

Phebe N. Novakovic
Executive Vice President – Marine Systems
General Dynamics Corporation

Testimony before the
House Armed Services Committee
Seapower and Projection Forces Subcommittee
112th Congress, Second Session

Shipbuilding Industrial Base

Washington, D.C.

March 29, 2012

Chairman Akin, Congressman McIntyre, members of the subcommittee, thank you for your invitation to testify today and for the committee's long history of support for United States shipbuilding.

Following a brief introduction of General Dynamics Marine Systems shipyards, I will address the issues requested in your invitation letter. Specifically, I will comment on the Navy's FY13 shipbuilding plan, our efforts to preserve shipyard skills, our initiatives to reduce costs and an assessment of the shipbuilding industrial base.

Introduction to General Dynamics Marine Systems Shipyards

General Dynamics Marine Systems business segment includes four shipyards, Bath Iron Works in Bath, Maine; Electric Boat in Groton, Connecticut, and Quonset Point, Rhode Island; and NASSCO in San Diego, California, and Norfolk, Virginia. Combined, these shipyards employ nearly 21,000 people. The group designs, builds, repairs and supports submarines, surface combatants and auxiliary ships for the United States Navy, and commercial ships for the U.S. Jones Act commercial market.

BATH IRON WORKS

Bath Iron Works (BIW), located on the Kennebec River in Bath, Maine, since 1884, delivered its first ship to the United States Navy in 1893. Since then, BIW has delivered 244 military ships. BIW is the lead designer for both classes of U.S. Navy destroyers that are currently in production – the DDG-51 and the DDG-1000 Class destroyers. BIW's Planning Yard activities sustain 80 percent of the Navy's active surface combatant fleet, offering a full range of surface combatant engineering, design, production support and lifecycle support services. BIW is Maine's largest single-site private employer with over 5,500 highly skilled engineers, designers and shipbuilders who, on average, have over 20 years of ship design and construction experience.

ELECTRIC BOAT

Electric Boat, headquartered in Groton, Connecticut, with a major construction facility at Quonset Point, Rhode Island, and an engineering and design facility in New London, Connecticut, has been designing, building and repairing submarines for the U.S. Navy since 1899. Starting with the first nuclear submarine, the USS NAUTILUS, Electric Boat has designed and built the lead ship for 16 of the 19 U.S. nuclear submarine classes, and delivered a total of 102 nuclear submarines to the U.S. Navy. Electric Boat employs 11,000 engineers, designers and tradespeople, focused on the

design, construction, repair and lifecycle support of nuclear submarines. Electric Boat is currently building Virginia-class submarines and is beginning the development of the next SSBN, the Ohio Replacement Program.

NASSCO

NASSCO's primary facility, located in San Diego, California, has designed, built and delivered 137 new ocean-going vessels (Navy and commercial) over the last 52 years. It is the only remaining private, full-service shipyard on the West Coast designing, building and repairing large vessels for the U.S. Navy and commercial Jones-Act customers. NASSCO is the largest industrial manufacturer in San Diego where it employs 3,160 engineers, designers, and skilled shipbuilding craftspeople, plus 300 long-term, on-site subcontractor partners supporting the shipyard. NASSCO is currently building the T-AKE Lewis and Clark-class dry cargo/ammunition ship and the Mobile Landing Platform. NASSCO also has a shipyard in Norfolk, Virginia, where our 500 employees and an additional 300 subcontractor partners conduct surface ship repair for the U.S. Navy.

Navy's FY13 FYDP Shipbuilding Plan

First, I would like to address the Navy's large surface combatant procurement plan. The Navy is committed to executing a multi-year procurement for nine DDG-51 class destroyers and we strongly support that action. We are grateful for the Committee's support of prior DDG-51 multi-year procurements, and your support of this latest multi-year authority will ensure Bath can continue to reduce the cost of these ships.

