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STATEMENT OF

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BEFORE THE

HOUSE ARMED SERVICES COMMITTEE

PROJECTION FORCES SUBCOMMITTEE

ON

NUCLEAR SUBMARINE FORCE: PAST, PRESENT, AND FUTURE

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Thank you for inviting me here today to testify on the past, present, and future of the Nuclear Submarine Force as well as to offer my comments on the current state of the nuclear industrial base. I appreciate the opportunity to discuss the advantages and evolution of nuclear-powered warships and the opportunity to discuss the stewardship of the national resource that is our nuclear industrial base.

Looking to the past, we see the Submarine Force with a remarkable record of evolving through technical, strategic and tactical change. The Submarine Force came to life in 1900 with a limited submarine built for harbor protection and defensive duties. WWI taught us that the submarine is a potent offensive force, from which we adapted our designs to the introduction of the improved "Fleet Boats" in the 1930s. During WWII, the utility of the Submarine Force became more evident. While the Fleet was reconstituting following the losses of Pearl Harbor, the Submarine Force took the fight deep into the Pacific.

Admiral Nimitz later said:

When I assumed command of the Pacific Fleet on 31 December 1941, our submarines were already operating against the enemy, the only units of the Fleet that could come to grips with the Japanese for months to come. It was to the Submarine Force that I looked to carry the load. It is to the everlasting honor and glory of our submarine personnel that they never failed us in our days of great peril.

Innovation and adaptation continued following the war, as the advent of nuclear propulsion enabled, for the first time, sustained submerged operation. Admiral Hyman G. Rickover, having recognized the tremendous potential of nuclear power in applications for naval propulsion, applied the full force of his engineering intellect and energy to deliver this capability to the Fleet.

Over 50 years ago, on January 17, 1955, USS NAUTILUS (SSN 571) put to sea and signaled the now famous report, “Underway on nuclear power.” NAUTILUS revolutionized undersea warfare. The unrivaled tactical advantage of a force of submarines freed from the air-sea interface validated Admiral Rickover’s vision, enabling submerged transit at high speeds for extended periods, operation of increasingly capable sensors and weapons systems, and support of a safe, relatively comfortable living environment for the crew. Resources were mobilized toward the national endeavor of building a viable and sustainable industrial base—which in turn, would permit the operation of naval nuclear-powered vessels to become a reality.

Improved tactical sensors and the inherent stealth of the nuclear-powered submarine enabled it to become a vital military platform during the Cold War. The Nation invested heavily in developing the tools, expertise, and knowledge to put our Submarine Force at the leading edge of sustainable nuclear technology. This investment enabled the technical superiority of our force to overwhelm the Soviet’s simple calculus of numerical superiority. Our attack submarines were an effective, ever-present counter to Soviet ballistic missile submarines, while our SSBNs provided the Nation’s only truly *survivable deterrence.* We designed, built, and operated submarines that outclassed the competition in a conflict with the highest possible stakes.

Like the war in the Pacific, the Cold War was won to a great extent under the seas. Submarine technical superiority and innovation were vital to those victories. Just as it was during the Cold War, this national resource—mastery of advanced nuclear technology—remains a formidable advantage in the current security environment.

Today, the Submarine Force once again has adapted to the Nation's need. Not only are our submarines actively engaged in the Global War on Terrorism, they are also poised to provide the combat power and tactical advantages against potential adversaries, ranging from transnational threats to potential peer competitors, today and in the future.

Although I realize this hearing is focused on submarines, I nevertheless feel obligated to address the impact nuclear power has had on our premier capital ship: the nuclear-powered aircraft carrier. With the commissioning of USS ENTERPRISE (CVN 65) in 1961, naval aviation experienced an equally dramatic leap forward in capability. Carriers were no longer tied to slow at-sea supply lines for propulsion fuel; the ability to rapidly respond across great distances has significantly increased the effectiveness and efficiency of our carrier force. While transiting, a nuclear-powered aircraft carrier can also refuel escorts, while the air wing continues to maintain its readiness. Nuclear-powered aircraft carriers arrive on station earlier, ready for the fight, and remain on station with unmatched sustainability.

