**Chief of Naval Operations**
**Adm. Jonathan Greenert**

**Naval Future Force Science and Technology Expo**
**4 February 2015**

**Admiral Greenert:** What an introduction. I didn't know I was a historian and all that. I stayed at a Holiday Inn Express; you know how that goes, right? They say well, when you just say things and they seem to work out.

But I want to thank the American Society of Naval Engineers as a co-host here. I'm really honored to be here. It's one of the biggest places or fora I've ever spoken to with a crowd this size. It's great.

It's good to see team mates here from science and technology. I didn't come into this job with this thing for, if you will, science and technology and bringing stuff in. But what I've seen going out to our labs, going over to the Office of Naval Research and all that, told me we've got to get things moving. Not to mention when I look out there at potential adversaries and how they can turn things quickly and we're not as quickly as I would like to. There are reasons for that. Then I said you know, you're the folks that are going to make things happen.

Think about it. Over the next 15 or 20 years we've got to modernize quite a bit of the things that we did quite a while ago. In the '50s we put together our Strategic Nuclear what we call the Enterprise today. The SSBN. We didn't build the SSBNs -- I mean we built the first ones back then, and we replaced them with the Ohio, and now we have what we call, what else, the Ohio Replacement. We'll get a name; we'll get around to that. But it is somewhat, somewhat revolutionary, mostly evolutionary. But we've got to replace the bomber, the ICBMs, all this in the next 10 and 15 years. The Ballistic Missile Defense, the concept, the afloat concept for sure. We're still getting a lot of the ground -- I mean it's getting to its limits and it's time to move no quickly to the next phase.

Our strike fighter concept. We say okay, great, the Joint Strike Fighter, some of you are involved in that. What does the next fighter look like? I'm not sure it's manned. I don't know that it is. You can only go so fast. You know that stealth may be overrated. I don't want to say necessarily that it's over, but let's face it, if something moves fast through the air and disrupts molecules in the air and it puts out heat, I don't care how cool the engine can be, it's going to be detectable. So what will that next strike fighter -- You get my point.

A lot of this is going on over the next two decades. So we will turn to you for how things are going to get done. And you know the old saying. Hey, everybody, money is tight. It's time to think. That old saying is really back and right in front of us today.

Technology is proliferating kind of rampantly because it wasn't all that long ago that not many had a smart phone. I mean you had to be rich to have that. SatCom, satellite imagery. You had

to have a huge infrastructure for all that. But not today, as you know. It's commercial and it's cheap.

Unmanned systems, aerial systems, that was science fiction. That was a cool movie you'd see here and there, and now you get it for a Christmas gift -- an unmanned aerial system. You know, it's amazing where we're going.

So what's the point in all that? When I bring it together I say technological lead is perishable, and it will be for the foreseeable future. So we've got to stay out ahead, and it's us that will do that. People in this audience that will take care of that.

The situation was acknowledged by the Secretary of Defense recently. He called for innovation and support of a new offset strategy, what the Deputy Secretary calls our third offset strategy. I won't go into great detail about that. He had a pretty good speech recently, it's out there, for the Center for New American Security and I commend it to you. It's simple to read. He speaks straight to the point and it gets there.

So what can you do for me as the Chief of Naval Operations? First, my job is to organize, train and equip a force. Okay? It's Naval Operations. I sure wish I could do more naval operations. That was fun. And I know many of my fleet commanders say you think you're doing naval operations, but you should be organizing, training and equipping. But we need, I need relevant capability and a capable force for the future and I need confident leaders. So we'll go to work on a diverse force that is enabled, that is motivated and of course is proficient and confident. But I need relevant capability and that's where you come in.

Our science and technology investments are really the source of our war fighting advantage. You know that. That's where it's going to come from. You invent it, adapt it, employ it, and put together an emerging technology into something that is functional and useful. And I'd like to influence that and I need to communicate to you clearly, we need to communicate to you clearly, what do we need out there? I mean the days of hanging around and waiting for a guy in a lab coat to come in and yell Eureka, I think I've found a new whatever, I just don't think we have the time -- that's what I was talking about -- nor do we have all the money to do that.

