

Interview with Capt. John D. Zimmerman

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As Program Manager of the Submarine Combat and Weapon Control System Program (PMS-425), Capt Zimmerman's leadership, drive, and unrelenting pursuit of innovation resulted in the fastest, least expensive, and most significant improvement in Submarine Combat System capabilities in the history of the Submarine Force.

The mission of PMS-425 is to develop and acquire the combat and weapons control systems for both in-service and new construction ships. In late 2013, the submarine force decided to modernize the 1990s-era combat systems on Ohio-class submarines. As the PMS-425 Program Manager, Capt. Zimmerman realized that it would take until 2022 to modernize all ballistic-missile submarine (SSBN) combat systems due to the process used for developing software and hardware. Zimmerman challenged his team to come up with a plan to bring as much submarine combat system capability to the entire SSBN fleet — for as little money as possible — in one year's time.

Led by Capt. Zimmerman, the team managed risk, overcame setbacks, and with buy-in from the fleet, delivered the most capabilities ever delivered to the Submarine Force in such a short timeframe. Additionally, Capt. Zimmerman and his team inspired other organizations with what can be accomplished by those willing to take risks and be innovative.

Achievements include: • SSBN Tactical Control System (TCS) Upgrade. • Decoupling Hardware and Software to provide greater capability, at less cost. • Developing Tools and Partners for Innovation. • Innovative Leadership.

For his efforts he was awarded a 2015 Secretary of the Navy, Innovative Leadership Award, Honorable Mention. Capt. Zimmerman is currently the Deputy Command Information Officer at Naval Sea Systems Command.

CHIPS asked Capt. Zimmerman to discuss his ideas about innovation, leadership and his team's success in March.



Q: You led a remarkable project unprecedented in the history of the submarine force using the traditional process for software and hardware upgrades for nuclear-powered fast attack submarines (SSNs) and cruise-missile submarines (SSGNs), which is the Rapid COTS Insertion process that relies on the Technology Insertion (TI) process. Did you inject anything new or change the traditional processes in executing your project?

A: Absolutely. The Submarine Force has an excellent tradition of bringing modern commercial hardware and combat system software to our submarine fleet. The Rapid COTS (commercial off-the-shelf) Insertion (RCI) process is how we develop new commercial hardware and submarine combat system software for our SSNs and SSGNs. We basically have a two-year development cycle for both the hardware and the software. These processes are staggered by one year so that as you are finishing your hardware development you are just beginning your software development. This process has basically been used since 1998 and so now it is pretty fine-tuned.

Once the hardware and software is finished then it is delivered to the fleet via hardware modernizations which are quite expensive and take a number of months to complete. Our major change was to try to decouple the software from the hardware so that the software we developed would run not only on the latest hardware but also on some of the more recent hardware baselines. By doing this as soon as the software was ready, we were able to install it on the older hardware via really inexpensive software installations in just a matter of days.

In the past this was never attempted. To be fair, we weren't able to install new software on every one of the old hardware baselines, but by adopting this new approach we were able to bring capabilities 300 ship-years in advance of the traditional RCI process. To understand the calculation, if two submarines, got two new capabilities, 5 years in advance of when they were scheduled, that would be 20 ship-years in advance of the standard modernization plan ($2 \times 2 \times 5 = 20$).

Q: How often is the hardware and software typically upgraded in the submarine fleet?

A: On average every submarine in the fleet gets a new set of hardware, which brings new software, about every six years. By focusing on providing software that could work on hardware currently in the fleet, we were able to bring new capabilities via just software, where in the past submarines only got new capabilities when they were given new hardware.

Q: Would you say the skill mix was typical for a team of this sort? I read that you removed barriers to innovation for the team. How did you do this?

A: I'd like to give a nod to my former Deputy, Matt Severson, here. Matt was very talented. He was the one who came to me with the idea of 'decoupling software and hardware.' He explained to me what he was thinking — and all I had to do was say "Great, Matt, let's do it!"

I definitely had a number of other great people on my team — and I will beg their forgiveness for not mentioning all of them — but I don't think as far as talent goes we were dramatically different from any other program. What we tried to do was challenge the way we did business in every area. I talked a lot about how we bring value to the warfighter. And I really tried to instill in the team — that “we don't just do what the Captain wants” — I told them over and over that it's the logic that should rule what we do.

