

NOT FOR PUBLICATION UNTIL RELEASED BY
THE HOUSE ARMED SERVICE COMMITTEE
SUBCOMMITTEE ON SEAPOWER AND
EXPEDITIONARY FORCES

STATEMENT OF
C. MICHAEL PETTERS
CORPORATE VICE PRESIDENT AND PRESIDENT,
NORTHROP GRUMMAN SHIPBUILDING, INC.

BEFORE THE
SUBCOMMITTEE ON SEAPOWER AND EXPEDITIONARY FORCES
OF THE
HOUSE ARMED SERVICES COMMITTEE

ON
IMPROVING SHIPBUILDING EFFECTIVENESS

JULY 30, 2009

NOT FOR PUBLICATION UNTIL RELEASED BY
THE HOUSE ARMED SERVICE COMMITTEE
SUBCOMMITTEE ON SEAPOWER AND
EXPEDITIONARY FORCES

Chairman Taylor, Ranking Member Akin, distinguished members of the Seapower and Expeditionary Forces Subcommittee, thank you for inviting me to appear before you to discuss what I believe the shipbuilding industry needs to be successful.

In several previous appearances before this subcommittee, I have discussed at some length the particulars of work that has been and is being performed at Northrop Grumman. Our skilled craftsmen and women continue to do what they have always done building the ships our Navy and Coast Guard need to perform their national security missions. We are proud of our shipbuilders and the ships we build.

Since my last appearance before this subcommittee, Northrop Grumman has merged the two sectors within the corporation where shipbuilding is performed – formerly Newport News and Ship Systems – into one sector, Northrop Grumman Shipbuilding. It is my distinct honor to lead this new sector of some 40,000 men and women who are designing, building, repairing, refueling and maintaining ships of nearly every class in the fleet at four shipyards and three other industrial sites in the US. We are now the largest industrial employer in the state of Virginia and the largest private employer in the states of Mississippi and Louisiana.

With the creation of the Shipbuilding sector, we now build ships for both the Navy and Coast Guard. I will focus in the remainder of my testimony on the Navy given the dominance of Navy programs in our shipyards, but the same points could generally be made regarding our Coast Guard programs.

We Need a Healthy Shipbuilding Industry

Let me begin my discussion of shipbuilding issues with a few assertions that I believe to be true and with which I expect you would agree. First, even in this age of “overnight delivery” and instantaneous and continuous communications, the United States remains a maritime nation. It always has been and, I expect, always will be. Most of our imports and exports, as well as much of the oil which fuels our industrial strength, come to us by sea. This leads directly to my second assertion – to ensure unhindered transit in the global sea lanes, the United States needs a healthy

Navy. We have only to consider the case of our good friend and ally, the United Kingdom, to see what can happen when a great power allows its mastery of the sea to deteriorate. Third, a healthy Navy requires a healthy shipbuilding industry. In June of this year at the Naval War College's Current Strategy Forum, the Chief of Naval Operations, Admiral Gary Roughead responded to a criticism that "American shipbuilding is broken" by saying simply, "I really take exception to that." He went on to say that a broken industry could not build ships like *Virginia*-class submarines or nuclear aircraft carriers. I share the CNO's views on this point. The shipbuilding industry is not broken, though it is not as healthy as it could and should be. The healthier we are as an industry, the better we can serve the needs of our Navy and the American people.

So what then does a "healthy shipbuilding industry" look like? In more than 25 years in this business, I've experienced the "highs" of answering the call to build a 600-ship Navy and the "lows" of having good ship programs truncated after we had invested our shareholders' dollars to be prepared for the work, but before we ever realized a return on our investment. These experiences, and everything in between, have taught me that a basic definition of a healthy shipbuilding industry is one that is able to attract capital, talent, and technology. Without these three key elements, no amount of good intentions or expenditure of effort will produce the kinds of results we, and the Navy, need.

Nor should we forget that a healthy shipbuilding industry depends heavily on a robust supplier base for the many thousands of components, parts and pieces which eventually become what makes these great ships run. When suppliers can not attract capital, talent and technology, just like we must do, we find ourselves having to locate new suppliers, requalify vendors, and provide assistance to suppliers in many different ways both technical and commercial. The shipbuilding industry must be considered in its totality. Shipyards are key parts of this important industry, but there are many other parts that are also critical to its health and success.