So we're working on two time scales. The basic research, that's the long term. Many of you do that. That's good. But there's a short term, what I call speed to fleet. My predecessor Gary Roughead called speed to fleet. It's getting things out there and trying them out as soon as possible. I call it let's get wet quick. Let's get this thing out there. It will be orange and it may look kind of odd put together and won't have the nice slick red/gray paint and it won't be totally tested and it might fail, but we've got to get it out there and see what we can do with that.

You've seen examples on videos here. You're going to have displays of things. We're getting better at that and I want to keep doing that.

You have a history of game changers, of getting things out there quickly. The GPs, the Aegis radar and weapon system, the Hawkeye radar which took us from really a quantum leap in range, resolution, the ability to share that air picture, the towed array, to be able to separate from a

platform and all the noise that platform generates, a sensor, and then be able to expand what that sensor can get. It totally opened the undersea domain to us and it's a key reason why we own the undersea domain. But it's also the Achilles heel for our submarine sin the undersea domain. Quiet propulsion. Not only in our submarines but in our surface ships.

There's a great picture of the Zumwalt, really the one that's the most famous -- not famous, the common picture, and there's a tug just mooring it alongside up there. The key to that if you look at it is that that ship seems to be about the size of that tug, both on radar and on sonar. That's the degree of quieting that you all have put together for us on surface ships when you look at that in the future. So we'll continue to rely on you.

Let me just give you three things that are important to me. I could go up here and ramble on, but Matt Winter, I've got to give him credit. He said you've got 30 minutes. Get up there, talk, ask some questions, get the hell out of there. I'll get the real guy up here, Bob Ballard. Nothing like being a start-up band for somebody, the greatest explorer in the undersea domain.

But I digress.

Number one, you've got to get us off gun powder. Get us off gun powder and rocket propellant at sea. Not totally. It will take a while to do that. But you're leading the evolution and it's about that laser, that possibility that that laser which we're out there testing now, and the rail gun.

We will have an incredibly deep magazine when we can bring those in.

Probably the biggest vulnerability of a ship is its magazine because it's where all the explosives are. You hit the magazine, kaboom, that's where all those photos are unless you got hit by a torpedo. That shell hits that or that rocket hits it and you see the big explosion. That's it. Imagine getting rid of that. The safety on board, the logistics you take, and the cost. The cost of one of these shots on today's laser is about a dollar. Okay? That's not too bad. And we've demonstrated it on the Ponce. She's being demonstrated out there today. I like what I see. I happened to be out there in the Gulf. I saw it in late November and it's working pretty good. Bring that along.

Rail gun, $25,000 a round. You say that's a little pricey. Well a missile half its range is a million dollars a round. So that's a scale I can deal with and that we would love to have, and those projectiles, those of you familiar with it, we are making them able to do a whole host of things. The projectiles on a rail gun. So let's move ahead in that.

We're having a ship war demonstration in '16. I'm very excited about that. Those of you who have put that together, Dahlgren, et al, I thank you very much for that. I think that will demonstrate this capability and open the eyes of a whole bunch of people, both in industry and certainly in the Department of Defense.

So get me off gun powder, number one.

Number two, I need stamina in the unmanned, underwater vehicle propulsion systems that we have today. I need them combat, reliable, in their power and in their propulsion. But I need them safe and they have to be able to be handled and managed by sailors. We're doing pretty well in the air, but it's a hurdle in unmanned underwater vehicles. We need much more increased range and endurance so that we can expand the scope of the mission.

They're smart enough to operate; they need to be smart enough to operate effectively out there. That is they've got to be autonomous in the environment. So that autonomy and the software with an open architecture system will allow us to get moving in that.

So the advances that we need in the unmanned underwater vehicles are really right now all about the propulsion systems.