I really wanted everyone on our team thinking. I also wanted everyone thinking more about how we should take risks as an organization because I feel strongly that you learn the most when you take risks and try to challenge your team. It took some time, but I knew we were on the right track when some of my leaders started talking more about the value we were bringing and where we should take risks — or where we thought the fleet should take risks — and I knew that they actually meant it.

Q: Were your team members Defense Acquisition Workforce Improvement Act (DAWIA)-certified? Did you use risk modeling software to evaluate the feasibility of your plan?

A: Yes, all the team members held various levels of DAWIA certifications. We didn't focus on a lot of modeling. What we did was evaluate what high-value capabilities we could deliver to the fleet — in the least amount of time for the least amount of money. With this in mind, I challenged the team to identify where we should take risks.

During one of my submarine rides I observed that the servers were using only 7 to 8 percent of their processing capacity. It was clear we had excess capacity in our combat control system so I challenged our engineers to reduce the number of servers in our combat system. Initially their response was, ‘But we might need them someday,’ but eventually we were able to convince them they were not needed.

Another example of the risk we took is in software testing. In the past our standard period for testing was a five-day, 120-hour continuous test. I questioned why it was necessary to test for this length of time. If something required that length of time to fail, shouldn't we start to see system parameters to begin to trend in a way that would lead to eventual failure?

We didn't actually have to see the failure; we just had to recognize that the system had begun to operate in a way that would cause its eventual failure. By taking this approach we were able to reduce testing to 48 hours with no significant impact to the quality of our testing. Again, it is this questioning attitude that enabled us to get the most capability for the least amount of money.

Our testing facility is Naval Undersea Warfare Center (NUWC) Newport. In the past, for a software code change almost everything was tested. We tried to think more critically about what the software change actually affected and changed the testing plan to reasonably test those things with the most risk.

Another example of how we managed risk and saved money in testing was in the use of our contractors. In the past, the practice was to have a government representative oversee every test the contractor performs. We eliminated that by holding the contractors accountable for testing. We told our government representatives that they would only be used to oversee the most crucial tests. So we cut costs by not having government representatives present for every test. There were initial concerns, but good dialogue between our government representatives and the testers gave us the right balance of oversight.

Q: Did you have any naysayers on your team who were not convinced that the team could accomplish what you set out for them to do? How does an innovative leader handle the naysayers?

A: There is a funny story here. When we originally made up our plan for everything we planned to accomplish in 2014 and 2015 — we had a lot of people concerned by how much we were trying to accomplish. One organization wrote us a 10-page letter documenting all their concerns regarding everything we wanted to do.

Another talented engineer wrote me a long email that likened our plan to ‘trying to cross a canyon on a tightrope.’ I still have that email. The thing was, all these people expressing their concerns, were good people. They were talented at their jobs and their feedback to us was definitely meant in the best possible way. We took their feedback seriously — but at the time I didn’t think we had enough information to tell us we shouldn’t pursue our plan.

Any time you are trying to do something that hasn’t been done before, there will be plenty of well-meaning and talented people, that will try to tell you why you shouldn’t do it. I would say: don’t stop before you’ve even begun. So we acknowledged their concerns and welcomed them to continue to work with us as we worked our plan. We didn’t accomplish everything we set out to do, but we accomplished more than had ever been done before — and I think we can say that we ‘crossed that canyon on the tight rope.’

Q: What were their concerns?

A: That we would not be ready to deliver a quality product on time; that we were trying to do too much with the hardware change in the fleet. To their credit they worked with us throughout the entire project. In some cases we had to take corrective actions to move us in the right direction. In other situations, we decided some things would be a bridge too far and we removed them from the plan. But overall I think we knocked it out of the ballpark.

Starting with real concerns from people can help you figure out where you need to go, and the challenges that need to be addressed. But if you never work an ambitious plan you won’t succeed in accomplishing new things. Our team got stronger because we took on such an ambitious plan. We definitely learned from our mistakes.

Q: Can you describe how your team accomplished the combat system upgrade and how they overcame any setbacks?