The FY13 FYDP shifted the 2nd DDG-51 in FY14 to FY16, which could disrupt production at Bath. We will work closely with the Navy and the Congress to ensure that the risk of any disruption is mitigated. Although the number of DDG-51s in the current plan does not reach the historically optimum production levels of previous DDG-51 multi-year procurements, on average three ships a year, we are very pleased with the clarity and stability in the Navy's procurement plan. A stable plan provides the predictability necessary for Bath to manage properly the workforce and the supply chain and make informed decisions about future facility investments.

While no additional DDG-1000 ships are contained in the FY13 Shipbuilding Plan, I would like to thank the Committee for its support of the program. This highly innovative and capable three-ship class is a major part of BIW's workload over the next

several years. We are over 60 percent complete in manufacturing on the first ship and the construction is progressing extremely well, on time and on cost. Construction of the second ship of the class is over 25 percent complete, and we will begin construction of the third and final ship next week. We are constructing these ships concurrently with DDG-51s, the 34th and final one of which, the PCU MICHAEL MURPHY (DDG-112), will deliver to the Navy May 2012.

Next, I'll address the Virginia-class submarine program. These submarines have been contracted for the last 14 years under a block buy followed by two multi-year contracts, which enabled Electric Boat to drive down costs through greater predictability of funding and stability in the acquisition process. The successes in cost reduction and the dramatically reduced production cycle times that we have achieved in this program would have been impossible without this committee's support for multi-year procurement. As an example, the lead ship schedule of 84 months has been reduced to 62 months on the next EB-delivered ship, about one year ahead of contract delivery.

We are currently under contract to build 10 Block II and III submarines and the President's budget requested your approval to contract for an additional nine submarines in Block IV from FY14 to FY18 in a multi-year procurement. We urge the Committee to continue its support of multi-year authority for this program.

I would also like to congratulate this Committee for its key role in accelerating the Virginia-class procurement rate from one to two submarines per year in FY11. The resulting increase in the production rate at our shipyard ensures that we can build each of these ships faster, more efficiently and at significantly reduced costs to the Navy.

As you know, the FY13 FYDP plan for Virginia-class procurement shifts the 2nd submarine in FY14 to FY18. While we are pleased that the Navy remains committed to at least nine ships for Block IV, the delay of the 2nd FY14 submarine does not come without consequences. The shift interrupts the two-ships-per-year series production plan and adds instability in the build plan and within the industrial base. Secretary of Defense Panetta has voiced his interest in restoring the 2nd FY14 submarine if the required funding can be found. We would encourage Congress to restore the 2nd Virginia-class submarine in FY14 by adding funds in FY13 for the necessary advance procurement of long-lead material for that ship. Continuing to support two Virginia-class submarines per year within a multi-year procurement ensures the most cost-efficient acquisition possible.

I will now address the Ohio Replacement Program (ORP). Over the last two decades, Electric Boat has made great strides in design-build, modular construction and design for affordability. These advancements in shipbuilding have contributed to excellent on-time delivery performance of three unique ship designs (the Virginia-class SSN, the SSGN Conversion and the USS JIMMY CARTER Multi-mission submarine) over a brief 14-month period in 2004 and 2005. I raise these accomplishments by way of demonstrating that Electric Boat can design, build and construct the new class of ballistic missile submarines on time and on cost. Imperative to this commitment are two key factors: first, stability and predictability in design and construction funding; and second, clear, cost-sensitive requirements that once established do not change. Under these two conditions, Electric Boat will deliver these ships in the most cost-effective approach possible.

With respect to the recently revised ORP plan, which moves the acquisition of the lead submarine from FY19 to FY21, we would urge the Navy and the Congress to ensure predictable and level-loaded Research and Development (R&D) funding. This ensures that we are able to maintain the most efficient design profile, driving down both design costs and ultimately the cost to construct the submarines.

Finally, I will address Navy's auxiliary surface ship programs. I would like to compliment the Committee for accelerating the final T-AKE ships as well as the Mobile Landing Platform (MLP) program, enabling NASSCO to continue providing significant cost savings as the Navy modernizes its support fleet. The MLP-class is a very capable and flexible platform, and the President's FY13 budget request added a 4th MLP in FY14. We ask the Congress for its continued support of this important class of ships, with the authorization and appropriation of the FY14 MLP.