As our submarine numbers go down, and we're going to have a dip. It's inevitable. We built so many in the '80s, and as we replace them we're going to have a dip for about 12 years, from the mid '20s to the mid '30s. But even without that, we need to keep that dominance in the undersea domain. We need that network and unmanned underwater vehicles are key to that.

And then number three, I need you to lock your IT doors. Lock your doors in there, because you do it at home and you need to keep that mindset at work. Cyber security is a very key requirement for all our systems and weapons, and if you say to me, give me the two things that keep you awake at night, the first one I can't tell you because it's classified, but the second one is the losing of proprietary data on high technology from cleared defense contractors. It is just driving me crazy and I'm very worried about that.

So it's not just desktops. Its chips in embedded systems. If something has a circuit board it can be attacked and it can be extracted. The security has to be designed in. You can't bolt in afterwards. So we have to get into that earlier and earlier.

Cyber security including guarding your intellectual property is really key on high tech. So what's high tech today, you hand it over to us, it's highly classified tomorrow. I think you understand the vulnerability of that and losing that. Cyber theft is just hemorrhaging us.

So think cyber safe. Some of you remember sub safe. Think cyber safe in that regard.

So I'm counting on you. You are going to keep us on the bow wave of innovation as we move ahead. It's not necessarily something, the innovation, what I mentioned is not necessarily going to be digital and lightning bolts and sparks. We have a lot of great innovation going on out there and some of you are involved, just adapting our force packages that we put on our support ships. It turns a simple looking support ship all of a sudden into a great humanitarian resistance, disaster relief, or it's a ship that can support SEALs, Special Forces. It's a ship that can go save people, go in and get high value targets, terrorists, or pull people out of an embassy. And that's innovation.

So it comes in all sizes, shapes and forms.

Let me wop now and see if you guys have got any questions. I'll be happy to address the questions you might have. Thank you very much.

**Audience:** Good morning. My name is David Grober. I'm with a company called Motion Picture Marine and also Porpoise Robotics. We are a STEM robotics program that was actually funded in the initial by O&R. I would just like to get your take on further thing we can do and what we can do to get our upcoming generations excited about nautical engineering and technology.

**Admiral Greenert:** One thing for sure, in fact Dr. Ballard and I were just talking back stage about this. I may be taking a big piece out of his front, but so what? He can talk about anything.

We've got to get to these kids early. We've got to get to them by middle school. And so we have got to go out. Speaking for myself, a lot of people say hey, tell me about your STEM program. Bigger and bigger and bigger. Well, I won't be able to warm the ocean, if you know what I mean on this, but I think we all have to work together and give to them and get the interest and have them see that it's not just the mystique but the value of what we do and as it applies to science, technology, engineering and math, and how this world operates on STEM.

So it's getting earlier and earlier. So much of what we were doing for so long, we were after high school kids and college kids, trying to recruit them and we were shooting way behind that rabbit. And we can't do it ourselves, so it's very very much a partnership.

**Audience:** Good and I would like to invite you, if you come to the exhibition hall, to stop by Booth 103, Porpoise Robotics this morning. Thank you.

**Admiral Greenert:** Everything has a price, right?

**Audience:** Admiral, it's not clear that our country's investing enough in our national security with the budget woes, sequestration and so forth. Nor does that seem to solve our budget problems for the country. So I'm just wondering what you think about that, and are we really making the case to Congress that this is not the right way to go? And if we don't speak up for ourselves in the military to get the resources we need, no one else will do it for us.

**Admiral Greenert:** We have to have what I would call more of a national debate on this. The work that I do -- security, maritime security -- We're speaking to the defense committees and they've been nice enough to invite us to come up and speak. We were at the Senate Armed Services Committee last week. We'll go to the House and the appropriators and all, and hopefully other committees will invite us up there. We've got to have the debate and lay it out very clear, that if we go on the track, on the law that is written today called the Budget Control Act, we will dramatically drop the amount of investment, if you will, in defense. What does that mean? People are missing a point as I spoke to earlier which is there is a lot of modernization that needs to take place over the next decade. If we go to sequestration, that's a ten year event. All of that modernization just gets pushed out because what we'll be compelled to do will be, we'll scramble through supplementals and maybe some small increases like we've had on the Bipartisan Budget Act. The Bipartisan Budget Act enabled us to continue to be ready and do

very small amounts of modernization. Maybe 20-30 percent of what we needed. In the world I live in, I needed $10 billion worth. WE got maybe two, two and a half or three.

