Remarks by the Honorable Ray Mabus
Secretary of the Navy
Directed Energy Summit
Tysons Corner, Virginia
Tuesday, July 28, 2015

CSBA and Booz Allen, thank you so much for hosting this very important event. And perhaps we'll review a bit. The Department of the Navy is a leader in how we use energy, both as a resource and as a weapon. And as we continue to pursue the employment and advancement of energy use – and specifically as y'all are meeting about and I'll talk about today, directed energy technology – we intend to add more promising energy capabilities to the long list of innovations that make the United States Navy and United States Marine Corps what they are today: the most powerful expeditionary fighting forces the world has ever known.

Our Navy and our Marine Corps uniquely provide presence around the globe around the clock, ensuring stability, deterring potential adversaries, and providing our leaders with options in times of crisis. We're America's away team because of the ability of Sailors and Marines, equal in times of peace or war, not only to be in the right place at the right time, but the right place all the time. We get on station faster, we can stay longer, we bring everything we need, and we don't have to ask anybody's permission to get done what needs to be done.

Our ability to provide that presence is built on four fundamentals. People: our Sailors and Marines, and their innate ingenuity. Our platforms: the numbers of ships and aircraft and weapon systems. Power: how we fuel those platforms and how we use energy defensively and offensively. And partnerships: our strong relationships with industry, with our international allies, and most importantly with the American people. The advantage we have in each one of these areas, and the forward-deployed nature of the maritime services, make our Navy and Marine Corps absolutely the best.

But the superiority both in terms of technology and concepts that we enjoy today in all domains – over, on, under the sea – didn't just happen. There have been more than two centuries of collaboration and experimentation among people in and out of uniform, industry and academia, defining and redefining what's possible. In so many cases, together we have taken impossible ideas – or ideas that people said were impossible – and made them real. And nowhere is this more true than in the field of energy.

Now, any of you who have heard me speak know that I use this history. The Navy and Marine Corps pioneered energy transformation in this country – from wind to coal, coal to oil, and the use of nuclear for transportation. We relied on our people – people like Admiral Hyman Rickover, who partnered with General Electric to put nuclear power on our platforms. And today, we have them on all our subs and carriers.

Today we're using hybrid electric drives on our ships and advanced biofuels in our aircraft and our ships. We're experimenting with different kinds of fusion reactors. And we're creating seawater-derived fuels for our unmanned, underwater vehicles. We're harnessing things like solar and wind at our bases. And by the end of this year, we're going to have one gigawatt of alternative energy on our bases. That's 50 percent of all the power that we use. The goal was to have that by 2020. We're going to get it done five years ahead of schedule.

And by doing that, we're denying our adversaries the ability to use energy as a weapon against us. You don't have to look any further than to see what Russia is doing in Ukraine or what Russia is trying to do to Europe to understand how energy, directed or not, can be used as a weapon. And until recently, we've been vulnerable on the supply. Here in fiscal years '11 and '12, that vulnerability was shown when nearly $3 billion in unbudgeted fuel price increases came into DOD, the result of unpredictable and volatile oil and gas prices. This unfunded bill – and it was unfunded in the year of execution – impacted training, impacted operations, and ultimately could have impacted national security. Our shift in the Navy and Marine Corps to alternative energy has decreased our dependence on fossil fuel, not only saving us money, but more importantly saving us lives, giving us a strategic advantage against those whose ability to fight was contingent on oil.

But our focus in the Navy and Marine Corps has never been on just harnessing power for propulsion or consumption. In the 1870s, Albert Michelson, the very first American to win a Nobel Prize in physics – who, by the way, at the time he won was an instructor at the Naval Academy – first measured the speed of light. Since then, the Navy and Marine Corps continue to advance and extend our harnessing of the electromagnetic spectrum that led to defensive and offensive systems like Aegis, the electronic attack suite on the F-18 Growlers, and laser-guided precision munitions. And we've extended that leadership to the development of electric railguns and deployable laser weapons.

But I think it's also important to note we're not the only folks who do the things we do. Some others, although more basic forms, are using this technology today. Just two weeks ago, the USS Forrest Sherman, DDG-98, and her attached helicopters were repeatedly targeted by a laser from an Iranian-flagged merchant vessel. Last week I read in the paper, 11 commercial airliners were targeted with lasers in an airport in New Jersey. These are examples of how the world is getting faster and is changing exponentially—the world that is with, too often, the exception of the United States military.

