that can be leveraged for national security as needed and
- the Department of Defense benefits from industry efficiencies and retention of critical infrastructure and skills.

CONCLUSION

*"In all our history, to the last,
In the hour of darkness and peril and need,
The people will waken and listen to hear...."*
Longfellow^{xxxiii}

Like the citizenry of Longfellow's poem, it is time to "listen and hear." The United States shipbuilding industry is in trouble. Until government and commercial action to increase efficiencies and further develop new shipping methods which can be integrated with the national defense structure is taken, the nation's key/critical infrastructure remains at risk.

An alarm is being sounded.

ESSAY ONE LABOR ISSUES

Large U.S. shipbuilders and suppliers have become dependent on the U.S. government to generate the majority of their revenues, as U.S. Navy work accounts for about 70 percent of the industry's revenue.^{xxxiv} The number of U.S. Navy purchases began to steadily decline following the end of the Cold War. The Navy's ship program has decreased 60.5 percent since the 1980s, dropping to an average annual procurement of 7.5 ships compared to 19 two decades ago.^{xxxv} U.S. shipbuilders, like much of the post Cold War defense industry, merged in the hopes of finding new markets in the international commercial sector. The post Cold War "peace dividend" for U.S. shipbuilders was industry-wide instability, huge labor force reductions, and excess in production capacity. The over-reliance on the Navy as the sole customer has cut capital investment, growth and productivity of the industry.

Labor Challenges

Large U.S. shipbuilders find it difficult to hire and retain a trained, skilled workforce. "More than 50 percent of U.S. employers say they cannot find the skilled workforce required. This is particularly true for entry-level positions... the U.S. shipbuilding industry has lost approximately 150,000 skilled employees since the late 1980s mostly due to the stagnant market."^{xxxvi} According to the Department of Commerce's May 2001 report on the U.S. Shipbuilding and Repair Industry,^{xxxvii} three-fourths of the 146 surveyed shipyards reported various labor skill shortages with the greatest being in welders, ship fitters, and pipe fitters. In addition, those yards surveyed reported shortages in field of naval architecture and marine engineering.^{xxxviii} These undermanned positions are critical to the industry's success.

The cyclical nature of the shipbuilding industry results in workforce layoffs during poor economic periods, and difficulty in rehiring skilled workers during shipbuilding booms. Unrelenting job insecurity is the norm in this industry. Skilled shipyard workers tend to move on to more stable industries. The skill level of the U.S. shipbuilding labor force equates directly to overall productivity.^{xxxix} U.S. shipbuilders are slowly recognizing weaknesses in their labor force and inefficient practices. "The productivity of U.S. manufacturing is directly related to the level of skill of the workforce employed in that industry."^{xl} Skilled labor shortages have led to cost over-runs, outsourcing work to complete projects, delays in project completion, and loss of new work, with the overall result of lost profitability. The shortage of skilled labor contributes to reduced productivity rates that can result in yards not being able to pay and retain workers. Lower productivity results in delayed work completion and/or cost over-runs, both of which could lead to financial disaster for a shipyard.^{xli}

U.S. shipbuilders today face three fundamental labor force challenges.

First, it is difficult to recruit, educate, and retain skilled educated workers. Recruiting quality workers is especially difficult. The shipbuilding industry has an image of being low tech, dirty, and requiring brawn over brains. "Shipyards are discovering that there is a critical shortage of skilled employees in the current economic environment of the United States. There is significant competition for skilled employees."^{xlii} The skilled labor force the shipbuilding industry competes for are generally high school educated, with mechanical, machine, technical, or computer skills. The industry can no longer hire

uneducated, single-task workers trained to do a specific task for 30 years. Increasingly important is recruiting a smart workforce that easily adapts to innovation and changes with technology instead of fighting it.

Second, the current aging workforce will be difficult to retrain and replace. Industry experts estimate the average age of their work force is late 40s to early 50s. There is potential for the industry to lose an entire generation of skilled workforce experience in the next 15 years.^{xliii} “The impending baby boomer retirements will start to remove the most skilled and experienced members of the manufacturing workforce.”^{xliiv} The combination of recruiting quality skilled workers and replacing the near pension-experienced workers is a major challenge for the U.S shipbuilding industry.