So we pushed out Joint Strike Fighter purchases. We pushed out weapons. We pushed out undersea things that we need to bring in. They have to be in the fleet in the late teens and the early '20s. That's when they're due. If we don't, we'll fall behind our adversaries. It's kind of clear. It's clear as that in some very high, important, I call it asymmetric capabilities, electronic attack, electronic warfare, cyber, anti-submarine warfare.

So all of these are pushed out. A lot of people look at the, yeah, but what about today? Will you be okay today? Can you go fight ISIL? Take care of Ebola problems? Protect the embassies and all that. Yes. Yes. We'll be able to do that. We have to look to the future and that modernization. We keep heading in this track, we'll get there. You set that course, you keep on that, you'll get there.

That's the part that bothers me. It's that late teens, early '20s. That modernization piece. And the biggest thing for us, looming, just staring right at us, in 2021 is the Ohio replacement, the first vessel. $9 billion right there. And our shipbuilding account on a good day is about $13, $14, may be $15 billion. So nine of it would have to go that one vessel. And we just replace the Ohio submarine. It's going to retire. It is on that track.

We've already taken it beyond its design years by five years due to the engineers who have figured out how to do that.

The Navy's not the only one. The Air Force has to modernize the bomber. We've got to look at the ICBMs. So I just said in my remarks, that's the strategic nuclear. That's homeland defense. That's pretty basic stuff. It goes on to other things, as I mentioned. Our TacAir and supplemental air, there's a host of things.

The Army's got modernization as well.

**Audience:** Patrick Tucker with Defense.

The next generation fighter, if you could say maybe three things that you want to see come out of that development process in terms of capabilities or just a change in the development process for a next generation fighter, what would they be?

The second question is when we talk about innovating for the world of 10 or 15 years, how would you rank the challenges that you think we'll be confronting either in terms of actual adversaries named and capabilities that they'll have, or just sort of a broader picture of what the challenge looks like to you in that time frame.

**Admiral Greenert:** The next generation of fighter I think has to have a manned and unmanned feature. So I think it needs to be perhaps interchangeable. Number two, it has to have an ability to carry a payload such that it can employ a multiple kind of spectrum of weapons, and it has to

be able to acquire access probably by suppressing enemy air defenses. Today it's radar but it might be something more in the future.

So my point to you today is, I don't see that it's going to be super-duper fast because you can't out-run missiles. And as I said, you can't be so stealthy that you become invisible. You are going to generate a signature of some sort in this science that we have today. So you have to be able to deal with that, and then you have to be able to employ weapons that are going to have longer range and be smarter and more of them. I believe we'll need to have to do more overwhelming of defenses, if you will. That's one way. Confuse it, or suppress it and provide a means of what I'll call access. You could say defeat anti-access, area denial; or you could say just give me joint access. It's really the same thing. Do you understand what I mean?

And the unmanned feature gives you more payload. Because the weight that we put on an aircraft due to the pilot is fairly extraordinary. You can take that off and put sensors on there instead. So I think with my hand waving and all that, that's my signal for modularity, if you will.

The potential adversaries of the future, I think weapon systems will continue to proliferate. I think that the undersea domain would be an area that folks are going to want to go to more and more in that regard. So I'd see that as a median in the future, a domain in the future that will be clobbered with, people will be moving into of course cyber. Those two. More of that, I think.

**Audience:** Good morning, sir. Midshipman First Class Craig, U.S. Naval Academy.

Sir, considering the recapitalization of nuclear forces is so expensive as you've said, is the strategic trident still a necessary and fiscally responsible concept for our national defense?