Shipyard Skill Preservation

Producing naval warships requires an uncompromising commitment to quality. Not only dimensional quality to meet the demands of modular construction techniques, but also quality that ensures the safety and reliability of platforms and the crewmembers that go into harm's way. Preserving the necessary skills in many cases means preserving the culture of quality resident at our shipyards.

BIW, for example, has some of the most experienced shipbuilders in the industry. Our production workforce averages over 20 years of experience building ships for the U.S. Navy. During the past several years we have integrated the completion of the DDG-51s with the startup of the DDG-1000 ships in order to stabilize employment and

retain our skilled workforce. Going forward, we have integrated the restart DDG-51s and the remaining DDG-1000s to increase our production employment level slightly and to enable a process of skill transfer from our experienced mechanics to new employees.

Beyond production skills, our technical staff is vital to maintaining the ability to design and plan complex surface combatants. To that end, since the reduction of our engineering and design staff following completion of the DDG-1000 design, we have been working with Electric Boat to try to stabilize employment and provide design support to EB programs. The key here is to optimize and rationalize our engineering capabilities across our shipyards to reduce costs and preserve critical skills.

BIW also utilizes a program of employee development to advance our personnel from apprentice-level to executive-level. This includes developing core shipbuilding skills in the production trades and highly technical skills for designing ships. BIW also has programs for supervisor and leadership development. Another important part of capitalizing on our skilled workforce is involving them in the improvement of the shipbuilding process. Over the past six months, they have provided over 1,600 working-level suggestions, of which more than 400 are now incorporated that directly impact performance and create safer working conditions.

Similar results are being achieved at Electric Boat, which includes 85 apprentices in the five-year Marine Draftsmen Association Apprentice Program as well as 156 people trained in our two-year Business Leaders Group Program. Electric Boat has invested nearly \$1 million in its Plateau Learning Management System, which continues to provide valuable training for the entire workforce – engineers, designers and tradespeople.

We also strive to ensure that the training people receive is reinforced with actual, meaningful, hands-on work in trade, program and functional departments throughout the shipyard. This is a critical complement to our training that allows our employees to demonstrate their developmental skills and judgment on the production floor and ship deckplates.

At NASSCO, we have recently adapted a process called Training Within Industry, or “TWI,” to teach our trade workforce the skills necessary to work safely and efficiently. This training technique has been applied to standardize over 500 shipyard tasks and has significantly contributed to improvements in safety, quality, efficiency and skills retention.

In addition to TWI training, NASSCO has employed a Supervisory Development Program to improve our management approach in scheduling, work execution, Earned Value Management System (EVMS) and leadership skills. NASSCO supervisors now perform administrative duties more efficiently allowing them to spend 84 percent more value-added time at job sites.

Cost Efficiency and Risk Reduction

Cost efficiency, overhead management and risk reduction are central to all businesses throughout General Dynamics. We have a culture of continuous improvement which means that every process – including engineering, manufacturing, supply chain management, human resources and finance, to name a few – is subject to rigorous cost analysis and process improvement. Our imperative is to reduce our costs, day in and day out.

In addition, General Dynamics believes in investing in our proven businesses, when there is sufficient volume and stability in our customers' plans to justify the expenditure of our shareholders' capital. Increasingly, we have had the necessary volume and stability in our programs to permit these investments. These investments are key factors in the reduction of costs and improvement of quality throughout our shipyards.

I will address these subjects as they apply by shipyard.

Electric Boat

At Electric Boat, Block II construction program success has been the result of leveraging the original modular design and making selective capital investments to develop and execute a four-module build plan. Assembling fewer large modules is more efficient and costs less than the past practice of welding together many smaller sections. In fact, cost reduction program efforts on Block II have led to delivery of the first four Block II ships early and below cost. We are now following the four-module build process with an improved final assembly and test process that is being realized on PCU MISSISSIPPI. The MISSISSIPPI is on track to be delivered nearly one year ahead of the contracted date and considerably below target cost.

