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Center for Strategic & International Studies (CSIS) and Navy Historical Foundation’s Symposium on Nuclear Energy, Naval Propulsion, & National Security

2 October 2018

Admiral Richardson: It is great to be here in such wonderful company and topics centered around such a terrific idea. When you thought this up and asked if I’d support it, and I said not only support it but would love to be part of it. This is one of these talks that you sort of look forward to giving when you have the opportunity to do that.

I want to continue with our celebration of nuclear power. You’ve all seen this photo before. It was on the cover of National Geographic, and I think it gives you a sense of the excitement in the country that accompanied the dawn of nuclear power. Nuclear Task Force One. All of those sailors spelling out $E=MC^2$ on the deck of the Enterprise, celebrating our triumph as we harnessed the atom. We’re here to celebrate that triumph by looking back. And I’m mindful that I’m in the company of some world-class historians here, and I think that the best histories as the ones that can transport you back into the time when these decisions were made to get past this sense of 20/20 hindsight, to get past this sense of armchair quarterback, to put you in there and give you the sense that we are where we are with nuclear power right now, kind of a fundamental part of our naval power. None of that was preordained by any means at all. This was not a thing that was going to happen. This was a thing that would happen only through a combination of vision, a combination of hard work, and a combination of technical expertise that really made this happen.

And I thought as we appreciated this, I’d like to talk about sort of three areas. One, I just want to highlight the spirit of innovation and optimism that accompanied the dawn of this program, and really as an idea and an example of what this nation can do when it really puts its mind to it.

Then in addition to the nuclear propulsion program itself, I want to talk about how revolutionary this technology was at the time and remains today.
Then I went to spend a little bit of time talking about the system that was put in place that allowed this technology to flourish not only to achieve the wonderful potential of nuclear propulsion, but also to mitigate all of its risks.

So let’s think about the first area, the era of optimism and technical achievement.

If you step back and look at the history of the program, the beginning of the program, the speed of accomplishment is just truly remarkable. And you could probably pinpoint either the genome or the first beginnings of the program in a number of different places but I thought maybe a good place to start would be 1939. If you think about 1939, Franklin Delano Roosevelt was still the President, and the Nazis had just invaded Poland. And Niels Bohr and Enrico Fermi had just figured out that they could split a uranium atom using fission and that could yield an energy release. This was the very first idea of fission, 1939.

Within a matter of months, these were all the quantum scientists, the quantum physicists, very exciting time at in that world as well. Within a matter of months of realizing that fission, Albert Einstein and his colleagues penned a letter to President Roosevelt calling for watchfulness and, if necessary, quick action regarding this technology.

President Roosevelt, being a man of bold vision and imagination himself, set up the Advisory Committee on Uranium, immediately established, and so we were off and running.

Fast forward just a few years, 1942. The United States is fully engaged the war at this point. In the theaters, everybody’s watching Casablanca. Right? And there was Enrico Fermi still at it. And in 1942 on 2 December brought the Chicago Pile, critical for the very first time, under the University of Chicago Stagg Field, produced half a watt of power in 4.5 minutes. There are so many pictures of everything that go along with that, with ropes and pulling control rods out by hand. But this was sort of the very first example of a controlled fission in 1942, underneath that stadium.

Now you really have to strap in. You have to get your harness strapped in tight because it fast forwards very quickly. 1942 was the first criticality. 1946, Captain Hyman Rickover is assigned to investigate nuclear power for naval operations. In 1951, merely five years later, he received congressional authorization to build the USS Nautilus, a submarine that not
only can break the reactive critical, but can harness that power into a propulsion plant and put it inside of a submarine.

The keel was laid for Nautilus in 1952. She was christened in 1954, sponsored by Mamie Eisenhower, President Eisenhower’s wife, as a symbol for this Atoms for Peace and what this meant for the nation.

The submarine was commissioned 30 September of 1954 and we were underway on nuclear power in January of 1955.

So think about that time line right there. Right? 1939 to first conceptual theoretical manifestation, the first experiment that releases energy from an atom in a controlled manner, and 1955, just 16 years later, we are underway on a submarine with that technology. Okay?

