THE BROOKINGS INSTITUTION

21st Century Defense Initiative

The Future of Unmanned Naval Technologies

A Discussion with Admiral Gary Roughead

Chief of Naval Operations

Monday, November 2, 2009

Washington, D.C.

Introduction and Moderator:

PETER W. SINGER, Senior Fellow and Director
21st Century Defense Initiative
The Brookings Institution

Featured Speaker:

ADMIRAL GARY ROUGHEAD
Chief of Naval Operations

* * * * *

ANDERSON COURT REPORTING
706 Duke Street, Suite 100
Alexandria, VA 22314
Phone (703) 519-7180 Fax (703) 519-7190

P R O C E E D I N G S

MR. SINGER: For those of you I haven't met yet, I'm Peter W. Singer. I conduct the 21st Century Defense Initiative here at Brookings. 21CDI wrestles with the changing forces acting on the age-old phenomenon of warfare, everything from changing actors, changing technologies, changing expectations upon warriors, changing doctrines, training programs, et cetera. In history, some of the most remarkable changes have been those that have been driven by technology like gunpowder, like the steam engine, like the airplane; technologies that force us to ask questions about not only what is possible that we didn't have to think about before, but more importantly, the human side of it, questions of what is proper, the right and wrong of everything from doctrine to questions around the laws of war. These moments, these technologies, are very rare in history; in fact, they're often oversold, but we may be living through one of these moments right now.

Today a young teenager is being invited to join the Navy through TV commercials that extol how the Navy is "Working every day to unman the front lines." That same type of TV recruiting ad is also being played out for anyone who's interested in joining the Army and the Air Force -- that is, you have the three services that are emphasizing unmanned systems in their recruiting efforts today.

Once they join the force, that young sailor will receive the latest in virtual training on everything from how to operate weapons system to how to deal with PTSD. Then once they enter into the force itself, if they're deployed into Iraq or Afghanistan, they may well us a PackBot or a Talon in doing route security and EOD work. If they end up in the surface force they may well end up for example on an Aegis class or an LCS that serves as a hub for everything from Fire Scout unmanned helicopters to Protector robotic sentry motorboats. If they career takes them into submarines, they may well end up using UUVs that help do everything from detect mines to surveil coastlines. Or if they end up in aviation, they may well end up in anything from the BAMS program Global Hawk to monitor sea lanes, to UCAS that explores the use of unmanned systems in carrier strike aviation. The point here is that young sailor not only will be engaging with technologies that as TV commercial, as that recruiting ad says, "Seems like science fiction but are in the Navy today."

But more importantly, that young officer will be begin to wrestle with questions that no one had to wrestle with before, everything from Naval doctrine to the laws of the sea. It's an amazing and challenging time and it's made all the more notable by the fact that it's happening in the midst of two ongoing wars and emerging global threats. So it's lucky for that young sailor as well as us here today that the Navy

has a leader like Admiral Gary Roughead in charge who it's our great honor to have joining us.

Admiral Roughead is the twenty-ninth Chief of Naval Operations and most importantly he brings to this discussion on unmanned naval technologies and their impact on the Navy not only a wealth of operational and command experiences including being one of only two officers ever to have commanded the fleets in the Atlantic and the Pacific, but also a reputation as a thinking leader dedicated to the mentoring of the next generation including having served as the Commandant of the Naval Academy from which he previously graduated.

Indeed, it was this ability to look both to the present but also to the horizon that has us doubly excited for him to join us today. Not only is the Navy moving forward in the use of these technologies, but it's also leading the way in the research and analysis of the questions that surround them under his personal leadership. For example, the CNO's SSG Group, Strategic Studies Group, at the Naval War College is examining the operational questions of the growing use of unmanned systems, while at the Naval Academy the Ethnics Program this year is focusing on the legal and ethical dilemmas that are coming out of using these technologies. So we're greatly looking forward to his views on this important area and very much want to think again for joining us.

ADMIRAL ROUGHEAD: Thank you very much, thank you for your kind introduction and the kind words about me, but as we all know, the Navy is made up of some great, great young people who I find my job is to keep up with that thinking. I often think of John Philip Sousa, the great band director, when someone asked him how do you make such beautiful music, and he said, It's really quite easy, but the hardest part that I have is knowing when to stop waving my hand to synchronize it with the end of the music. So in a way that's kind of what I do.

But it's good to be here to share some thoughts, and rather than simply give a description of everything we have going on, I thought it would be better from the standpoint of getting to a discussion afterwards to simply share with you some of the elements as I consider as we move into this new era of applying technology in new ways to warfare. I would also like to thank Peter not just for the introduction and Michael for making this possible, but also for the great work, Pete, that you've done in thinking about this, and more importantly, in being able to articulate it in ways that those of us who have a strong interest and see the potential in this area of unnamed systems, it feeds our process, so I thank you for the work that you've done in that regard. It's been truly terrific for us to be able to spin off of that.