Cost reduction on Virginia Class has been a continuous focus. We began to redesign the Virginia Class in 2006 to incorporate new technologies and lessons-learned to reduce the cost of Block III ships. We used a disciplined, cost reduction-

driven approach called Design for Affordability to ensure that the Virginia's design was optimized for production. As a result, we have eliminated three million hours of Electric Boat construction labor and contributed to a unit cost reduction of about \$400 million per ship. In doing so, we achieved the U.S. Navy's goal of \$2 billion per ship in FY05 dollars.

In 2008, we signed a fixed-price incentive contract for a multi-year procurement of all eight Block III submarines. The first ship of this block, now three years into construction, is ahead of the build pace of any ship to date. We expect our culture of process improvement will result in EB's continued positive performance on Block III construction.

On the Ohio Replacement Program, Electric Boat is applying modular-build techniques that were refined greatly on the Virginia-class program. Through early prototyping, we have demonstrated a new build strategy for the missile compartment that can save \$45 million per hull and remove 15 months off the legacy Ohio-Class build schedule. Electric Boat is attacking design, construction and lifecycle costs concurrently, at the onset of the program.

To date, we have achieved 12 percent savings off our original estimate for design. Over the next two years, we will continue to further reduce the cost of the program using a variety of approaches including: cost versus capability trade-offs with the U.S. Navy; implementing revised business processes in conjunction with a state of the art electronic design tool; simplifying the platform design; and using components and parts from the Virginia-class program. Our engineers have already instituted 510 cost-reduction initiatives and we are currently reviewing another 1,200 for implementation. This level of effort is unprecedented so early in a multi-decade program.

Underpinning many of these improvements has been our investment in our businesses. Since 2000, we have invested over \$500 million at Electric Boat to support submarine construction, maintenance and modernization work. Major capital improvements include:

- Graving Dock repair
- Modular Transportation System upgrades to 1,800-ton capacity which supports the Virginia-class four-module build plan;
- A new hull coatings facility at Quonset Point, Rhode Island;
- A pre-launch Final Assembly Facility at Groton, Connecticut.

BIW

Similarly, General Dynamics has made numerous capital investments at BIW to support the DDG 51 and DDG 1000 programs, including approximately \$350 million for the:

- State-of-the-art Land Level Transfer Facility completed in 2001
- Ultra Hall facility in 2008
- Machine Shop and Construction Platen upgrades in 2011.

The Ultra Hall facility allows units of up to 5,000 tons to be erected and outfitted indoors in a controlled environment. Building in this type of environment enables higher levels of completion earlier in the build sequence resulting in significant cost savings. Most recently, BIW reconfigured the footprint previously used for its three historic inclined ways into a unit assembly and outfitting area.

We continue to drive down overhead costs through initiatives such as: consolidating leased facilities, dramatically reducing energy and water consumption, and using innovative approaches to ensure that what we pay for these commodities is favorable.

In addition to the macro shipbuilding process improvements associated with facility changes, myriad lower-level continuous process improvements associated with lean manufacturing principles and Lean Six Sigma have become culturally ingrained in our workforce over the last decade. Our culture of continuous improvement and the innovative spirit of BIW's skilled mechanics and managers have resulted in over \$58 million in savings in the last two years alone. This included aggressively re-engineering all major organizations in order to eliminate duplicate or unnecessary processes.

BIW has also expertly employed numerous new information technology tools to improve planning, design development and the flow of information. Capitalizing on best practices, process innovations and sharing across all GD shipyards, BIW has further evolved concepts used by Electric Boat and NASSCO to benefit the DDG-1000 and DDG-51 Programs. The design/build concepts used on the Virginia-class submarine program were incorporated during the early phases of the DDG-1000 design, and structural assembly process improvements transferred from NASSCO have yielded benefits on DDG-1000 and DDG-51 production.

NASSCO

The T-AKE dry cargo and ammunition ship program has the best learning curve in the industry. As T-AKE 14, the last ship of the class, is nearing launch, the learning curve for the class stands at 79.2 percent. T-AKE 14 will deliver to the U.S. Navy for 38 percent of the touch-labor hours it took to build the lead ship of the class. The T-AKE program achieved a reduction in rework to 0.8 percent on the final ship. This was achieved through the deployment of a comprehensive continuous process improvement initiative started in 2006. Since that time, we have modified the design to make it more producible, made substantial facility investments to improve throughput and focused the entire organization on process changes that have dramatically improved efficiency.