Right now, I don’t even think we could do the paperwork in that amount of time. We couldn’t get the analysis of alternatives done and all the other stuff that characterizes modern acquisition.

It didn’t stop there, of course. We were underway under nuclear power in 1955. But in parallel to that the Polaris Missile Program started. So in 1956 that program begins. This was one of the programs which was really, again, founded on the technical optimism that characterized so much in that era, but particularly this program. So we built it. Just took a submarine that was designed to be an attack submarine, essentially sawed it in half, spread it apart, and put in a missile compartment, right? All this was working in parallel. We were designing the missile compartment, designing the submarine, making sure that it would not only sink but also come back up with that missile compartment inside of it.

In parallel we were building, designing and building missile technology that would be able to leave that submarine and reach a destination with some sense of accuracy thousands of miles away. We were putting in the guidance system, and we were doing the atomic weapon end of it. All in parallel. None of this foreseen. None of this deeply studied. But we had the sense that with the right people in the right jobs we could make this thing happen, and certainly we did.

1956 was the program start. 1960, the first launch of Polaris from the USS George Washington submerged.
In parallel with that we had the USS Enterprise, the first nuclear powered aircraft carrier. The biggest ship in the world at the time of its launching, and also the biggest power plant in the world at the time of its launching. Okay?

So eight reactors. The most powerful nuclear power plant in existence at the time. And sometimes we, as we think about shipbuilding today, we lose sight of the unbelievable advantages that nuclear power brought, both to the submarine and to the carrier.

If you just want to appreciate the Enterprise for a second and think about its power plant, the core of the reactor, the reactor plant. To give you a sense of the density involved. If you, the carrier is something like a Honda Accord, mid-sized sedan. The power plant would be the equivalent size of two D-cell batteries inside that sedan, and yet it produced power for 50 years.

Not only did it propel the aircraft carrier so spectacularly, but it also by virtue of that power density, allowed the ship to carry at least twice the amount of aviation fuel, ordnance and everything else, by virtue of the room that it created.

Because it was underway on nuclear power there were no exhaust gases from a combustion type of propulsion. Those exhaust gases would come out of the stack and precipitate on the wings of the aircraft which would accelerate corrosion of those aircraft. And so you get a maintenance boost in the air wing by virtue of not having to wash down the aircraft and take care of that corrosion.

The logistics force and the rest of the Navy was transformed just to keep up. We had to design an entire new class of logistics ships, just to be able to supply the Enterprise and allow her to reach her potential. And her development was as impressive as Nautilus. Keel laid in 1958, launched in 1960, commissioned in ’61, and on her maiden voice in 1962. Again, the speed that this nation can achieve if we put our minds to it is stunning.

As she moved down the James River, just to give you a sense of the excitement of the time, the people lined the river banks, several layers deep, to watch this marvel of technology that the United States had created, sail out to sea.
And of course there was more to it. This was our response at the time to, well, the Cold War was on and in full swing, and the Soviets had caught us, they’d stolen the march on us with Sputnik. So as we got our minds around what that meant, not only were we moving to recapture the momentum in the space race, inspired later on in the ‘60s by another visionary President, President Kennedy. Our immediate response was nuclear powered warships. This was one of our major counter-punches.

And so you saw a lot of publicity about the Nautilus going up under the polar ice cap and achieving a position underneath the polar ice at the North Pole, receiving a presidential unit citation for demonstrating where this submarine, with this technology, could go. It was possible to circumnavigate the entire globe submerged. And all of these things captured a tremendous amount of publicity as a symbol that we were in this Cold War, our technology was there, we were in it to win it.

To give you a sense of what this delivers, one of my very first responsibilities as the Director of Naval Reactors was to speak at the inactivation of the USS Enterprise, and I will tell you it was an event for the ages. We had 12,000 people show up for that. We spoke from one of the elevators of the ship. So 12,000 people are down on the pier, which was a magnificent sight. And among those 12,000 people were some of the people that had designed and build the Enterprise back in the ’50s and ’60s. Some of the people from Frank’s program, the Naval Nuclear Propulsion Program. There were plank owners. There were shipmates from the entire life of the ship that had spanned 51 years and 25 deployments.