Pete mentioned the Strategic Studies Group, and even though we in the Navy have organizations and structures that are always working on the various programs that are in development, for me, I am often stimulated in my thinking by those who operate outside of the normal bureaucratic process because it's important that we bring those ideas in, where we take ideas that perhaps had been considered or perhaps had not been considered and look at ways to bring that into the process. For me, the group that I rely on very heavily is my Strategic Studies Group that operates out of our War College in Newport, Rhode Island, a group that we assemble every year. They are bright senior officers in the grade of Captain, and then in recent years we've begun to bring in some more junior officers and some of our young Navy civilians into that process, and I would also say that we have representatives from the Air Force, the Coast Guard and the Marine Corps in that group as well.

When they come in I give them a 1-year project and they are tasked directly by me, in fact, since I have been the CNO I have personally written the tasking letter to them, and then they report directly to me at the end of their project, but doing the course of their work as they explore these new concepts and new ideas, I find it very helpful to meet with them in Newport or here on an interval of a couple of months so that I can benefit from their thinking and actually start to put that thinking into the

mix even before they're doing with their work. What I ask them to do is to generate revolutionary concepts in naval warfare and to focus on those concepts that have potential that we are not necessarily dealing with at the time. Over the years the SSG had evolved into what I would call some kind of very long-range thinking and when I became the CNO I wanted to bring that a little closer in to where we could make use of it because when you are talking about cyber warfare 40 or 50 years from now, I find that a little challenging to get my head around. Sometimes it's challenging to get your head around cyber warfare by the end of the fiscal year. So I think it's one that what I wanted them to do was to be able to use a naval term and to put a marker out beyond the budget years that we're dealing with, but so far out that one can question or even not be able to do anything about the work that they're doing, but put a marker out there where I can just see it and then that allows us as an institution to steer our efforts, to steer our investments not necessarily to what we would call a point target but, rather, to head in that direction where there is potential, where there is promise.

This year or last year actually I asked them to show how manned and unmanned will complement one another in the future, and for these concepts to be delivered in the 2020 to 2028 timeframe, things that we can begin to move in that direction. The reason that I said look at

manned and unmanned and how they will operate together is because even though we can move off and get very engaged in things unmanned, the fact of the matter remains that we will have for the foreseeable future manned systems in our inventory. It is not as if we have the luxury of flushing everything we have down the drain and starting anew. I make it very clear to the group when I meet with them and in the tasking that I send them to keep in mind that most of the inventory that we have today will still be around in the 2020 timeframe. Right now we're a Navy of 285 ships and in 2020, 220 of those will still be in service. So the things that we're talking about simply can't be that which goes on the move. It has to be adaptable in a way that suits us.

The other thing that I insisted on was that it has to be tempered and informed by fiscal reality. It can't simply be we have all the money in the world, let's go off and reinvent the universe and reinvent naval warfare without any consideration as to what the fiscal environment will have. But I don't want them to be doing budget lines or anything like that. It has to be informed. So I think those are some of the factors and the parameters that they have worked on.

I also made it clear to them that for the Navy, and I speak for the Navy, that unmanned systems have to address all of the domains in which the Navy operates, and I would say, I'm going to make a bold

statement here, I see a lot of my joint colleagues in the audience, the Navy uniquely operates in all domains on the planet. We operate on the surface, above the surface, into space, but then we operate below the surface. So when we talk about unmanned and as we as a Navy move forward in this unmanned world, it really needs to be taking into account all of the domains in which we operate, it can't simply be slivers, and as we knit all of this capability together and capacity together, it has to take into account that we're operating in all those different domains.

I would also say that as we have moved into this, we have some inertia to overcome because the way that we work on things in the Pentagon, the procurement system and the employment, just the culture that comes with the service, a culture that comes with an acquisition system, can affect the thinking and that's why I tend to rely more on the outside groups like the SSG to inform me in that regard, and it really requires that we do take a new look at how we employ and how we use these systems. It's very easy I think as we look at those unmanned capabilities in our minds to still think of them and to have operating concepts and doctrine that really is very grounded in a manned-centric approach, and if we don't break out of those old ways of using and think about new deployment concepts, I'm not sure that the investments that we

make will move us that much faster into the future. We have to break the operating concepts as we apply these unmanned systems.

Similar to what the SSG did the year before on cyber, when I received the unmanned systems, I was really quite pleased with what they delivered. They've already brought the results to me and to my staff, they have been briefing in the round, and I think that as I look at the work that they did, the idea of aggregating force and disaggregating force, of modular unmanned systems and integrating what those capabilities will bring into the existing platforms that we have with those that we are now introducing, I thought that they did some pretty extraordinary work.

They got into the C2 concepts, and you'll hear me talk often among my leadership about command and control, and the way that I view command and control. It's easy to think of it in terms of the data that's moving back and forth or the technology that's in play, but I tend to consider command and control the organizing principle, and when people talk about C4I or C5I, I always talk in terms of C2 plus C2I because it's command and control, and then it's how you make that command and control work. So they've come up with what I consider to be some interesting thoughts and ideas on what I would call a hub and a spoke concept where one entity or one sailor can control many different systems and network systems together based on the tasks that have to be

accomplished at the time. What they have been able to shape my thinking to do is to drive toward a family of systems that will give us a more netted force, and again I refer back to the multiple domains in which we in the Navy work.