A: You bet. As you noted — I had challenged my team how we might bring as much combat system capability, for \$1 million, in one year's time. Normally, PMS-425 has a budget of around \$150 million per year, so that \$1 million was only 1 percent of our budget. I think establishing a short timeline, and very limited funds, forced us to think about this effort much differently than we normally do.

Within just one month my team took the concept from being laptop-based to integrating just one new modern server into the legacy combat system. We really liked the idea because by doing this we could continue to use all the legacy combat system display stations, a critical hardware piece, and the one new modern server had more than 50 times the processing power than the legacy SSBN combat system.

The technical team did just enough work on the interface between the server and the combat system to make us relatively confident that we could make this successful — and then we were off to the races. In order for us to go fast we had to do a number of things in parallel. We needed to invite the fleet to come see the system demonstrated when it was still a long way from being complete.

At the time they saw the demonstration, the latency of our 'new system' was so bad that it took five to ten seconds after you clicked a button for the action to occur. It wasn't the prettiest of demonstration, but we told the fleet we were confident we could fix those technical issues, and so they said if you can we definitely want this system.

Other risks we took were we had to order all the computer servers and hardware we needed, at a cost of about \$300,000 — before we had any assurance that we would be able to get the system to work to a level of quality that would be acceptable to the fleet.

We had to get the Submarine Learning Center and the training community to update their training plans and curriculum before we were 100 percent sure the system would get installed on SSBNs.

In all these circumstances we were honest with our partners about what challenges we still had to overcome. We told them what we thought we could achieve — but we always made it very clear that there were no guarantees.

In the end, I think people were willing to take risks and join us — because the potential gain was huge — and the risks were small by comparison. That said, we did need key leaders in the Submarine Force who were willing to stand up early on and give support to this initiative. I think the support we received from Randy Craig and Capt. Dave Roberts from the Submarine Learning Center was key. Also, Capt. Rich Wortman from OPNAV N97, our resource sponsor, was another big advocate of this initiative.

For fleet support, Sailors and officers from the two SSBN force squadrons worked hand-in-hand with us, while Submarine Development Squadron 12 worked on the operating guidelines for the SSBNs.

But probably the best part of the whole initiative is that the people who were involved knew that what we were doing was real. Whether we succeeded or failed depended on their effort and input. I told them how important this would be to the SSBN Force if we could pull this off and they figured everything out. They were solving problems every day, and challenging the way we do business and how long things normally take, and you could just see how fired up they were to be part of this project. It was awesome.

In the end, we were able to do all the development and testing, and install the new hardware and software on 11 of 14 SSBNs and in three training centers for a total cost of \$1.5 million — half the cost of a similar installation on just one SSN.

Q: Your nomination form for the SECNAV Innovation Leadership award states that you exhibit an unrelenting pursuit for innovation. Can you talk about the characteristics of innovative leadership? Can they be learned?

A: Absolutely. First I'd like to acknowledge my submarine heritage and training. One of the things I always enjoyed about being a submariner is that to me it still is like the sailing days of old where you get a mission and you have to go out and accomplish it, often times without being able to communicate. I loved having a team with me — where we had to think and overcome any challenge that was thrown at us. I think that sort of mentality, and critical thinking, really helps to develop a skill set that is open to innovative ideas.

Second I would say innovative leaders need to have the courage to challenge the way we do business in everything we do. I really believe innovation is like a muscle: the more you exercise it, the stronger it gets. But you have to be willing to exercise it. You have to have a mindset that no policy or process is beyond examination. Anything can be improved upon.

I think you also need to recognize that the greatest respect we can show to those above us is by backing them up — and informing them when we think there is a better way of doing something. As leaders I think the greatest respect we can show to our people is that we are willing to listen to them, and that the guidance we put out is always up for discussion.

If our people are going around saying 'Capt. Zimmerman said this...' I think we have failed. Think about how much more powerful it is when you don't attach someone's name or title to a decision and instead have to communicate the 'why' behind why you are doing something. To me, when you attach a title or a rank to a decision you are telling everyone: 'Turn off your brains, this is already figured out.' That really isn't conducive to the type of environment you need to inspire innovation.

Last, you've got to be willing to take risks. You've got to try new things. You've got to be willing to accept that what you are trying might fail. There is a great book by Eric Ries called *Lean Startup* and his basic philosophy is — when you are trying something new, and innovative, you won't really know if it will work or not, so the goal is to try things out in the simplest and fastest way possible so that you actually learn what works and what doesn't.