Finally, U.S. shipbuilders’ productivity ranks almost last among international shipbuilders.^{xliv} U.S. shipbuilders continue to use outdated inefficient production, manufacturing, labor, and management practices. Both labor and management often fail to recognize these inefficiencies and are resistant to change. “Production organizations are frequently single versus multi-craft oriented; this specialization of personnel results in increased workforce turnover, and reduced shipyard flexibility, efficiency and cost effectiveness.”^{xlvi} Large U.S. shipbuilders suffer from extremely high material costs, high labor costs, and low productivity.

The cyclical nature of shipbuilding has made the most desirable workers leery of depending on this industry for their personal economic security.^{xlvii} To overcome this phenomenon and to prosper, shipbuilders are looking to implement a combination of short- and long-term solutions now. Shipbuilders must continue apprentice and vocational training programs, either in-house or working with state governments. Use temporary skilled workers as trainers, and outsource low-demand components. But most of all, and with union agreement, build multi-skilled tradesmen to provide needed workforce flexibility to fully utilize all employees year round; thus, creating job and economic security.

Solutions

Companies that find smart solutions to problems first, gain a strategic competitive advantage in today’s highly competitive global environment. U.S. shipbuilders must forecast, think and act faster than their foreign competitors. The shipbuilding industry must redefine, reshape and sharpen the skills they desire in their workers. Redefining the workforce means finding the right mixes of man, computer, and machine. U.S. shipbuilders must leverage knowledge from their current and future labor force to find solutions for improving productivity. Moreover, in order for the shipbuilding industry to continue to prosper, shipbuilders must find ways to maintain an experienced workforce, and to obtain skilled workers for: workload increases, “baby boomer” retirements, economic booms that increases competition for skilled labor in other industries, and to grow a new generation of skilled workers.

Many shipyards are revitalizing their training programs and apprentice schools to entice young workers to enter into the shipbuilding industry. For example, one large shipbuilder is revitalizing their apprenticeship program after almost a decade of dormancy. Their new program consolidates 20 different trade programs into six broad apprentices including trade areas of piping, electrical, painting, steel, machinist, and carpentry. The intent is to expose the apprentices to more skills along with earning an associates degree and lead toward a multi-skilled workforce.^{xlviii}

Another example is the 2003 joint venture between a major shipyard and the State of Louisiana. The goal of this venture was a training program for shipyard workers to work in any yard. The plan calls for training 21,000 workers during the next four years using the state's community college system. The intent is to grow workers skilled in shipbuilding and to keep them in Louisiana.^{xlix} Even smaller yards are growing skilled workers by initiating apprenticeship programs with local high schools.

In the last decade or so, shipbuilders in the U.S. and Europe have resorted to bringing in skilled foreign workers to offset their labor shortfalls. During the early 1990s, Louisiana shipbuilders hired skilled workers from Mexico.¹ Then in 1997, the U.S. Department of Labor put a stop to hiring foreign labor due to the skyrocketing number of requests. However, in 1998, they reversed their decision and granted special visas/permits to four Louisiana shipyards that allowed them to hire skilled foreign labor for one year. Most of the workers were from India and filled the vacancies of welders, pipe fitters, and marine electricians. Although only intended as a temporary fix, the measure drew fire from unions who believed the foreigners were taking jobs away from Louisianans and that the yards were trying to avoid paying decent wages to Americans. The shipyards countered these accusations by saying they were using the first-class foreign workers to train entry-level workers. Moreover, they were hiring local qualified workers, but not fast enough to offset their turnover rate.^{li lii}

Like the federal government and other industries, shipbuilders are using temporary workers to offset shortfalls in skilled labor. Temporary workers in the form of outsourcing or sub-contracting are a short-term way to subsidize the workforce during peak times. Sub-contracting is a viable option when a shipbuilder only needs a certain type of skilled worker for a specific job or in peak periods. Outsourcing is an attractive option for components and services that are not in high demand, such as fabrication or repair of propellers. Likewise, there is opportunity in sharing of skilled labor between shipyards to meet emergent needs and retain valuable skilled labor.