Nuclear-powered aircraft carriers have nearly unlimited propulsion endurance, twice the aviation fuel storage capacity, and 50 percent more magazine space than fossil-fueled aircraft carriers of comparable displacement. Nuclear-powered aircraft carriers are far better able to sustain combat flight operations for extended periods of time, and demonstrate a significant and tactically valuable decrease in demand for underway replenishment.

Today's surge-ready Navy requires ships that are mobile, sustainable, and adaptable. As the number of our ships decreases, the premium on flexibility, speed to the fight, and endurance increases. As geopolitical uncertainties cast shadows of ambiguity on our ability to rely on forward bases on foreign soil—endurance, adaptability and sustainability become even more desirable.

As the Director, Naval Nuclear Propulsion, I am solely responsible for providing safe, effective, and reliable nuclear propulsion to the Navy. The availability of nuclear power for future operations is dependent on continued safe and effective operations, both at sea and in port. Today, the Naval Nuclear Propulsion Program supports 103 reactor plants in 82 nuclear-powered warships, the NR-1, and four training and test reactor plants. Since 1955, we have operated safely for more than 5,600 reactor years and steamed over 132 million miles.

Nuclear power is more relevant today than ever. The increasing cost of fossil fuel and the uncertainty over future supply will cause fossil fuel needs to be more of a strategic problem for our forward-deployed forces. Since 1997, fossil fuel costs to the Navy have increased by about 50 percent. Nuclear power enables our aircraft carriers and submarines to deploy anywhere in the world to protect our interests and deter aggression, and to rapidly change theaters of operation on short notice. It gives our submarines the stealth, speed, endurance and multimission capability they need to confront asymmetric threats in the adversary's "backyard," preemptively and covertly, including threats posed by terrorists.

Today, nuclear-powered warships are welcomed in more than 150 ports of call in more than 50 countries—in large part because of our record of safety. Safety is the responsibility of everyone at every level of the organization. Safety is embedded across all organizations in the Naval Reactors Program, from our Headquarters to equipment suppliers, contractors, laboratories, shipyards, training facilities, and the Fleet. Put another way, safety is mainstreamed. It is not a responsibility unique to a segregated safety department that then attempts to impose its oversight on the rest of the organization. Our record of safety is the result of long-term, deliberate investment in the material, design, and operational standards that characterize the Naval Nuclear Propulsion Program.

In maintaining our safety standards, we rely on a multilayered approach, which we call *Defense in Depth*. Our reactor designs and operating procedures are simple and conservative, but we also build in redundancy to compensate for the risks inherent in the operational environment. The systems and components are rugged. They must withstand battle shock and still perform. Most important, we bring good people into the Program and rigorously train them to demanding standards to produce skilled, confident operators.

A key aspect of safety is the use of high-quality materials and components, engineered and manufactured to the most stringent, exacting specifications by qualified craftsmen. These craftsmen and their manufacturing infrastructure comprise an industrial base that is unique and highly specialized.

In striving to deliver an affordable product, we cannot relent in the standards essential to safe nuclear propulsion. These standards apply across the spectrum of building and maintaining nuclear-powered ships. The most recent success with this approach was the delivery of USS VIRGINIA (SSN 774), the first major combatant designed since the end of the Cold War, and the first to use state-of-the-art modular manufacturing techniques.

The current state of the industrial base and its outlook for the future are important issues. The industrial base is comprised of three distinct elements: the nuclear component industrial base, the shipbuilding industrial base, and the design industrial base. The nuclear component industrial base includes those vendors and suppliers who manufacture the components for nuclear-powered ships. The shipbuilding industrial base includes both the public and private yards that support nuclear-powered warships. These yards must maintain sufficient numbers of craftsmen to build and maintain our ships, but they must also have the right mix of trades. My role in shipbuilding is setting and enforcing the standards for nuclear portions of the ship. However, these standards can be rendered moot without the shipbuilder skills necessary to implement them. Lastly, the design industrial base consists primarily of the engineers and designers who have the expertise and experience to design new classes of ships or modify the design of existing ships.