If I could see more of anything in the Navy today, I would hope to see more risk taking. More people trying new things. They don't have to be big risks. You can learn a lot from even small risks. We need more and more people at lower levels in our organizations taking small risks and being innovative.

We won't learn much if every innovative plan, or small risk, has to be briefed at the highest level of the command. There is a great book called “*Drive: The Surprising Truth about What Motivates Us*” by Daniel Pink. Basically people are motivated by three things: Mastery (getting good at what they do), Autonomy (being able to make their own decisions), and Purpose.

Innovation — which to me goes hand-in-hand with risk taking — hits two of the three things that Daniel Pink says are important: Mastery and Autonomy. If we are willing to take risks and try something new, whether we succeed or fail, we will definitely learn, so mastery will improve.

The CNO, Admiral Richardson, has been promoting ‘High Velocity Learning.’ Well, if you want high velocity learning I think you need high velocity risk-taking. As far as autonomy goes, just think about how fun, exciting, and inspiring it is when you are the one making the call on what will be done. That is definitely motivating.

It's not very motivating when your boss tells you how you are going to be innovative, or if every step along the way you have to brief everyone above you to make sure they are OK with what you are trying. As my 17-year-old son has said to me on a couple of occasions — “It's time to cut the cord,” when he thinks I am too overbearing about his risk-taking.

I think it is so crucial that leaders establish an environment where their people feel like they can innovate, that they can take some risks. They need to know that we have their backs and that we want them to develop their innovative skills.

Q: It's interesting that you think more innovation needs to occur at lower organizational levels in the Navy. Some would say that more innovation occurs at the deckplate — that officers are too cautious.

A: I hear what you are saying. Expertise is definitely critical to innovation, and a lot of times it is those on the deckplates with the most expertise. I'm not saying managers can't innovate, and they don't have to know everything about a process, but they have to have knowledge. Critical and innovative thinking has to be developed from the start. We do need followers that can take orders, but we need everyone to be thinking about how we should be doing business.

Q: The award nomination form states that you developed tools and partnerships for innovation. Can you discuss the tools that you developed and the partnerships you formed? Are they applicable in tackling any complex project?

A: Partnerships and new technology tools are both important. We really loved small businesses in PMS 425. We partnered with them in many different tasks so we could leverage the innovation that I think you often find in small businesses. Using these small businesses we improved our knowledge of important commercial technologies such as virtualization, auto-test/retest, and software code modernization.

We had a number of strong partnerships; one in particular was the Office of Naval Research (ONR). Dr. Kip Krebs, from ONR, has been doing some fantastic work developing a Mission Planning Application for operational planning, including intelligence, surveillance and reconnaissance (ISR) planning in the Navy. We were thrilled to partner with him so we could speed that capability to the Submarine Force. We found that with the new server we could do some pretty cool stuff.

So new technology is definitely important. It expands your set of technical skills and can lead to better ways of doing business. But I actually think partnerships are even more important. I think there are many different programs in the Navy that are working on similar areas. How can we better leverage the work that someone else has already done? I love it when I can benefit from other people's work.

Q: What are your thoughts on the ongoing efforts within the departments of the Navy and Defense to accelerate innovation? Do you see any new naval technologies on the horizon that could be game-changers?

A: To me innovation in the Navy and DoD is more about the culture than it is about some technology. I am all for trying a new technology — but what I really want is people engaged and thinking how do we bring forth better capabilities, for less cost, than we have ever done before? We need to give our people real problems and then step back and let them be creative with how they solve them.

We also need to support our innovators. Those who are willing to take risks and challenge the status quo are pretty rare. The last book I would recommend is *Thinking, Fast and Slow* by Daniel Kahneman. In the book, Professor Kahneman states that ‘Decision makers who expect to have their decisions scrutinized with hindsight are driven to bureaucratic solutions.’

It's that sort of thinking and second guessing that really squashes innovation. Most people are already uncomfortable trying new things. And if they feel they will be criticized for taking a small risk then they are going to go with the very slow bureaucratic approach that everyone needs to be briefed, and agree, before we try something new or take a small amount of risk.