You may have noted that my definition does not require or expect a completely stable, unchanging shipbuilding plan from our customer. While the ability to have a good idea of what is coming down the road is important, we must recognize that the Navy's requirements are not

static. In fact, the milieu in which our Navy must operate today is one of the most dynamic and changing environments we have seen in almost a century. The Navy needs a shipbuilding industry which can respond to changes in their requirements by being flexible and healthy. With the right mix and the appropriate levels of talent, technology and capital, the shipbuilding industry can support the Navy as it responds to changes in threat and mission. None of us want to have to manage a shipbuilding plan that is continuously changing and lacks a fundamental vision of the kind of Navy the nation wants, but our nation's adversaries are not locked in to a 30-year plan and we cannot afford to be either. We should balance the need for flexibility with the reality of long durations for design, facilitization, procurement of material from an already fragile industrial supply base, and, ultimately, ship construction.

Buying One Ship at a Time

The core of our difficulties in shipbuilding, in my view, is that, because of the nature of our political process and the acquisition regulations that guide ship procurement, the Navy generally must buy ships one at a time and it must pay for each of them up front. These requirements cause difficulties in at least two respects. First, who among us has the resources to pay the entire bill up front to buy assets which will last at least a quarter century and many half a century? We don't buy our houses that way and most people don't even buy a new car that way. Yet our system of procuring military hardware demands that the Navy do just that. Given this and budget realities, we wind up buying one ship at a time and this is the second significant difficulty we face as shipbuilders. The process of buying one ship at a time stifles investment and forces us to struggle to capture the talent, technology and capital we need as an industry. I will elaborate on the reasons for this in a moment.

All is not lost, however, for there are a growing number of ship programs where the Navy, with the support of the Congress, and especially this committee, makes multi-year, multi-ship procurements. The highly successful *Virginia*-class submarine program is an example of how we can lower costs and improve schedules by breaking the mold of one ship buys. I will return to the submarine program as an example of other things that can be done to ensure the health of our industry later in my statement.

Comparisons are often made between American shipbuilding for the US Navy and foreign commercial shipbuilding and the question is asked, “Why aren’t you (the American shipbuilder) more like them?”¹ I have visited some of these shipyards and was struck by the size and nature of their order books. In one yard I visited, they had orders for 300 ships. In an environment like this, the shipbuilder has an incentive to be innovative and to invest capital to lower their costs. Imagine, for example, that a shipbuilder with an order book of 100 ships decides that installing a new crane can improve the efficiency of production by one-tenth of one percent. When that savings is applied across the entire 100 ships, the shipbuilder’s new crane can be paid for completely. In my terms, capital is “free” to the shipbuilder in this instance. This is in stark contrast with the environment in which shipbuilders for the US Navy must operate.

Shipbuilders building ships for the US Navy who choose to invest in equipment or processes which would benefit the Navy by improving the ship or reducing construction costs must break even with this investment on the first ship where it is applied. This is not our choice or preference, but it is the harsh reality of working with government procurements. Allow me to give an example. On one of our recent aircraft carrier refuelings, several of our craftsmen developed a machine that could accurately drill the thousands of holes that must be drilled as part of the refurbishment of the catapult troughs in the carrier’s aircraft launch system for fewer man-hours than the existing, labor-intensive system where each hole must be sited and drilled by hand. Building this machine required the shipyard to invest some of its capital, but the anticipated reduction in man-hours required to perform this work on each successive ship was expected to be considerable. In fact, the tool did save us man-hours and the cost savings were applied toward the development of this new tool. Acquisition regulations, however, required us to bid the cost of doing this same work on all subsequent carrier contracts at the new, lower cost which resulted from using the machine. Thus, the only opportunity to recoup any of this investment we made was on that first ship even though our customer, the Navy, reaps the benefit of the savings on all remaining ships where the tool is used.