Today, I will focus on the issues we face in the component and design segments of the industrial base.

Component Industrial Base:

The nuclear component industrial base is unique and specifically dedicated to delivering equipment that meets the exacting standards essential to safe, effective, and reliable plant operation. Our Program has been closely managing this segment of the industrial base since the very beginning of the Naval Nuclear Propulsion Program, and it has been remarkably effective and flexible in adapting to the Nation's needs.

The truncation of the SEAWOLF program made it necessary to reduce the size of the nuclear component industrial base, moving from a substantial number of competitive manufacturers to a largely sole-source environment. For perspective, in 1990 the Navy had 13 companies manufacturing major mechanical nuclear components—today we have 6.

In 1992, we initiated a series of studies to identify requirements necessary to preserve the nuclear-powered submarine industrial base. My staff examined the nuclear component industry; then Assistant Secretary of the Navy (Research, Development, and Acquisition) and the Program Executive Officer for Submarines examined the rest of the submarine industrial base; and the Joint Staff studied submarine force structure requirements. All three studies supported the conclusion that low-rate production would be the minimum necessary to sustain the industry and that a construction hiatus created excessive risk of permanently losing the ability to produce affordable, quality submarines.

The Office of the Secretary of Defense also tasked RAND to examine the health of the nuclear-powered submarine industrial base. They independently concluded that low-rate production was necessary to sustain the industry. RAND based their conclusion on the fact that there is no civilian or commercial market for submarine or nuclear technology and that stopping production would quickly dissipate the skilled work force.

In 1994, Naval Reactors initiated a further study that validated a build rate of one VIRGINIA-class submarine per year could sustain the nuclear component industrial base. As part of that study, we evaluated the industry's workload and financial status. The findings of that study were consistent with the 1992 and RAND studies: namely, that "Buying less than one shipset [of reactor plant components] per year makes a difficult situation worse for the nuclear suppliers. Their ability to produce reliable components on time became increasingly uncertain, and the cost increased substantially."

The report explained that the low returns on assets experienced by nuclear suppliers would impact their long-term stability and decrease the likelihood of future reconstitution should they fail. It also addressed the need to absorb overhead over fewer orders, thereby driving up component costs and the cost of the entire program " . . . running counter to the Navy's commitment to contain program costs."

Based on those studies, and a commitment from the Navy to execute to a low rate production submarine building program, Naval Reactors worked aggressively and collaboratively with the vendors to reduce unneeded capacity and to strengthen vendor-customer relationships such that we could rely on them to deliver products that met our needs. For example, since 1989, we have reduced from two reactor core vendors to one, and the production hours at the remaining reactor core vendor have decreased from about 2.3 million man-hours per year to 1.5 million. During that same period, our heavy equipment vendor has decreased from roughly 1 million man-hours to an average annual rate of about 300,000 man-hours today. The action was timely, because the changes in demand experienced by the nuclear component industrial base in the years since the Cold War has been remarkable. New submarines have been authorized for construction at a rate averaging less than one per year. This compared with an average of eight per year in the 1960s, and about four per year in the 1970s and 1980s.

As a result, our key nuclear industrial base capabilities and skills have been preserved, albeit in a fragile state and absent the cost advantages of a competitive market. When it appeared that the Navy was ready to increase production to two VIRGINIA-class submarines per year, we readied our production facilities. The industrial base infrastructure is still positioned to support a decision to procure two VIRGINIA-class submarines per year, though this flexibility comes at a premium.

Aside from the premium for flexibility, there is an inevitable cost that comes with a small, dedicated, predominantly sole-source and sole-customer component industrial base. As the Navy buys fewer components than planned, the cost of those remaining components must bear the full burden of the contractors' fixed overhead—each unit becomes more expensive. In addition, changes in quantity of components ordered tend to create churn—churn that we have to pay for, both in real dollars and in credibility with our vendors. For example, we have paid, and continue to pay, our sole-source suppliers a substantial premium for the many times the Navy has decided to delay component procurements in order to redirect funding for near-term needs. Specifically, we would save about $70M per year, or about 8 percent, on VIRGINIA reactor plant components just in overhead if we were buying two shipsets instead of just one.

