Mr. John K. Welch

John K. Welch was appointed President, Electric Boat Corporation, and Corporate Vice President, General Dynamics, on October 2, 1995.

A nuclear submarine officer, Welch joined General Dynamics in 1989. Before he was named president, he was vice president for programs, with responsibility for program management of new construction (SEAWOLF, TRIDENT, and LOS ANGELES class ships); overhaul and repair programs; material acquisition; planning; and information technology. He was also program manager for the New Attack Submarine. Welch came to Electric Boat as vice president for program development, overseeing strategic planning and competitive analysis; program and product marketing; and high-technology program acquisition and management.

Prior to joining General Dynamics, Mr. Welch was Operations Center Manager, Submarine Science and Technology Division at Advanced Technology, Inc. (ATI). Responsibilities included advanced technology development in areas of submarine acoustics, quieting, hydrodynamics, combat systems, and machinery diagnostics; engineering; and logistics programs for in—service submarines.

Prior to joining ATI, Mr. Welch was Division Director for Maintenance and Information Engineering at General Physics Corporation. He was responsible for development of computer support service for nuclear utilities and maintenance and material management services for utility and government agencies.

Born March 8, 1950 in Waltham, Massachusetts., Welch earned a bachelor’s degree in aerospace engineering from the U.S. Naval Academy in 1972, a master’s degree in aeronautical engineering from the Naval Postgraduate School, and an MBA degree from Loyola College. Following naval nuclear power training, Welch completed tours of duty onboard USS Bluefish (SSN 675) and at the U.S. Naval Academy. He left active service in 1979 and retired from the Naval Reserve in 1992. Welch also completed executive programs at Pennsylvania State University and Northwestern University. He is a licensed professional engineer.

Welch has served on numerous professional and civic organizations including the Eastern Connecticut Symphony Orchestra Board of Directors, the United Way of Southeastern Connecticut Board of Directors, and Chairman of an American Society of Mechanical Engineers (ASME) division. He is currently on the Board of Directors of the Naval Submarine League, Board of Trustees of Bryant College, and the Advisory Council to the University of Rhode Island School of Engineering.

Welch is married and has two children.

Shipbuilder's Perspective

John K. Welch
President, Electric Boat Corporation

It is a real honor to be here and to be part of this celebration. In front of me sits the "Who's Who" of submarine warfare, those who set the standard for today's submariners. Congratulations to all of the DEVRON personnel, past and present, on your 50th anniversary. You have been an instrumental element in keeping our Submarine Force at the mainstay of undersea superiority.

This is a time for significant anniversaries. On February 7th of this year we marked the centennial of Electric Boat, which was established to bring completion to the HOLLAND which would revolutionize naval warfare. A year later when the HOLLAND was accepted by the Navy, the Submarine Force was born, a milestone that we'll all be marking in a big way next year.

At the end of World War II, the Navy had the foresight to establish the Development Squadron so that operational development could keep pace with emerging technical capabilities, making possible a critical combination to our country's Cold War victory. We are all proud of that accomplishment. There has never been any shortage of challenges at the DEVRON, and there will be no shortage in the future.

For the next few minutes I want to focus on our collective future, connecting our past to the challenges ahead. Our spirit of innovation has kept us technologically and operationally advanced and central to the Navy's need for 100 years. How will we keep that flame alive as we go forward? We are challenged to innovate in three different ways: in roles, missions, and operational practices; in our business and financial strategies; and in our technology, where we need to provide the platform flexibility to deal with those missions. All three of these elements

interrelate and demand teamwork. We are prepared to do our part in each interactively. As shipbuilders, we are prepared to lead where necessary. Because going forward, technology leadership is becoming increasingly invested in industry, I will spend most of my time in this talk on that element of this triad of progress. Technology, however, may be the easiest of the three to deal with. Indeed our technological cup runneth over, and our engineering staffs are brave with innovation. But do we have the will to drive into the open the new roles and missions and to sponsor new politically difficult strategies in our business and financial processes? Before addressing our technological future, I want to quickly reprise our history.

The first submarine, the HOLLAND, was bought by the Navy because it promised a low-cost and quick way to achieve leverage against powerful navies. To use today's terms, submarines were the asymmetric approach. The development and production of large numbers of long-range fleet type submarines in World War II responded to our Navy's urgent need to take the battle to the Japanese, even in their home waters where they controlled the air and the surface. Under the command of some truly legendary men, these submarines performed magnificently. In the post-war years, we answered the Navy's call for the design and production of the first nuclear powered submarine, an extraordinary challenge that involved marrying the all—important attributes of stealth and endurance for the first time.

Another huge challenge was to design and build the GEORGE WASHINGTON, the first in a long series of ballistic missile submarines that culminated with TRIDENT, which climaxed the Cold War and remains today as our nation's primary strategic deterrent. The Navy's requirement for more effective undersea warfare capabilities was met with a remarkable series of attack submarine designs with innovation after innovation, like Electric Boat's 637 class submarines and Newport News's versatile 688 class. The 688I vertical launch system provided an expanded land attack capability giving our modern war corps of the fleet a lot more bang for the buck, and it's clearly being demonstrated today. With its unprecedented combination of speed, stealth, and payload, the SEAWOLF class has reinforced beyond doubt the comprehensive superiority of our technology.