A few months ago at the Annual Sea-Air-Space Symposium, I talked about the importance of reinvigorating the culture of innovation that's out there, particularly in the Navy and Marine Corps, in order to kick start, to accelerate emerging operational capabilities, to get them from the lab to the fleet, get them from the naval research and development enterprise into the hands of the warfighter quicker, faster, more efficiently. And an example that I'm going to talk about today is the electromagnetic railgun. It's

going to be on a Navy ship, finally, next year, but only for testing and only after several decades of development. That's just too long.

So I've directed the Department of the Navy to streamline in every way we can our acquisition process. All too often, we've found ourselves with rules and requirements that have nothing to do with the ultimate outcome of getting something to the warfighter and everything to do with protecting bureaucratic fiefdoms. So I'm calling on stakeholders at every level of the department, bring me solutions. And I've created a crowdsourcing platform to get the best ideas from the fleet to the decision-makers uninterrupted and unhindered by administrative chains.

I applaud the efforts from so many sources to make the acquisition process simpler and faster, to remove some of those bureaucratic obstacles and layers, and to prioritize responsibility and accountability in the process. If we don't free ourselves from the ever-expanding, ever-tightening hold of bureaucracy, if we don't set the pace on adopting change, if we continue to think and do in the same ways, by not being intelligent users of energy in all of its capabilities, then our days as the preeminent force in the world are almost certainly numbered. And we can, and we will, lose.

I think in this room it's safe to assume that you believe, as I do, that losing just isn't an option. So this morning I'd like to tell you a little about what the Navy and Marine Corps are doing to stay ahead of that curve; how our military, our industry and the American people hope to benefit.

As I mentioned, the Navy has always been a leader in energy, and directed energy is no exception. We built the first megawatt-class, high energy laser called the MIRACL – Mid-Infrared Advanced Chemical Laser – in the '70s, and we tested it with the Sealite Beam Detector in the '80s.

In 2012, a prototype laser was temporarily installed on the flight deck of the USS Dewey and successfully shot down three UAV targets. In 2014, we deployed the first operational laser aboard the USS Ponce in the Arabian Gulf. And it's from these successes that I think I and the Navy leadership recognize the potential utility, and by the way cost effectiveness, of directed energy weapons across a full range of military operations.

And I have developed – and I established the Navy Directed Energy Steering Group. This oversight group brings together senior leaders from across the department, from tech experts to resource sponsors to warfighters. And my task to them was to develop a departmental strategy and roadmap that prioritizes relevant missions, draws on S&T, draws on R&D, to support rapid and efficient acquisition of directed energy weapons. Deputy Secretary of Defense Bob Work approved the strategy in 2012 while he was serving as Undersecretary of the Navy, and I'm going to release a comprehensive roadmap this fall. This roadmap will chart our course for research and development in the field of high-power radio-frequency weapons, lasers and directed energy countermeasures.

I followed it up with my guidance for the program objective memorandum call for FY '18, which, importantly, will establish a resource sponsor and a program of record. This defined pursuit of directed-energy technologies are going to broaden the range of tactical options for warfighters, reduce costs, decrease response times, and create breakthroughs with commercial, nonmilitary application for Americans in industry ranging from construction to medicine.

And these tools provide a cost-competitive solution and have options because the variable intensity of directed energy gives commanders power to chose whether to deter, disable and or destroy using the same system. The cost of a single laser shot from our laser weapon system, LaWS, on Ponce is less than a dollar, compared to hundreds of thousands or in some cases millions of dollars in current self-defense capabilities. Railgun rounds cost about $25,000 each, compared to half a million to a million of a half for missiles. And unlike conventional projectiles, directed-energy weapons, as Michaelson learned, travel really fast, at the speed of light. I understand that's pretty fast.

High-storage-capacity batteries can serve us in the Navy as magazines, but they can also be a source of power for items like cars and buildings in the civilian sector.

Now, the applications of directed energy and the advantages are plentiful, but there's still obstacles to overcome. And the Department of the Navy, I would argue, is best positioned to address these obstacles right now. The size, weight, power and fuel required by contemporary directed-energy systems make naval vessels the platform of choice to operationalize this technology. Our ships are big enough to host large, heavy weapons systems. Our gas turbines can provide the magnitude of power necessary to make these weapons effective. And we've got all the saltwater in the world and the airless atmosphere to cool. And since the size of the fleet is increasing and it will be at more than 300 ships by the end of this decade, there's going to be plenty of platforms to put these on.