¹ The General Accounting Office addressed this issue in their May 2009 report, “Best Practices: High Levels of Knowledge at Key Points Differentiate Commercial Shipbuilding from Navy Shipbuilding.” The report points out many important differences in areas such as completeness of design at the start of construction, the amount of risk in contracts, and discipline, or the lack of it, in the change process. The report’s discussion of the business environment is also useful in setting the context of my comments which follow.

If the cost of the tool just equaled the cost savings achieved, we would break even on the first ship and the Navy would get a lower price on all future ships where this work was performed. If the tool had cost more than the first application savings, we, the shipbuilder, would absorb the difference in accordance with our contractual shareline with the Navy. If the tool cost less than the savings, the difference in savings would again be shared with the Navy according to our shareline. In none of these cases is there any subsequent benefit to the shipbuilder for taking a chance, being innovative, and making an investment. All the gain on future contracts goes to the Navy. Where then is the incentive for any US shipbuilder to make an investment such as this?

This lack of incentive stymies investment in machinery, tools, designs and people. Even when a shipbuilder believes making an investment is the right thing to do, the return on investment generally does not support shareholders' requirements for the use of their capital. Fortunately, in recent years we have seen increased recognition of this problem by the Navy's acquisition community as well as members of Congress. With the support of the Congressional defense committees, both the *Virginia*-class submarine program and the CVN 78 program, which is building the first of the *Ford*-class nuclear aircraft carriers, have benefited from new capital investment incentives the Navy has added in our shipbuilding contracts.

In the *Virginia*-class CAPEX program, the Navy has incentivized both shipbuilders to make capital investments we might not otherwise be able to make. These incentives require an up-front use of shipyard capital with an opportunity to earn an incentive if the improvement resulting from the investment actually delivers the savings that the shipbuilder has estimated over the life of the 30-ship class. As teammates in the *Virginia*-class program, both Northrop Grumman Shipbuilding and General Dynamics Electric Boat have proposed capital projects to the Navy and funded them from corporate resources. When the Navy agrees that the anticipated savings are being achieved, the incentive is paid by the Navy and split equally by the two shipyards. As a result, we are able to improve the expected return on investment for these capital projects – a requirement of both parent corporations for the use of shareholder dollars. This is also an example of the unique teaming arrangement between GDEB and NGSB which has worked so successfully building *Virginia*-class submarines. By splitting the incentive between the two yards, each team member's success is tied to the other team mate's giving both good

reason to share their ideas and find creative ways to improve the program together. At Newport News, the CAPEX program has played an important role in helping us prepare the facilities we need as the team increases production to two submarines a year beginning in 2011.

The CVN 21 program, which is completing design of the *Ford*-class carriers, the follow-on to the ten *Nimitz*-class carriers, was also provided incentives for the shipbuilder to make capital investments. We and the Navy have known that building aircraft carriers on uncovered platen areas and in the drydock allows the weather to impact worker productivity. We had no alternative, however, and had to accept these inefficiencies because we could not justify, in terms of return on investment, the cost of building new, covered facilities. By adding investment incentives to the CVN 21 design contract, the Navy helped improve our return on investment and supported a business case to spend our capital to build the new facilities. Today, thanks to these incentives, we have two new, large, covered assembly buildings at the head of our carrier construction dry dock which are being used in an improved and lower cost construction process for the CVN 78. We are now assembling and outfitting larger carrier units in these buildings and then using our 1050 ton crane to lift the units through the retractable roofs directly into the dry dock.

Serial Production is Key

Buying ships one at a time is the antithesis of serial production, which is the most efficient way to build ships and, in fact, most other manufactured products. While shipbuilding employs a considerable degree of automation, it is ultimately craftsmen who assemble the ship, route hundreds of miles of power and communications cables, groom and test its thousands of systems, and bring the ship to life. Labor cost savings are achieved when craftsmen are able to “move down a learning curve” by performing a task frequently enough that they improve their learning and performance with each recurrence. In serial production, management can ensure that workers – especially those performing more unique or difficult tasks – perform the same work on each ship they help to build thus accelerating their movement along the learning curve.