Long-term solutions would include developing a multi-skilled, adaptable workforce that not only works harder, but smarter, faster, and more efficiently. U.S. shipbuilders must recruit, train, and educate a thinking workforce. The workforce must be flexible, agile, and capable of identifying and implementing smarter processes faster than their global competitors can. Ship designers must design commercially competitive, less expensive ships produced faster and operated cheaper than their global competitors. Shipyards must build flexible workforces capable of handling a variety of related skills and enable various members of the workforce to work with other craftsmen.

Conclusion

U.S. shipbuilders are very good at producing highly complex superior combatant and support vessels. Large U.S. shipbuilders have been unable to compete in the international commercial shipbuilding markets because of their inefficient labor and production practices. There is a prevailing industry-wide perception that foreign shipbuilders have unfair advantages.

To compete on the global commercial shipbuilding market, U.S. shipbuilders must radically improve their labor practices and production processes.

ESSAY TWO

ALTERNATIVE SOLUTIONS FOR COMMERCIAL SHIPBUILDING

The U.S. shipbuilding industry continues to struggle to remain competitive in the commercial global market for the construction of large ocean going sealift vessels. Productivity within the commercial shipbuilding industry continues to lag behind most other large manufacturing industries. The challenge for U.S. shipbuilders is to find a niche market that will afford them the ability to remain competitive in the commercial market, both domestically and globally. This essay suggests that the potential exists within the U.S. to build alternative vessels that are smaller than traditional large ocean going ships whose purpose is to enhance the current U.S. transportation system while improving U.S. strategic lift capabilities.

Short Sea Shipping

There are currently five major modes of transportation used to move domestic freight shipments throughout the U.S.: water, air, highway, rail, and pipeline. Of these modes, rail and highway represent the largest share of freight transportation. “Department of Transportation’s (DOT) planners acknowledge that highway and railroad infrastructures won’t keep pace with growth in freight traffic during the next two decades. To ease the squeeze, DOT is taking a closer look at domestic waterborne commerce as part of an integrated intermodal freight transportation system.”^{liii} “The only practical way to relieve the problems of the highways is to divert traffic to other modes of transportation, and of the other modes, only waterborne transportation offers the potential for unrestricted growth of containerized cargo movements.”^{liv} The Maritime Administration (MARAD) is leading the initiative in the U.S. to promote the use of domestic waterborne transportation—rapidly becoming known as short-sea shipping—as a means to move freight that would otherwise move by rail or via trucks on the interstate highway system. MARAD is promoting short-sea shipping as the way to go in the future to reduce fuel consumption, road congestion, and air pollution. The biggest challenge for short-sea shipping in the U.S. is not whether it is necessary or applicable. The challenge is how to implement a system that is cost effective, efficient for everyone in the shipping chain and does not disenfranchise any of the current stakeholders. This is no small task. Policy makers as well as shippers must be prepared to take risks to realize the potential that short-sea shipping offers to improving U.S. highway congestion; the shipping and shipbuilding industry; the maritime workforce; the improved efficiency of cargo movement throughout the U.S. by truck, rail, sea and air; and the strategic lift capacity of DoD in time of national emergency.

In recent years, several second-tier U.S. shipbuilders—Halter Marine and Bender Shipbuilding, for example—have demonstrated that they can build small cargo ships for prices that, while still not competitive in world-market terms, are nevertheless affordable for *Jones Act* operations.”^{lv} Building greater numbers of small cargo ships in like-series configurations would substantially reduce costs and provide a much-needed niche for the U.S. shipbuilding industry. There should be no mistake that the U.S. government and the shipping industry must be prepared to invest significantly in the costs inherent to making waterborne transportation a viable means of cargo transport throughout the U.S. Costs will come not only from the price of the ships themselves, but in training and maintaining an adequate maritime manpower force and improving port infrastructures.