And because we are fortunate to have the world's largest amphibious force and second-largest air force all within our department, if we develop practical combat systems, we can employ them almost immediately under sea, on the sea, in the air and on the ground. Strategically, as a maritime force – one that is perpetually deployed, deployed to maintain that global presence – we're the one service capable of complementing the near-instantaneous effects of directed-energy weapons with near-instantaneous response.

Just look at the laser deployed on the Ponce in the Arabian Gulf. Not only has it proven its ability to withstand the intense heat, pretty intense humidity, a lot of the harshest elements you can find, it's proven that if it needs to it can defeat small boats and UAVs, it only takes one Sailor to operate it, and it's got a second use as a telescope.

The Office of Naval Research is using lessons from the Ponce to facilitate our solid-state laser technology maturation program. The Navy's produced 100- to 150-

killowatt laser prototype for at-sea testing by 2018, and we're seeing if we can shrink that timeline a little bit. Meanwhile, due to the exceptional capability demonstrated by LaWS on Ponce, we've decided to extend that deployment and continue to watch it in theater.

And now shifting from directed-energy to electric weapons, as I mentioned, the railgun has been a long time coming. But despite the slowness in getting there, we've now successfully tested a 32-megajoule railgun – 32 megajoules, the same amount of energy as the denotation of 11 pounds of C-4. That energy accelerates a 23-pound projectile zero to 5,000 miles an hour – so Mach 7 – in under a millisecond and propels it more than a hundred miles. If you want to make a comparison, the Navy's current five-inch gun has a range of about 13 miles, its rounds weigh a hundred pounds, and their explosive nature makes them more dangerous to store and to handle.

Next year, we're going to test the railgun at sea aboard the high-speed vessel USNS Trenton to validate its use on a mobile platform. During that test, we're going to shoot 20 projectiles, five of them GPS-guided hypervelocity projectiles, or HVPs, at targets 25 to 50 miles away. The Department of the Navy is continuing to lead the way. And we see opportunity to work with some of our most important partners as we keep moving forward.

So to our industry partners, we want to and need to work with you to improve the efficiency of these directed-energy and electric weapons. The smaller, the lighter, the cooler, the more energy-conscious we can make them, the better. We also need some help in developing adaptive optics and other atmospheric compensation techniques to address the harsh maritime environment, and we need smaller batteries that store more energy. For the railgun specifically, we need materials techniques and manufacturing technologies to produce long-life barrel rails and projectiles that can withstand the extreme aerothermal effects associated with Mach 7 instantaneous flight.

We need Congress to support the development of directed energy. But in all things, it's important to understand that while these weapons represent the future of warfare, they're not a cure-all. They're a part of a whole. And directed energy weapons, very frankly, have developed a stigma of overpromising and underdelivering. I think we're fixing that with the weapons currently in development, and they're a key component of our suite of operations. Today we're using these weapons to complement our conventional kinetic systems, with the long-term goal of enhancing their capability and effectiveness against the most challenging threats that we have.

But to do so, we need to maintain both our current gun and missile systems and integrate the next generation of weapons through a retrofit and/or reconstruction. And most important, we've got to work, and we've got to work together, to eliminate acquisition processes that take years because we're in a race that will be decided by nanoseconds. By embracing, supporting, enhancing directed energy solutions, we can break free of a process that simply aims to keep pace with the threat. We've got to stay ahead of the threat.

Directed energy can go beyond its envisioned role as an offensive and defensive tactical tool, and it can become a truly global deterrent. If we do this right, our fleet will employ 300- to 500-kilowatt lasers against over-the-horizon threats. We'll use railguns. We'll be able to strike at targets more than 100 miles away. And we will defend our people and our platforms with nonlethal things like high-powered radio frequency systems in every domain.

The prior chief of Navy once told me the difference between soldiers and Sailors is that soldiers look down. They look at maps, they see borders, they see obstacles. Sailors look up. They look at the horizon and what's beyond and what's possible. Like our Sailors and Marines, creativity, adaptability and willingness to take risks are the hallmark of this country. And we know the direction of this future, and soon we're going to have a roadmap to follow. But together, we've got to have the foresight and the commitment to make directed energy a strategic part of the new normal. From the Marines, Semper Fidelis, Always Faithful. From the Navy, Semper Fortis, Always Courageous. Thank you all.