Further, since 1995, the start date for a two-per-year VIRGINIA-class submarine build rate has changed seven times. Each time a date moves to the right, we lose credibility with suppliers whose business consists largely of Navy orders, and in turn, this erodes their willingness to make investments for greater efficiency in the future. Further, there are the instances where our vendors have made substantial investment in specialized machine tools only to have them under-utilized in the absence of anticipated orders.

<u>Design Industrial Base:</u>

The design of a nuclear-powered submarine is a complex undertaking. It requires a large pool of talented designers and engineers, advanced technology, financial resources, and the expertise of an array of subject matter experts. Admiral Rickover understood the enormous investment required to establish a critical mass of these elements to design nuclear-powered warships. Fortunately for the Nation, this investment was well spent.

A proficient designer learns his trade through years of training and experience, and the skills are highly perishable. In the aggregate, the pool of scientists and engineers who are proficient design specialists constitutes a national resource that the Nation buys when it invests in new ship designs. Their skills are a critical enabler of our industrial base. If lost, or even if diminished to a barely self-sustaining level, reconstitution of this capability will be enormously difficult, if not practically impossible.

To that end, our submarine designers are working on affordability initiatives for the VIRGINIA-class and helping to design the next-generation aircraft carrier, CVN-21. Naval Reactors is also investigating options for reducing the cost of the future submarine power plants—which has the additional benefit of helping to retain the critical design talent that will be required to develop the design for the next nuclear-powered warship.

It has taken a peak of about 4,000 engineers and designers to develop a modern submarine design. In the past, this peak manning was achieved from a baseline of about 2,000 experienced individuals. The design and engineering workforce would then build over 5 years to the required peak manning and would train and mentor the next generation of submarine designers in the process. Presently, our force of submarine designers engaged in design work is about 2,200 (including 600 occupied with CVN 21 work) and is headed toward less that 1,000 by the end of 2007. The expertise resulting from our long-term investment is, today, atrophying. We must sustain a strategy that maintains the critical mass of the unique competencies of this vital national resource.

Conclusion:

The issue is one of how our Nation maintains the ability to design and build nuclear-powered ships today and into the future. Decisions made over the next few years—even on individual submarines and aircraft carriers—will have a great impact on the industrial base and our ability to produce the high-quality ships the Navy needs. We must sustain a strategy to ensure the design force may affordably start the next nuclear-powered ship design.

The first VIRGINIA-class submarine was just delivered to the Fleet. After substantial investment in research and development, design, and engineering, we should amortize that investment over a full class of ships. Efficiencies in the construction process will come with repetition and an associated learning curve, and that should lead to cost savings. Further, we should use our superb designers to investigate opportunities to employ technologies and innovative engineering to drive cost out of the VIRGINIA-class where it makes sense.

We have a nuclear component industrial base with a capacity of about two submarines per year plus an aircraft carrier about every 5 years. Our nuclear industrial base is not optimized to cost effectively meet the current procurement projections. Any further reductions in capacity would push the limits of viability and eliminate the modest surge capacity we have today. Therefore, it is vital that we take the necessary steps to reduce our costs and achieve savings for the entire VIRGINIA Class. This will require more vigorous and innovative solutions across all areas of our supply, design, and construction infrastructure.

For now, our approach to this issue is two fold. The Naval Nuclear Propulsion Program is, again, embarking on a study of the nuclear industrial base to ensure that we maintain the correct amount and type of capability, while exploring opportunities for realignment to yield savings and efficiency gains. Additionally, we are investigating options for future nuclear propulsion plant technology that can be applied to new ship designs or that can lead to more cost effective plants in existing ships.

In summary, our current nuclear-powered shipbuilding posture leaves us with a nuclear industrial base that is fragile, both in terms of viability and affordability. We must be willing to continue our financial investment to sustain the industrial base, or risk the irretrievable loss of this formidable capability.