One such example is the T-AKE's ammunition-magazine sprinkling system design. Working in close cooperation with the Navy technical community, we replaced decades-old Navy standard equipment with a modern, commercially available system that is cost effective to install and maintain. Our systematic approach to continuous improvement has reduced total ownership cost of the T-AKE class and has resulted in a system design that can be readily applied on future U.S. Navy ship classes. These ships are delivering under budget and cumulatively years ahead of schedule.

The Mobile Landing Platform (MLP) is demonstrating the value of completing ship design before starting construction. The 1st MLP, now 45 percent complete, is on schedule and budget. As a result of completing design and production planning prior to construction, MLP is already performing near where T-AKE is finishing, with a 0.9 percent rework rate.

The dedication to continuous process improvement extends to our Repair programs in both San Diego and Norfolk. As an example, for two recent LSD-Class mid-life modernizations in San Diego, we demonstrated over 20 percent cost reduction on repeat work items. These lessons learned are shared between our east and west coast facilities allowing us to provide the best practices and lowest cost approach on our Repair projects.

Across the business, NASSCO incorporated 10,845 process improvements in 2011, including 163 Lean Six Sigma projects, accounting for approximately \$19.5 million of cost reduction.

Since 2000, General Dynamics has invested approximately \$300 million in capital to improve NASSCO's efficiency and throughput capacity. The deployment of this capital

was targeted based on numerous studies and analyses including benchmarking with two of Korea's most productive shipyards – DSME and STX. Areas of emphasis include:

- Increased steel capacity and efficiency
- Increased block lift capability (two 300-ton cranes and two 320-ton transporters)
- Dedicated blast-and-paint facility
- Established an additional stage of construction for pre-outfitting blocks including increased buffer storage capacity
- Complete overhaul and renovation of our floating dry-dock.

Health of the Shipbuilding Industrial Base

Finally, let me address your question about the health of the shipbuilding industrial base from General Dynamics' perspective. As prime contractors, each of our shipyards is healthy, highly productive and extremely well facilitated. As I noted above, key to our success has been a stable, predictable Navy budget and commitment to shipbuilding that has allowed us to reduce our costs, improve our performance and ensure the health of our suppliers. On that subject, let me expand. It is difficult to paint the entire industry with a broad brush, so I will address the submarine and surface industrial base separately.

Submarine Industrial Base

The U.S. submarine industrial base consists of highly specialized suppliers possessing unique skills and capabilities which, if allowed to atrophy or disappear, could not be reconstituted quickly or affordably. The technology, facilities and personnel that are employed by this supplier base are critical to the continued viability of U.S. submarines.

The submarine industrial base is stable, but limited. Multi-year procurement, with economic order quantity buys and adequate advance procurement funding at a two-ship-per-year level has allowed the supplier base to have confidence in the market and therefore reinvigorate their investment both in human capital and facilities. However, the base is limited because we have a number of one-of-a-kind suppliers who possess designs, facilities and people not replicated elsewhere. The number of submarine suppliers has been reduced from over 17,000 during the Los Angeles- and Ohio-class build-up to now fewer than 6,000. Roughly 300 suppliers possess one-of-a-kind skills and capabilities. In excess of 70 percent of the subcontracted value of a Virginia-class

submarine is committed to single- or sole-source suppliers. Many suppliers have elected to exit the market over the last 15 years for a variety of reasons.

The current stability in the submarine industrial base is the result of the Navy's ability to provide a predictable build rate for Virginia-class ships, the transition to a two-ships-per-year build rate and the commencement of the Ohio Replacement Program. These factors have facilitated renewed interest in capital investment, reinvigorated hiring and training and reduced the exodus of suppliers from the market.