We can't grow innovators in that sort of environment. So anything we can do to create environments that are more tolerant of risk-taking and innovation should be a priority. As we grow more innovators I think we should look to put them in jobs that are well-suited for that type of mentality. We should also promote our innovators ahead of those who are just content with the status quo.

We need leaders in the Navy, and our innovators are leaders. So overall I am thrilled that the Secretary of the Navy has placed such an emphasis on innovation. To me he is helping us establish the culture and the environment that is necessary for innovation to thrive in the Navy.

Q: You said that critical thinking skills and innovation should be developed from the start. Do you think that the Navy should offer a course for innovation?

A: In the submarine force we say the best training is actually by doing — by standing watch — that's when you really learn. The best way to innovate is to allow innovation to try new things and to create a culture of innovation. I definitely love good books, and training is certainly important, but right now I think our emphasis needs to be more on the doing, in terms of bringing more innovation, and innovators, to the Navy.

Q: What is your current assignment?

A: I am currently the Deputy Command Information Officer at NAVSEA. I am currently working a lot in the area of cybersecurity which I think is a perfect area for innovation. There is a lot happening today in cybersecurity and we need people who are willing to take risks and innovate — so we can learn fast and bring new capabilities fast — in order to keep up with the speed of our cyber adversaries.

I am a big proponent of design thinking — the idea that you need a solution that is well-designed for the problem it is facing. Our cyber problem is extremely fast and decentralized, so we need to create an innovative, fast and decentralized solution in order to best address it.

Q: I have heard leaders say that the cybersecurity workforce and problem needs the discipline and rigor of the Nuclear Navy. You are an interesting fit for the CIO position with your nuclear and acquisition training.

A: Nuclear discipline and rigor are good things to bring to any problem, including the challenging world of cybersecurity. However, I am concerned about 'one-size-fits-all policies' that are slowing us down when we should actually be going faster. I think we need to ask ourselves do we have a good strategy?

As an example, I would offer up the movie, ‘The Imitation Game’ about the quest to solve the Enigma machine, the Germans encrypting device, in World War II. The movie pitted Professor Alan Turing against a bunch of mathematicians and code breakers. Every day, the mathematicians and code breakers would scribble furiously on paper trying to crack the German code, and every day they failed.

Professor Turing realized a different approach was necessary and decided to create a machine to solve the machine problem. And, of course, Professor Turing succeeded. That’s how I see our current cyber problem: We have a lot of people pushing a lot of paper, very slowly. We can’t keep up with our cyber adversaries with that sort of approach.

We need to think about a solution and strategy that can better match the extremely fast, and decentralized cyber challenge we are facing. What better technical, operational, and process solutions can deliver us the most cyber value, in the least amount of time — at the least cost?

Capt. John D. Zimmerman is a Massachusetts Institute of Technology, Seminar XXI, Fellow and a 2012 graduate of the Kenan-Flagler Business School, University of North Carolina program: Understanding the Government-Industry Relationship in Acquisition. He is certified DAWIA Level III in Program Management.

Capt. Zimmerman is a 1988 graduate of the U.S. Naval Academy with a Bachelor’s Degree in mechanical engineering and a 2001 graduate of the U.S. Naval War College with a Master of Arts Degree in National Security and Strategy.

Capt. Zimmerman’s Submarine Force operational experience includes: •1988-08 – Served aboard two ballistic missile and two fast attack nuclear powered submarines. Completed nine strategic deterrent patrols and three Western Pacific deployments. •2006-08 – Commanding Officer of the nuclear powered, fast attack submarine USS JEFFERSON CITY (SSN 759). •2008-09 – Director for Intelligence, Commander Submarine Pacific Fleet. •2009-10 – Deputy Director for Intelligence and Special Operations, Commander Pacific Fleet.

Other Recognition: •2015 Secretary of the Navy, Innovative Leadership Award, Honorable Mention. •2015 NAVSEA Commander’s Team Innovation Award for the SSBN Tactical Control Systems Upgrade. •2014 Association for Enterprise Information (AFEI) government award winner for innovation, cost savings, operational impact, and cultural change.

Capt. Zimmerman has received two leadership awards: William Sowden Sims, U.S. Naval War College, and David Lloyd Submarine Officer’s Advanced Course.