Many of the ship designs being evaluated for the short-sea shipping option could be converted to military configurations, providing dual-purpose vessels for the government to use in times of national emergency. “The main role for these ships would be during the initial or surge phase of transoceanic transport. A secondary role would be for intra-theater support, involving shorter ranges.”^{lvi} Improved deck handling weights and increased overhead space are the most common improvement most ships in the short-sea fleet would require to support DoD’s needs.

Passenger Ferry Service

The lack of sufficient national economic resources devoted to ferry systems in the U.S. is limiting the contribution this vital mode of transit could be making to relieve congestion, reduce pollution, and stimulate economic development in metropolitan centers of the country. Despite the growing importance of ferry travel to U.S. transportation and the economy, federal investment in ferries is dwarfed by the support given to roads, aviation, and other forms of mass transit. Federal funding for ferries currently represents only one-tenth of one-percent of the total U.S. Surface Transportation Program. At the same time, the nation’s six largest ferry systems (Alaska, Hawaii, New York/New Jersey, North Carolina and San Francisco) already project a 14 percent increase in passenger traffic over the next 5 years.^{lvii} Federal resources are needed to help expand these systems and to support the development and construction of new U.S. ferry facilities, vessels, and domestic manufacturing capabilities. The concentration of federal support for the U.S. highway system, at the expense of water transit, has been catastrophic for the American shipbuilding industry and advocates of ferry systems. Having subsidized road travel to the degree that we have, other forms of transportation cannot compete with the cost advantages of highways and roads. No mode of transit has suffered more from the disproportionate support given the automobile than ferries. With the demise of ferry service has come the demise of ferry construction in America. Today, the only ferry vessels of any merit being built in the U.S. are the few built under license to foreign designers.

Nothing symbolizes the doleful state of U.S. capabilities in ferry transportation better than the soon to be in-service Toronto to Rochester ferry across Lake Ontario. It will be the first car and passenger “fast ferry”^{lviii} operating on the Great Lakes—and only the second such vessel operating in U.S. waters. By contrast, there are at least 100 such ferries operating across the waters of Europe and another 40 serving Latin America, the Middle East, and Asia.^{lix}

A significant increase in federal investment in ferry transportation is the place to start. Late last year a bill entitled, *Ferry Transportation Enhancement Act*, was introduced in the House by Congressman Rick Larsen and in the Senate by Senator Patty Murray, both of Washington State. The Bill called for \$675 million over the next six years under the Ferry Boat Discretionary portion of TEA-21. Tripling the \$220 million previously authorized in the 1998 TEA-21 would be a wise investment in the nation’s ferry construction and operating capabilities. However, the proposed increase is already threatened by the inclusion of all ferry boat initiatives, along with all programs formerly supported under TEA-21, in a larger *Surface Transportation Bill* just reported out of the House Transportation and Infrastructure Committee on March 24, 2004. The draft bill reduces the proposed amount for ferry support to \$439 million. No matter what amount emerges, the advocates for ferries in this country need to keep up the pressure to prevent

this critical mode of transportation from being viewed as a tourist attraction rather than a vital transit asset.

Beyond the new funds, what is truly needed is some form of national program office to function as an authoritative voice for ferry transportation in general—and to endorse the most worthy of the demonstration projects submitted from around the country. A permanent program office can coordinate various programs of common interest, guide communities and local governments as how to apply for federal demonstration funding, and serve as the national information center on ferry boat related issues.

The Theater Support Vessel: Support for Combatant & Commercial Shipbuilding

There are few examples within the history of the U.S. shipbuilding industry where a company has produced both commercial vessels, as well as warships. Most of today's U.S. shipbuilding industries are in the business of producing warships for DoD. Almost all of the U.S. privately-owned shipyards have recognized that they cannot compete in the global market. Foreign shipbuilding subsidies coupled with enormous production start-up costs have brought about the near extinction of the U.S. commercial shipbuilding industry. How can our government help reduce the overhead costs of the DoD shipbuilding industry, expand the commercial transportation network, and most of all grow our U.S. economy?