The submarine industrial base embraced the challenge of achieving the \$2 billion target cost for Virginia-class submarines (in FY05 dollars), contributing in excess of \$200 million in cost savings per ship. Multi-year procurement utilizing both Advance Procurement (AP) and Economic Ordering Quantity (EOQ) funding has been particularly beneficial to the submarine industrial base. The ability to contract for multiple ship sets of material has allowed for reduced cost from raw material procurements, stable production runs, predictable volumes used to calculate indirect rates and reductions in service and support ratios. The submarine industrial base has benefited from 72 percent (\$3.5 billion) of the Virginia-class Block III material funding being committed to them in the first 36 months of the contract. Equally important, the suppliers have expended roughly 75 percent (\$2.6 billion) of these commitments, creating significant economic benefit and job creation in their communities. The U.S. government has shared in this positive performance as material is running below target cost whereby the savings based on the prime contract share lines accrues to them in part.

The recent revisions to the Virginia-class Block IV plan (shifting one of the two FY14 ships to FY18) and to the Ohio Replacement Program (lead-ship construction start moved from FY19 to FY21) have created concern within the supplier community. In response to the Navy's need for lower costs and quicker build cycles, many of the suppliers accelerated production based on the expectation that their workload would benefit from the Block IV plan (two ships per year, FY14 through FY17). The loss of the second FY14 Virginia-class submarine would create a workload valley and interrupt the current learning curve. The psychological impact from the revision to what has been a period of predictability and stability is significant, and is causing recollections of the Seawolf Program termination with many in the supplier base. Many are very cautious and concerned.

Surface Ship Industrial Base

Not unlike the submarine industrial base, the surface combatant ship supplier base has challenges. BIW maintains a supply base of roughly 3,000 suppliers in 47 states to secure goods and services needed to construct our complex products. Over a third of these suppliers (1,100) are small businesses. While most of these suppliers remain healthy, declines in U.S. Navy shipbuilding have caused a few companies to cease operations. Some companies leave the military market, and many others attempt to diversify their product lines to make non-military products a much larger portion of their portfolios.

While diversification is good news from the perspective of sustainability in a constricted market, the incentive to invest in specific facilities and tooling to support Navy programs, and the ability of the prime contractors to obtain favorable schedule and pricing agreements, is diminished. For example, a raw material and component market base (excluding major equipment) that 10 years ago was nearly 100 percent competitive now contains a significant single- and sole-source element for more than 65 different materials and components used in surface combatant construction. Today, roughly 29 percent of the value of raw materials and components used by BIW in surface ship construction is committed to single- or sole-source suppliers.

Recent announcements regarding proposed multi-year procurements of DDG-51 class ships are welcome news to the surface combatant supplier base. It is important to send this message of stable sustained programming for ship construction to promote affordability and a constant supply of needed raw materials and equipment.

Finally, to promote cost savings, BIW executes the establishment of supply contracts for configuration-managed major equipment useable by the surface combatant shipyards to secure Economic Order Quantity pricing for class programs such as the DDG-51 and DDG-1000 programs.

The auxiliary ships delivered by NASSCO are built to commercial standards, which allow for a more diverse potential supplier base than the surface combatant ship programs. With literally thousands of large commercial ships being constructed worldwide on an annual basis, NASSCO enjoys a healthy supplier base. However, low quantities and long timelines in between firm orders on programs can significantly reduce the number of bidders, constraining our ability to drive to the lowest possible price. Serial production runs provide the best incentive to the supplier base to continue to participate in the U.S. Navy surface ship market.

To ensure the continued health of our shipyards and to shore up, where weak, our supplier base, we must have predictable ship programs in sufficient volume. Reductions in ship buys once the program is on-going, or gaps between classes of ships, will drive businesses out at all levels of the industrial base.

Summary

In summary, Mr. Chairman, the shipbuilding industry has benefited from the Navy's efforts to stabilize their shipbuilding plans and address their program requirements. Likewise, significant cost savings have been realized by the actions of Congress through authorization of multi-year procurement contracts, advanced procurement and advance construction funding. To fulfill our role, General Dynamics' shipyards will remain dedicated to delivering high-quality ships to our Navy at the lowest possible cost.