The Navy's current submarine requirements are more complex and demanding than ever, reflecting still-emerging military realities—the absolute need to construct our ships for lower cost. These submarines must be multi-mission capable and able to operate in support of the fleet in blue water and littoral operations. They also must be reconfigurable—adaptable to new technology with significant improvements in payload and sensor capability. Last year the Defense Science Board Task Force on the Submarine of the Future strongly endorsed the role of submarines in their ability to decisively influence events now and in the years to come. "Attack submarines," said the task force, "are a key and enduring element of the current and future naval force, a crown jewel in America's arsenal." They made the case for more, not fewer, SSNs.

So how do we get from where we are today, with our current force levels and capabilities and our current spending levels, to the future? The answer begins with the VIRGINIA class. These ships are the Navy's commitment to dominance in undersea warfare. Our industry is committed to produce ships that provide the Navy with the capabilities and flexibilities to perform its missions around the world. Industry's commitment extends further still, innovating our business practices to deal creatively with the politics of the program so that these ships are more affordable. The teaming agreement between Electric Boat and Newport News resulted from our diligent pursuit of that goal.

VIRGINIA class is exciting for a lot of reasons, not the least of which is its built-in ability to accommodate new capabilities and technologies. The key is modularity-modular design,

modular construction, and modular mission capabilities. This modularity will provide the Submarine Force with a class that gets better with each succeeding ship. In fact, continuous improvement of the VIRGINIA class has been mandated by Congress, requiring the Navy to build successive submarines that are more capable and more affordable than their predecessors.

Industry is challenged to perform. We must propose design improvements as new and better technologies emerge, so the design of a future class of submarines, in 2020 or so, can incorporate the latest, best, and most affordable innovations available, with the insertion facilitated through modular design. When the lead VIRGINIA class is delivered in 2004, it will redefine the state of the art in submarine capability, with numerous advanced technologies onboard and operational. These include lightweight one aperture arrays, advanced electronic support measures, nonpenetrating periscopes, photonics mast, advanced electromagnetic silencing systems, and mine detection and avoidance systems. Real-time links to offboard, underwater, surface, air, and space-based assets will give the ships unprecedented communication capabilities to participate in network-centric warfare. VIRGINIA's propulsion plant, a simpler yet elegant, compact design with much increased energy density in the life of the ship core, eliminates the need for refueling and saves hundreds of millions of dollars in life cycle costs for each submarine. Modular isolated deck structures and structurally integrated enclosures provide the acoustic and shock isolation that will facilitate the use of commercial off-the-shelf (COTS) technology, enabling the Navy to more cost-effectively keep the ship on the cutting edge of advanced processing. VIRGINIA's open architecture command control and communications and intelligence system will make particular use of COTS systems and components. Future enhancements will be facilitated by the ship's fiber optic cable system, which will provide for efficient plug-in/plug-out equipment integration. This whole approach to COTS will expand from electronics to other areas of the ship, increasing mission capability and affordability.

Along with the development of the VIRGINIA class, there is now under serious consideration a powerful concept with implications for both the near and longer term. The first four TRIDENT SSBNs are becoming available for conversion to an SSGN configuration optimized for precision strike in special warfare. Last week the Senate Armed Services Committee allocated start-up funds to begin design work on the conversion, which is very encouraging. We have a one-time opportunity to convert these ships to multi-mission SSGNs for a very affordable price coincident with the refueling. Retaining these magnificently capable ships in service for another 20 years not only provides the fleet with important covert strike and special warfare capabilities, but takes another step toward the future of the Submarine Force. The large tubes can provide tremendous opportunities for innovative payload deployment.

What lies beyond the VIRGINIA class? At the most recent submarine technology conference, several distinguished officials led by Dr. Paris Genalis implored us to build the case for the translation of the matchless stealth and endurance attributes of our submarines and the technological promise of the future into relevant war-fighting capabilities, those capabilities that we will need in the next half-century. "Our attributes," they observe, "are superb, but we must sharpen our focus on how these attributes are used to meet our national security needs." This translation must go forward on the basis of imagination and conceptualizing roles, missions, and operations; in creating and applying technology; and I must add, in revamping our business processes to gain maximum efficiency.

We, the Navy and industry, plan to evolve to the point of revolution the VIRGINIA class design through technology insertion. We directly participate in the Navy submarine technology development process, exploring radical ideas for their merit and their potential practical application for the future. The Navy-industry team is as tightly integrated through this process

as it has ever been. We are sharply focused on the path forward in payload through the DARPA submarine payload and sensors initiative. I am proud to say we are a participant on both teams selected by DARPA. We intend to apply every bit of our imagination to help redefine future submarine missions by the payloads they can deploy, both weapons and sensors—some of them flying, some of them swimming, some of them crackling through the ether.