One of the ways to address these issues is with a decision to start up a full-scale production line for Theater Support Vessels (TSV) type vessels (military and commercial) utilizing the existing U.S. shipyard infrastructure. The Army's TSV has proven its off-the-shelf/dual-use applications—from a commercial high-speed ferry to a highly capable intra-theater lift platform for the military. With some minor modifications and reengineering, "Spearhead, TSV-1X" has become a major force multiplier for the DoD throughout OIF, serving both the Army and CENTCOM. The TSV not only offers tremendous capabilities to our military forces, its commercial ferry applications could help to ease the bottlenecks and congestion occurring on the interstate and railroad transportation networks within the U.S. According to Mr. Eugene C. Bonacci, a managing partner with Management and Transportation Associates, Inc., "... domestic water ferry service clearly is a viable solution to the daunting rail and highway infrastructure problems. The funding required to develop and implement these water ferry services is a relatively small fraction of the funding that would be needed to improve the current rail and highway infrastructure.... flexibility is crucial to our homeland security and national defense."^{lx}

TSV production offers a realistic opportunity for military and commercial partnerships, and collaboration. Because TSVs utilize off-the-shelf technology for both applications development cycle time and most of the associated production risks are significantly reduced. Through a co-production endeavor, the commercial merchant marine sector and DoD could help revitalize our nation's crumbling production base. By leveraging Incat's and Austal USA's TSV technology into teaming agreements with U.S. shipbuilding industries, like Bollinger, there exists tremendous potential in gaining the best of two worlds—best technology and best production practices.

In December 2003, the U.S. Department of Commerce, Bureau of Industry and Security released the findings of a study assessing the economic benefits of acquiring and building TSVs in the U.S.^{lxi} The parameters involved the procurement of seven high-speed, aluminum-hull vessels with a delivery date of 2008. The acquisition cost for one

TSV was \$141 million. The results of the study were extremely promising to the U.S. shipbuilding industry's future with strong economic^{lxii} and employment^{lxiii} benefits and with potential for new market creation^{lxiv}.

ESSAY THREE SHIPBUILDING AND NATIONAL SECURITY

While the necessity for a U.S. commercial shipbuilding capacity is discussed in other sections of this paper and its viability under current conditions is hotly debated in industry, economic, and political circles, the inseparable nature of the relationship between national security and a capability to design and construct combatant warships is disputed by few. To place the ability to protect maritime lines of communications and supply or to support political objectives by projecting U.S. military power from the sea in the hands of foreign shipbuilders is tantamount to placing the defense of the United States in the hands of other nations. What is reasonable to debate is how the U.S. shipbuilding capacity will meet the challenges of warship requirements, to what level and capability will U.S. naval war fighting be built, and at what cost.

Not unlike other defense industry sectors, shipbuilding has been under great stress since the fall of the Soviet Union. The once-envisioned 600-ship Navy demanded such high levels of resources that some argue defense requirements irreparably damaged U.S. commercial shipbuilding capability. In an environment where skilled labor is at a premium, the demand to support defense construction requirements consumed labor at equally premium rates. With today's Navy projected to be something less than 300 ships, a reality is that a once robust warship construction capability is now focused in two major corporations controlling a total of only six shipyards capable of producing combatants for U.S. maritime defense needs. Due in part to reduced warship acquisition, many of the U.S. shipyards have evolved into single product or sole source facilities. In pure economic terms, the absence of competition creates an environment where existence is the goal, and efficiency and innovation is only driven by reduced availability of resources and skilled labor. In effect, the symbiotic dependency between defense and industry in this sector has created a *de facto* government subsidy of the shipbuilding industry.

The world of international relations has always been an environment in which each nation acts in terms of what is best for its own national interests. In the post-Cold War world, the need for our allies to be supported by a U.S. defense and security umbrella has greatly diminished, and in many cases with it a reduction in the level of cooperation with U.S. political initiatives. Permanent land bases have all but vanished in most parts of the developing world, and access to land bases for operations of any kind is best described as tentative and situation dependent. Additionally, the vulnerability of fixed bases makes it prudent to develop options to support the range of missions from presence through combat operations. Though not a new concept, sea basing is again a key element in projecting power and influence. For over 60 years, the aircraft carrier has been the pre-eminent Naval power projection asset in the U.S. Navy. A proven performer in a range of capabilities, the aircraft carrier has been imminently successful operating in its original design purpose as a floating airfield for power projection from the sea. The capability to provide a persistent presence in international waters near a trouble spot and the uncertainty on the part of an adversary as to when and where a carrier battle group may strike adds to the value of the aircraft carrier. However, at approximately \$5 billion for