Thanks to the multi-year procurements Congress has supported and funded, the *Virginia*-class submarine program today is essentially in serial production and solid learning curve performance has been experienced for the last several ships. As the program ramps up to two submarines per year, or one submarine per year for each of the two teaming partners, cost savings and schedule improvements from serial production will be even more evident. At the beginning of the program, however, we were given a vivid reminder of what happens when a specialized workforce is disbanded because of the absence of work. At Newport News, delivery of *Texas*, the second submarine of the *Virginia*-class, in June 2006 was our first submarine delivery in ten years and required the reconstitution of our submarine work force. This was a difficult process and our cost and schedule performance on that ship was disappointing. With each successive ship, however, cost and schedule performance has improved dramatically. *New Mexico*, our third submarine delivery, is on track to deliver well before its contracted delivery date and some two years quicker than *Texas*. We are now working toward delivering submarines on a schedule closer to sixty months. The *Virginia*-class program is a text book example of the benefits of stabilizing a work force in serial production of a ship with a mature design.

Achieving learning curve savings on ships which have even longer construction times, such as aircraft carriers, is more difficult. Here a worker may do a complicated task on one ship and not do it again for another four years, depending on when the follow on ship began its construction. The longer the gap between the start of construction of these complex ships, the more difficult it is to achieve learning. In effect, ships such as carriers begin to look like “one of a kind” ships or a series of successive “lead ships.” Given the demographics of skilled shipyard craftsmen, this problem will be exacerbated as older workers with the experience of multiple ships over long careers begin to retire at an increasing rate.

The Paradox of Lead Ships

Every shipbuilder is faced with the challenge of lead ships. A “formal” lead ship is a good thing for shipbuilders since it means that a new type of ship has entered into production. If that ship is one of many of the same type over an extended period, working through the difficulties of building the lead ship will pay dividends when the other ships in the class enter production. At

Northrop Grumman Shipbuilding, we have built many lead ships in the last several years. I've already discussed how we had to reconstitute our submarine work force in order to build *Texas*, our first submarine in ten years. It is worth noting that because of the teaming arrangement with Electric Boat, we actually had two lead submarines – modules built at Newport News for *Virginia*, Electric Boat's lead ship, and *Texas*, our first delivery. I have also discussed CVN 78, lead ship of the *Ford*-class which is currently under construction at Newport News. In our Gulf Coast shipyards, we have built LPD-17, lead ship of the *San Antonio*-class expeditionary warfare ships; we are building LHA-6, the first LHA amphibious assault ship built since *Peleliu* was commissioned in 1980; NSC-1, *Bertholf*, the lead National Security Cutter for the US Coast Guard; and some commercial ships over the years.

In recent years we have seen an increase in what I will call “unofficial” lead ships. These are ships of the same general type as their predecessors which should, therefore, be able to benefit from learning and process improvements. But either because of major design changes or the extended period between the completion of one ship and the start of the follow ship, the second ship takes on many of the characteristic difficulties of a lead ship. We have worked through these issues in all our shipyards.

In the Gulf Coast yards, LHD 8, *Makin Island*, is one recent example of how the eighth ship in a class of ships can become a “lead ship.” This LHD amphibious assault ship followed construction of seven of the *Wasp*-class ships built in Pascagoula from 1985 to 2001. LHD 8, however, went through a series of major design changes that included replacing the steam powered propulsion system with a totally different type of propulsion system, all electric auxiliaries, an advanced machinery control system, new fire protection systems, and the Navy's most advanced command and control and combat systems equipment . Whatever learning had been established over the preceding 15 years was all but lost as LHD 8 became a “one of a kind” lead ship.

Similarly at Newport News, the aircraft carrier program experienced a continual opening of the gap between ship construction starts. Shipbuilders tend to focus on the relationship of launching one ship – christening it and moving it out of the dry dock to finish its outfitting at testing on the

water – and keel laying for its successor. With the laying of the keel of a carrier, the intensity of assembly of units in the dry dock accelerates dramatically and the ship begins to take form. When these two events are in proximity to each other, we are able to move our steel trades who are most involved in joining units together and erecting the ship from one hull to the next and benefit from learning and minimized disruption. As that gap widens, however, we must move these workers to other projects or, in the worst case, temporarily lay them off. There is an inefficiency that comes from moving people on and off similar work that hurts learning and risks increasing costs.