The future submarine we envision will provided increased payload through external weapons. The torpedo room is the second most costly compartment in a submarine. It places high underway maintenance demands on the crew, and it places constraints on payload development and delivery with its requirements for launch or release through a 21 inch pressure hull opening. By placing weapons external to the pressure hull, as we've done in 688 and the VIRGINA class VLS system, these issues can be eliminated. In the near term, VIRGINIA class payloads will be familiar—ASDS, MARK-48, ADCAPS, and TOMAHAWK—with the capacity for systems and inventory like standard missiles and ATACEMS. Looking forward, however, these payloads are going to take on a distinctly futuristic look, such as super [cavitating] munitions, high energy lasers, high powered microwaves, and lethal pressure pulses to name a few possibilities. We'll be able to provide these capabilities by eliminating what has been called "the tyranny of the 21 inch tube" and replacing that traditional delivery system with a flexible interface with the water, a sort of bomb bay. Coupled with external magazines of rapid response weapons, this approach would give the battle group commander awesome fire power launched with near total stealth. We also believe we can extend performance and reduce cost through the introduction of permanent magnet motor-based electric drive, with its promise for a common propulsion plant throughout the fleet, surface and submarine, as the enabler for an all-electric ship. In the case of the future submarine, an external electric drive system integrated inside the stern as an integrated propulsion package will provide several benefits. It removes the costly shaft and alignment of current mechanical systems, allows better isolation of the hull structure, and makes additional improvements to stealth possible. Electric Boat is now leading a comprehensive industry team in the development of this technology. This e-drive system will make an all electric ship a reality, offering the flexibility that derives from putting propulsion power on the grid available for other functions, such as future weapons, launch and recovery systems, or covert recharging of auxiliary vehicles. Ultimately the all-electric ship would embody expanded war fighting capabilities with enhanced sensors, high-energy weapons, communications upgrades, and improved tactical maneuvering. There are also significant economic advantages to an all-electric ship. These include reduced total ownership cost, increased ship availability, and the capacity for continuous and affordable modernization. In fact, modular configuration design will allow ship operators to literally "plug and fight," as Admiral Bowman recently wrote. Envision hull modules connected only by an electric cable and a data fiber.

One of the more radical features of our future submarine is its double hull, a significant departure from past U.S. submarine design philosophy. This double hull design enables us to more affordably incorporate a variety of important capabilities for new missions. The Navy's requirements for improvements in payload capacity, stealth, and operational reach will be difficult to achieve affordably through a traditional design. While past studies of double hull have shown them to be more expensive, our more recent cost assessments indicate that through the new technologies emerging, a double hull platform is becoming the more cost-effective option to meet future warfighting needs.

The use of adjunct vehicles will be another characteristic of the future submarine. These vehicles will extend the reach of the undersea platforms, enabling them to conduct such operations as mine reconnaissance, electronic warfare, and intelligence gathering in areas that would otherwise be denied, operating as a mothership. The future submarine will give the joint

force commander the ability to covertly deploy adjunct vehicles, a capability possessed by no other platform.

The Navy will have other options as well. While all future submarines will retain a degree of multi-mission capability, I believe the fleet can comprise numbers of specialized submarine platforms. The ability to specialize within an affordable cost structure will be facilitated by increasing the modularity of the basic ship design enabled by technologies that are on the horizon today.

I hope I've entertained you a bit with a look ahead at some of our technological opportunities, but we have to get back to the difficult matter of future roles and missions in business and financial strategies. Without dynamic innovation in these elements, the capability that technology offers won't be realized. The industry is working hard on its part. The DARPA payload and sensors program, for example, envisions two technology teams centered around companies with leading technological capabilities in payloads and sensors, putting their heads together with submarine designers to conceptualize new technologies enabling new missions.

We need perhaps a 21st century version of Holland and Rice, marrying storage batteries with generators, motors, and a novel hull form to create the submarine, or the DEVRON creating an effective approach to undersea warfare using submarines and sonar. I believe the Navy-industry team is up to this challenge. Many cogent observers are urging us on. They sense the increasing possibilities for stealth and endurance enablers, but it is up to the Navy-industry team to articulate the way in which these enablers deliver the reality of military capability.

In business and financial matters, the overwhelming need is for integration. We need to see how dollars and operations and maintenance will go further if leveraged by ship construction dollars and vice versa. Integration and financial management—this is the responsibility of senior Navy and industry leaders to aggressively pursue. We need to take full advantage of the advanced design and engineering infrastructure already serving the VIRGINIA class to streamline the lifecycle support of the entire fleet—integration of design and engineering with lifecycle. We need to tie our R&D more closely than ever to application and technology insertion, pushing forward to new roles and missions. Processes put in place over the last three critical years to manage research and development need to stand, and they need to deliver, making good on promises of an integrated Navy-industry R&D process.

We are much too patient in achieving progress toward our twin goals of efficiency and effectiveness while we work our way through the murky cultural and political issues. We need to be able to fully utilize the budget we have in the most creative and effective way to produce submarines in the numbers we need with the capabilities that connect to the future.

Are we only submariners, or is that just part of being undersea warriors? Are we committed only to our glorious past, or are we ready to tackle our awesome future? I think we're ready, but we need to move forward as aggressively as we did with the introduction of nuclear power and the ballistic missile submarine.