each NIMITZ-Class aircraft carrier (and by some estimates as much as \$11.7 billion in design and construction costs for the first CVN 21 aircraft carrier), it is not reasonable to expect to use aircraft carriers in a primary sea basing role. The LPD-17 program is providing replacements for amphibious assault ships needed for the Fleet Marine Force, and following the Marine Corps model, a robust program of deploying maritime pre-positioning forces (MPF) to place equipment and supplies in anticipated theaters of operations is underway. An innovative approach to sea basing can be found in the development of mobile offshore bases. Designed to support large aircraft, cargo handling, storage, and personnel berthing, these mobile offshore bases would consist of one thousand foot sections to be joined at sea to accommodate large organic airlift aircraft. Complementary elements of sea basing would be the deployment of theater support vessels (TSV) and high-speed vessels (HSV) to shuttle personnel and material to the beach from offshore bases or MPF ships. Along with significant new resource allocation, feasibility of this concept is dependent on full control of the sea to avoid the same vulnerabilities of fixed land bases.

In a resource-constrained environment, what's needed generally becomes secondary to what the budget can afford to provide, with every choice carrying the consequence of an opportunity cost. The high cost of shipbuilding in support of defense requirements, whether for combatants or for the sort of support and sea basing platforms described above, compels a thorough review of the total ownership operating cost of each platform. The acknowledged highest operating cost element is personnel, so it comes as no surprise that design and development focuses on ships that can operate with fewer crewmembers. One of the key performance parameters for CVN 21 development, for example, is a threshold reduction of 500 billets and an objective reduction of 900 billets as compared to the NIMITZ-Class manning requirement.^{lxv} This represents an impressive reduction of between 14 percent and 25 percent in personnel costs. The desire for manning reductions is not unique to the U.S. Navy. The technology and design of combatants of many nations indicate that most Navies are on the path to crew reductions. It will be necessary to rethink operations and tactics, damage control procedures, logistics management, and maintenance plans as a progressive process conjoined with manning reductions.

The shipbuilding industry is part of the critical infrastructure of the U.S. as identified in *The National Strategy for the Protection of Critical Infrastructures and Key Assets*.^{lxvi} The U.S. has traditionally been sea dependent with fully 95 percent of today's commerce moving through our seaports, so it was a logical extension to become a seafaring nation. Failure to protect the shipbuilding and seaport infrastructure would mean economic ruin and potentially set the stage for defense disaster. The security approach taken by the shipbuilding industry is thus far linked to both the U.S. Navy force protection program at facilities with a U.S. Navy presence, and the *International Code for the Security of Ships and of Port Facilities (ISPS) Code* as prescribed by the International Maritime Organization (IMO) for those facilities without a direct U.S. military presence. The U.S. is a key signatory and member of this international body. Following the tragedy of September 11, 2001, the IMO unanimously agreed to the development of new measures relating to the security of ships and port facilities. These guidelines were developed and ratified by international diplomatic conference in December 2002. In order to codify mandatory compliance in the contiguous United States, Congress passed the *Maritime Transportation Security Act of 2002 (MTSA)* to complement and strengthen the layers of defense to our nation's port security. The MTSA is specifically designed to protect the

nation's ports and waterways from terrorist attack. The ISPS is the first multilateral ship and port security standard ever created, requiring all signatory nations to develop port and security plans. Together, these far-reaching initiatives promise to greatly improve security in and around the ports and harbor areas where U.S. shipbuilders are located. Unfortunately, during our Industry Study travels, the application of these initiatives seemed lacking. While the promise is in the agreements and legislation, the execution is not fully evident on the ground.