At two points in our recent history, the Navy engaged in a “two-ship” carrier procurement buying CVN 72 and 73 as one package and then, later, CVN 74 and 75 as another. This method of procurement enabled our shipbuilders to plan construction of the two vessels so that labor moved from one hull to the next in an efficient manner, facilities and footprint were used wisely and material was purchased at the best possible price by buying two sets at once. Procurement of CVN 76 in the mid-1990s created a gap of almost two years from CVN 75’s launch to CVN 76’s keel. CVN 77 followed with a significant amount of redesign and insertion of new technologies. The gap had now increased to three years. The combination of gap, new design and movement to a shipyard-wide enterprise resource management tool set the stage for CVN 77 to be our most difficult carrier in many years.

As CVN 77 was being built, the Navy found itself in the position of having to delay procurement of CVN 78, lead ship of the next class of carriers, twice. The original schedule called for an FY 2006 award for a October 2013 delivery. It was then slipped to FY 2007 for a 2014 delivery and again to an FY 2008 award and a September 2015 delivery. To mitigate the impact of significant loss of learning and redesign of the entire ship (except for the hull), the Navy has worked with us to provide capital incentives for new facilities which support improved methods of building the ship as I discussed earlier. The Navy also funded designing the ship in a computer-based “product model” environment. Using state of the art software, we are designing the ship in a virtual environment that depicts all the arrangements of the ships equipment and systems. Thanks to visualization techniques, this data can be used to generate a three-dimensional representation of the ship that allows engineers and designers, construction staff,

management, and our Navy customer to “walk through” the ship. In this way, we can identify interferences among systems that one might not have found previously on two dimensional drawings, review post-delivery maintenance practices, and rehearse the execution of build sequences and component installation. The result on CVN 78 has been levels of coordination and cooperation between designers and builders and between the Navy and the shipbuilder that had not occurred in the past. We believe the combination of these initiatives will help us overcome some of the inefficiencies which have resulted from the gap which now exists in carrier construction.

It is worth noting that different people view “gaps” in different ways – some focus on launch to keel comparisons, others on start to start, and others on delivery to delivery. Ultimately, each comes down to the same point: stretching the time between the construction of two ships of the same type which have lengthy build durations must be managed carefully to ensure all the implications of the stretch out are understood. Everything in a shipyard is interrelated and change in one area generally impacts other areas, particularly other ships.

Overcoming the Problems of Buying One Ship at a Time

The actions taken by the Navy on CVN 78 in close coordination and cooperation with the shipbuilder are excellent examples of things that can be done to help shipbuilders overcome the harmful effects of procurement delays, one of a kind ships, and lack of serial production. Given the fiscal environment we all must operate in today, shipbuilders, acquisition professionals, Navy program managers, Fleet customers and Congress must continue to look for opportunities to write “good” contracts that are based on realistic assessments of costs, a full understanding of risks, and recognition of difficulties imposed on shipbuilders with regard to capital investment, technological innovation and workforce development because we are buying ships one at a time.

In this brief testimony I have attempted to provide you with my perspective on the core problems that confront American companies building ships for the US Navy today. The shipbuilding industry is fundamentally sound. Collectively we have responded to the changing needs of our Navy throughout the modern era. We are not an industry that seeks handouts or special

treatment. We have modernized our facilities, provided our craftsmen the most up to date training possible, and put the most appropriate tools available into the hands of our engineers, craftsmen and support workers.

The shipbuilding industry is doing its part in sustaining the conditions in which we can serve the needs of our Navy and Coast Guard customers. What we ask in return is:

- Understanding of the issues which confront us;
- “Straight talk” about costs and the risks of programs – between shipbuilder and customers and with the American people;
- Willingness to change funding and procurement practices to break the cycle of “buying one ship at a time;” and
- Help in creating valid business cases that enable us to attract capital, talent and technology by providing incentives, cost sharing arrangements or other appropriate vehicles.

As a shipbuilder, there is no sight more satisfying than to see a great ship we have been working on for years sail away from one of our shipyards to begin its journey of millions of miles and thirty, forty or fifty years of service to the country. Working together, we can continue to ensure that when our sons and daughters are called upon to go to sea in defense of the nation, they will do so on the finest ships in the world built by the finest shipbuilders in the world.