**Admiral Greenert:** It is as long as the country and the people that run it and determine what is the means for deterrence, they set the policy. So I think you need to decide what is the policy and what's the best means for the existential support or defense, if you will, of the country, and then you take it from there.

Right now it is determined that it is.

**Audience:** Good morning, sir. Thanks for being here. Laura Sellingman with Inside the Navy.

Could you please talk a little bit more about the rail gun, the advantages that it will bring to the fleet, the challenges that you see it combating. And then specifically, what platforms do you see it being fielded from?

**Admiral Greenert:** The platforms, I'll go backwards I guess. The platforms that I see it fielded from are those platforms that can generate the power to support the need -- a rail gun produces like electromagnetic pulse, so you've got to charge it up, then you have the pulse. Does that make sense to you? Okay. I don't want to insult you but at the same time if you say oh I don't know what he's saying.

Then number two, so you have to have power capacity. So right now if I were looking ahead I'd say the Zumwalt is probably, that thing has an amazing amount, in fact it has twice as much power generated than it will need for all the systems that are going to be on board that ship right now. Do you follow what I mean? Okay.

So that's the biggest challenge right there.

Number two, what do you use it for?

**Admiral Greenert:** Well, the mega jewel, that that thing generates when that projectile goes, it does so far, 100 miles is where we are right now, and you can generate enough of a shot after shot, you know? To do that. That's a 100 mile weapon.

Well, we ought to be able to extend that. We ought to be able to double that range. So now you're talking about naval gun fire support sort of thing or what was once a missile and now is replaced by that.

Now you look towards the accuracy of that, if that can become very accurate; and you look to the sky, you say why can't it knock down a ballistic missile then? If it has that much energy now how accurate can it be? And can you, if you will, steer the weapon and have it intercept?

So its original intention I think was naval gunfire support to augment it and replace it. It's becoming now, it's looking more like it can replicate a missile, maybe a cruise missile or something and then maybe knock something out of the sky. So as you can see, it's really expanding its potential.

**Audience:** Sir, Tara Kopp with the Washington Examiner.

According to reports the administration will release a new National Security Strategy at the end of the week. To what extent was the Navy's FY16 request shaped by this upcoming strategy?

**Admiral Greenert:** Quite a bit, because the Navy's budget supports the DOD, and its strategy. So we took a good look at the Department of Defense Strategy. You go back to 2012, we have what we call the Defense Strategic Guidance, then the Quadrennial Defense Review, so those two combined and written, if you will, integrated, and we looked to see if we reflect the National Security Strategy. And we're comfortable that we do.

**Audience:** Just a quick follow up, it reflects the coming National Security Strategy or the one that was previously on the books?

**Admiral Greenert:** The one that is coming up. We got a view of the draft to say take a look at it so that we weren't immediately out of line. So it is a reflection of that.

**Audience:** David Crouse, Naval Research Laboratory.

You were talking about the budget and how we have to focus our money, and one thing to keep in mind is, of course, we can't predict what Congress will do in the future, and programs might be cut. And one thing that I noticed when I started working at NRL was in the past there might have been programs that had good results, but when the funding was cut, basically at NRL or I know another example at Sandia National Labs, pretty much everything that happened was destroyed. And I have had to essentially reinvent the wheel in some instances because of that. So reports might be out but everything else, the data, the algorithms that were programmed are all gone.

So going into the future, I think that O&R might want to look at better archiving results, especially if a program is terminated, maybe trying to spend a little extra money for people to document and save it somewhere where people can find the results in the future.

**Admiral Greenert:** That concept, first of all, good point. I'm sure Winter's back here having a cup of coffee, but he's listening. You make a good point and I'm serious, because if we don't have enough money to bring to fruition all hosted programs, in my view, and we've put money in and I need to listen to you and then I need you guys to listen to me. There needs to be a communication. That is, we may be able to develop the capability to a concept and if you will archive it and put it on the shelf, to bring it out in better fiscal times or maybe when some of the technology supporting it is more mature.

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