And think about what happened in those 51 years. This ship was built to fight the Cold War. Her first mission was in the Cuban Missile Crisis. She was off helping and on station for that blockade. There were a couple of carriers in that effort. One of her sister ships, the USS Independence refueled in the same amount of time that Enterprise was underway, it refueled about 20 times and burned over five million gallons of fuel while she was on station. Enterprise could out-perform her in every dimension and burned no fuel.

Fast forward. The security environment changes. Enterprise doing duty off of Yankee Station off the coast of Vietnam. At 0700 on 2 December of 1965, Enterprise commenced her first air operations in combat. Raised in the super structure cover with people who were so excited -- newspaper reporters, VIPs, et cetera. And the Task Force Commander, Admiral Ed Miller,
transmitted the signal that, “I have the distinct honor and pleasure to announce to you that on the 2nd day in December 1965 at 0720 Hotel, the first Nuclear Power Task Group of your Pacific Fleet and the United States Navy engaged the enemy.” And Enterprise went on flying a record of 125 strike sorties and dropping another record of 167 tons of ordnance.

Fast forward again. She served throughout this dynamic and security environment, engaging and serving in Operation Enduring Freedom, commanded by then Captain Winifeld. In response to 9/11, I think Sandy you were on your way home, took a look at the news, left full rudder, 180 degree turn, back into the fight. On station, sustained. No need to worry about logistics in terms of fuel, power, et cetera. Ready to go.

Think about the life span of the ship. The first commanding officer of Enterprise was born in 1916, during World War I. And the decommissioning CO of the Enterprise was born after the ship got underway in 1966, four years after her maiden voyage. And during that time, the 51 years, an amazing span of service to our nation. During which time warfare completely changed and the personal experience of everybody on that ship from the dawn of aviation, really, to the 21st century warfare. The role of the carrier changed. It adapted. There’s something to be said about the virtues of near unlimited power and a monstrous payload. It’s adaptable to the changing tides of time.

In terms of the optimism, the technical achievements of the Naval Nuclear Propulsion Program, both in the undersea and carrier aviation, aircraft carriers. A stunning achievement on a stunning time line from the very first theoretical idea of nuclear fission to harnessing the atom and putting it to work in things like Nuclear Task Force One.

But still there was more. This technology spawned a technological revolution. You can have a debate at some point in terms of what constitutes a revolution, but I would say that one thing that characterizes a revolution is that not only does the technology move forward on its own, but it brings so many other technologies along with it. Nuclear power was such a technology. It wasn’t just the capabilities of reactors and payloads, but the possibilities that it opened up, spurred on advances in other fields.

So by virtue of being able to remain submerged for almost an indefinite period of time, now we were true denizens of the deep. We had to know that environment. So oceanography took
leaps forward in terms of what understood about the ocean. Ocean acoustics, leaps forward. Inertial navigation, leaps into action. Missile technology, leaps into action. Metallurgy, chemistry, all of it moves forward by virtue of being pulled along by the potential of the Naval Nuclear Propulsion Program.

In fact, today if you dabble in this you’re probably familiar with the chart of the nuclides which is still produced by the Naval Nuclear Propulsion Program. They still define the state of the art.

So we have a clear track record now, not only of a proven technology that has magnificent operational outcomes for the Navy and the nation, but also this force that pushes forward technology in so many other areas.

A third area I wanted to touch on this morning was just a system that was put in place to bring all of this about. These outcomes, as I said, did not just happen on their own. They were the combination of the long-term visionary leadership of Admiral Hyman Rickover who realized that the design and the manufacture, the assembly, the testing, the operation, maintenance, selection and training of personnel, were all highly interrelated. He had this vision, saw this thing at the systems level almost from the very beginning. And to tackle that system’s comprehensive vision, he set about creating an organization where problems were brought directly to the attention of people in authority with the technical knowledge to make those decisions. He created an organization, a system that unified authority, accountability and responsibility. The unification of not only technical authority but also regulatory authority, a partnership across the Department of the Navy and the Department of Energy. This cradle to grave responsibility accompanied with the tenure of the Director where you actually will have to own that job, own the decisions you make, live with the decisions you make and create a closed forum solution that brings home in a tangible way that boy, this really does reside with us. This may be, we were going to treat this like our last job. We were going to do it to the ultimate amount of our abilities. Not just the operators, but the designers, fabricators, contractors, everybody.