ESSAY FOUR

THE ECONOMICS OF RESOURCING THE SHIPBUILDING INDUSTRIAL COMPLEX

The nature of the challenge to the U.S. military shipbuilding industrial complex to meet the needs of the DoD and Department of Homeland Security is that U.S. shipbuilding on a whole is arguably no longer a competitive market. As a result, the advantages of competition—namely, market performance that results in output that responds to the demands of the consumer in terms of price, quality, and quantity—are absent. U.S. shipbuilding nearly void of commercial business takes on the characteristics of a monopsony, or buyer's monopoly. Further, with now only two companies owning the remaining six large shipyards capable of delivering U.S. military ships, the market structure is nearing that of a bilateral monopoly.

In a monopsony, the sole consumer generally has the power to pick the point on the demand curve, in effect naming both price and quantity, oft to the benefit of the buyer and detriment of the seller. Movement toward a bilateral monopoly poses even greater risk of market failure—with one seller and one buyer, outcomes are hard to predict. The price charged for a good/service in this case depends on the relative bargaining power of the single buyer and single seller and on how effectively each applies that power. With the NAVSEA “One [Nuclear] Shipyard” concept,^{lxvii} one can argue that U.S. shipbuilding is moving closer to a bilateral monopoly than it is to any other market structure.

Road to Bilateral Monopoly

U.S. shipbuilding, within the past two decades, has seen a major shift in its place in the global market. At the height of production and global market share in the mid-1940s, U.S. shipbuilders lead the world in the design and construction of advanced naval warfighting sea-going platforms and commercial platforms. As recently as the 1980s, the U.S. shipbuilders continued to be global players. Less than a quarter of a century later, only two remaining markets: military ships and Jones Act ships.

The factors that lead to this greatly reduced, highly niche position are a subject of debate, but few analysts will argue against the point that a contributing factor to the loss of what commercial business remained in the 1980s was due to the mobilization of the U.S. shipbuilders to deliver the Cold War Era 600-ship fleet.^{lxviii} In order to deliver a 600-ship Naval fleet, U.S. shipbuilders nearly abandoned all production, skill disciplines, and infrastructure associated with commercial ships. The higher quality material (and thus higher cost) demands of military ships did not scale for commercial projects; the space, time, and labor demands for military construction squeezed out commercial construction. Seizing the opportunity, foreign governments subsidized their national shipbuilding industry, quickly capturing the remaining global commercial market share.

With a Post-Cold War target of a U.S. Naval fleet now roughly half of the size envisioned during the Reagan era, dramatic declines in U.S. military spending left enormous excess shipbuilding production capacities. The result was predictable—market shrinking, consolidation, and loss of skilled labor.

After drawing down to just two major corporations and six major shipyards, the U.S. shipbuilders are now trying to return to the commercial markets. Shifting market focus this time, however, is proving far more difficult than it was in the 1980s. U.S. shipbuilders find themselves unable to compete with shipyards in Asia and Europe. Continuing foreign government subsidies, economies of scale that result from a now dramatic market share advantage, labor rate disparities and higher raw material costs (exacerbated by “Buy America” policies) preclude U.S. shipbuilding reentry into the commercial marketplace.

Global Protectionism

The shipbuilding industry is protected and subsidized by nations around the world. Even the U.S., a leading nation for free market enterprise in the world and a vocal advocate for free trade, employs protectionist actions to support its shipbuilding industry.

Many nations with the capability to build a modern warship consider production of those ships to be national assets and worth protecting, continuing to build ships domestically even though costs may be significantly higher than if purchased from an international source. Here in the U.S., a good example is the fast ferry platform that the Navy, Army, and Marine Corps are currently evaluating for littoral combat use. According to a senior Army official, it could cost the U.S. taxpayer approximately twice as much to build these catamaran-type vessels in American shipyards than it would be to purchase them directly from an Australian producer.^{lxi}

Similarly, within the commercial shipbuilding sector, there are numerous examples of protectionism. Starting with the U.S., the clearest form of subsidy shipbuilders are the *Merchant Marine Act of 1920*, also known as the *Jones Act*, and the *Passengers Service Vessel Act*. Congress passed these Acts as a measure to protect domestic shipbuilding interests and shipping routes by dictating that any cargo or passengers carried by ship between U.S. ports, to include ports of U.S. territories, must be carried on a ship built in the U.S., owned by an American company, flagged in the U.S. and crewed by Americans. These Acts run counter to free market principles, results in inefficient use of resources, and hurts consumers in Alaska, Hawaii and the territories. The International Trade Commission determined that allowing completely free trade in the ocean-going market would result in a \$656 million gain to the U.S. economy per year.^{lxx} In 1988, the U.S. General Accounting Office estimated that the *Jones Act* cost Alaskan families between \$1,921 and \$4,821 per year.^{lxxi} If not for the *Jones Act*, any number of companies around the world could enter this trade, increase competition, and drive costs down.

The Kvaerner Shipyard in Philadelphia illustrates another type of protectionist support. The city of Philadelphia was left with an abandoned Naval shipyard in the 1990s. The city, State of Pennsylvania, and Federal Government gave Aker Kvaerner, a Norwegian shipbuilder, \$429 million in subsidies to “refurbish a section of the former Navy yard, train its workers, and jump-start operations.”^{lxxii} Kvaerner was only required to invest \$165 million of its own money over an 11-year period beginning this year, a small sum for this shipbuilding giant.^{lxxiii}

Turning overseas, Asian and European countries have also invested millions in their shipbuilding and repair industries. In China, the shipyards are government owned, with the government paying for all capital improvements, the implication being that the private Chinese shipbuilder pays only for labor and raw materials.^{lxxiv} The South Korean government also spent heavily in bailing out its shipbuilders after those builders were unable to sell ships in a saturated ship market and defaulted on their loans.^{lxxv} In Japan, the Japanese Development Bank provides Japanese shipbuilders with long-term loans at below market rates to finance ship construction.^{lxxvi} The Nippon Foundation, a Japanese government controlled entity, provides low-interest loans to shipbuilders for operations and capital investments.^{lxxvii}

European nations are also subsidizing their shipbuilding industries. The European Union (EU) allows national governments to provide shipbuilding subsidies of up to 14 percent of the cost of new ship construction.^{lxxviii} The EU also agreed to a doubling of aid allowed for research and development.^{lxxix}

Cost of Labor

U.S. shipyards face a difficult, if not impossible, task to compete with overseas shipbuilders in terms of labor rates. Shipyards overseas, notably in China and Korea, pay a fraction of the cost that U.S. companies must pay in terms of labor and benefits. Chinese shipyards are able to pay their workers less than one dollar per hour.^{lxxx} In South Korea a typical shipyard worker earns \$9.27 per hour.^{lxxxi} Labor expenses in the United States, Japan and Europe are dramatically higher in that a typical factory worker would cost the employer \$15 to \$30 per hour.^{lxxxii} Labor expenses are so low in China that a senior Northrop Grumman Newport News Shipyard official stated that the Chinese can build a ship for less than the United States can purchase the materials for the same ship.^{lxxxiii} In terms of medical benefits, using a comparison from the auto industry, General Motors pays an average of \$1,200 per automobile built in the U.S. for benefits of its workers and retirees.^{lxxxiv} Chinese companies pay virtually nothing, as their health system is government operated.

Conclusion

If the U.S. government intends to retain the world's most capable warfighting Naval fleet, the nation's shipbuilding industrial complex is a strategic national interest that must be sustained. To keep U.S. military shipbuilding viable, without the competitive advantages of a commercial shipbuilding market in the U.S. and without government protection, the market should be treated as a bilateral monopoly. Because of the uncertainties of performance in a bilateral monopoly, the federal government should:

1. Formalize the "One [Nuclear] Shipyard" concept, awarding major shipbuilding contracts to both major shipbuilders, spreading the workload across applicable shipyards and over time (capacity planning) in such a way as to retain the critical mass to respond to national defense needs for shipbuilding.
2. Provide incentives that foster innovation in automation, robotics, modern measurement and control techniques, computerized management methods, and facilities that increase productivity on a scale equivalent to foreign shipyards.
3. Perform regular self-audits to ensure that unfair burden is not placed on the industry as a result of the intervention.

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