If you go to those private organizations that work with this program, there is a tangible atmosphere in the halls and amongst the people of those contractors. They too, consider themselves as part of the program. The walls have pictures on them. The history of the Naval Nuclear Propulsion Program. The Directors’
portraits are up there—except for mine because I only did three years—but they feel as much a part of this success, as much a part of the technical standards. All of them, you know, this is the atmosphere that Admiral Rickover created. Placed a premium on the technical expertise and high-performing engineering. And I’ll just quote him in a 1979 report. “The discipline in the Naval Nuclear Propulsion Program has been successful not because it involves military applications, but because I have insisted upon staffing the program with intelligent, motivated people who I hold accountable.”

What a recipe for success as we think about tackling problems today. As we think about maybe reaching that optimism, that technical optimism, that can propel us forward. I can think of no better quote, to center our minds and to allow us to put together organizations to move us forward.

So I think that’s where I’d like to just sort of bring the talk to a close. Above all else, the Naval Nuclear Propulsion Program serves as a tacit reminder and even more, an inspiration of what can be done with the right amount of imagination, the right amount of energy, the right amount of authority. The combination of this optimism, aiming for lofty and demanding roles, coupled with this organization and social structure, produced incredible and far-reaching outcomes.

The fundamental lessons taught by the early days and throughout the program applied today. The lessons of Enterprise, of Nautilus, of George Washington, applied today. The importance of adaptability. Adapting our own systems, the payloads and tactics, adapting to the enemy as well. The importance of power and ship design.

We’re seeing that today as we think about pulse power weapons, directed energy weapons. These are going to require immense amounts of power, and nuclear power ready to deliver.

The importance of scalability from putting a nuclear propulsion plant into a small submarine all the way up to powering an aircraft carrier. That spirit endures today. We have the USS Gerald R. Ford, a new aircraft carrier design underway on nuclear power. Her future will support the same sort of adaptability, the same sort of service to our nation that Enterprise delivered during her life.

The Los Angeles Class is another example of a long-sustaining program, still serving as the work horse of our attack submarine
fleet, even as the new submarine class, the Virginia, comes forward in increasing, increasing numbers and performing spectacularly at sea.

The Ohio Class SSBN which is the inheritors of the undersea leg of the Strategic Triad. She inherited it from George Washington and the first generation. Then we have the Ohio Class on alert right now as they have been every moment since 1960. And soon to be relieved by the Columbia Class moving forward in the future.

Submarine employment has changed since Nautilus. Converting SSBNs to SSGNs. Adapting the platform to the security challenges that we face.

Carrier aviation has changed. We have adapted to the changing security environment.

Like the USS Enterprise, like the nuclear powered submarines of the past, Gerald R. Ford and the submarines of the future will be around for decades to come. Like Enterprise, national security and warfare will change over those decades, and so too will lead the way as we employ that ship. The combination of power and payload will give us all the adaptability that we need. There is an inherent demand for those two virtues at sea.

So the Naval Nuclear Propulsion Program, as stunning as its past is, is by no means a done deal. It took courage and fortitude on the part of a few visionaries to make it happen, to bring it to life, and it will take courage and vision to continue to bring it forward and allow it to reach its full potential.

I believe that this revolution inspired by nuclear propulsion, nuclear power, is still unfolding and has tremendous potential for more service in the goal of peace and prosperity.

And beyond the remarkable circumstances under which it developed, beyond the history of operational achievements, the Naval Nuclear Propulsion idea represents what the team can accomplish with the right ingredients. A sense of optimism, indeed a bias towards accomplishment with a sense of urgency. The right people, technical expertise, held accountable, with the appropriate authorities to own something from cradle to grave with the attendant accountability.

As we think today about recapturing and gaining that sense of urgency in great power competition, we I think could do no
better than to try and seek to recapture, recombine these ingredients in nuclear power and elsewhere to be adaptable and agile, to find these revolutionary technologies where they exist, and to harness them and achieve remarkable outcomes.

So that’s my pitch for you today. It’s been a delight to kick this very important conference off. Thank you very much.

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