There are of course a lot of technical challenges of which I know many of you in the audience are well aware, but I would say that where we can make some significant breakthroughs us just in the organizing principles and in the way that we approach the unmanned systems. The idea of being able to disembark or embark long-range unmanned air systems for example changes the nature in which we can run flight decks, changes the nature of the carrier air wing configurations as we move into the future. Some of the vignettes that they've used even not just at the high end of warfare but even in humanitarian assistance where you can offload entire capabilities and bring new ones on much more easily I believe than you can with manned systems.

The other area that I believe has been important is the work that goes on with regard to being able to use these systems in denied environments, systems that are going to be heavily dependent on the electromagnetic spectrum and the networks that operate in there, so how do we make sure that we are operating and able to operate in those denied environments, and as Pete mentioned, the importance of human

involvement in the decisions that are involved in the use of lethal force. I'll talk about it later, but in the reorganization that we have done within the Department of the Navy to get to this and to get to matters of cyber warfare, we become focused on the hardware and the organizational principles, but at the same time that we move to reorganize ourselves we've actually reorganized ourselves within our JAG Corps to put in place a group and an element in the Judge Advocate General's staff that deals with issues of cyberspace and clearly they will be involved in unmanned systems. All of this is being folded in. We are moving quickly. I would say the last two SSG groups on cyber and on unmanned systems played no small part in the changes that I've made to the staff, and I'll get into that in a bit.

There is no question that there are some technological hurdles that will require some time and money to overcome, and the issues that we have to deal is how do you apportion those investments as we go forward. I would also say that I am often struck that as we talk about unmanned systems we've really become enamored with the vehicle itself and there has been very, very little discussion and arguably little work on something that makes it all work together and that's the network and the architecture of the network, how the information will be moved, what are the redundancies that you would have in place, and what are the

common protocols that are going to be required as we move into the future. So I am a little bit of a network guy and that also was one of the great drivers in how we have changed our organization to better deal with the decisions that we're going to have to deal with in the Navy.

Perhaps more than any other service other than our colleagues in the Coast Guard, bandwidth for us is extraordinarily important, but I also believe that it has to be a discussion that centers not simply on bandwidth because of getting a lot of information on and off our ships, and I am not convinced that our problem is solely a bandwidth problem. I believe it is a bandwidth problem to be sure, but it's also an antenna problem and how are you able on small ships to put in place the receivers and the transmitters of information that I believe as we talk about the challenges of bandwidth at sea of unmanned systems that we, and we will, move forward aggressively in the world of antennas because I think that defines to a large degree how much information you can move.

I've referred to the cultural problems. Those are probably some of the most challenging ones that we have. Whenever I deal with a topic like cyber networks and unmanned systems, I often boil it down into two categories. One is that you have technological issues, and then you have policy issues, and give me the technical problems any day. I'd rather wrestle with those than with some of the policy problems because that's

where we have to deal. But in that culture is also a culture that I think is characteristic of militaries everywhere, and that is the desire to be able to feel that you are more in control of the situation all the time. I recently visited a robotics lab and I was talking to some very sharp young engineers who had just finished making some modifications to an unmanned capability. It wasn't an aerial vehicle. It was something else. They had just finished having to reengineer the man back into the loop. The system would perform much better without a man in the loop because of the feedback and the accuracy of that information coming back being fed into the arm, if you will, but the requirement had to be reengineered to put a person back in the loop and the only conclusion that I got as to why that was was because they wanted a man in the loop. So we have to think very, very hard about that and determine that which requires someone in and that which requires someone out, but as you may have gathered, that's a little bit of an issue with me so that's why I dwelled on it a little bit.

I also would say that the procurement system that we have is going to be quite challenged in having to deal with moving forward on systems like this. The speed with which technology moves, the ability for us to determine the requirement, define what it is what we want to do, and then not have to lock everything in place at that instant in time is

something that will continue to challenge us unless we can get some changes made where some of the capability, some of the aspects of what we're developing, can be held off until later stages of development and right now that is something that I believe challenges us today and unless we get that changed we will be fielding technology that is not as current as the events that we're going to be dealing with, so that's an area that's of great interest to me as we go forward.

There are some other areas that have captured my attention with regard to unmanned systems and some in this room have heard me in other settings say that there is no such thing as an unmanned system. There may be a pilotless airplane or uncrewed submarine or surface vessel, but there are people who are having an effect on that, whether it's on the maintenance of it or if there is a person in the loop, but there will be in some way, shape or form people associated with that system. It is very easy to not think about that because we have an unmanned system, but in point of fact, as many of you know, the cost of people is the most pressing driver on our future programs that we have. The cost of people will continue to rise. If we are blind to the numbers, to the manning model, to the skill levels of those individuals who are part of our unmanned enterprise, then we are not appropriately addressing the total ownership costs, and if you can't address the total ownership costs, you can't then

determine what the return on that investment is, so that we really have to have a good focus on what the manning models are.

I talked about culture. As we get into operating some of the unmanned systems, where does that reside? If you are dealing with operators, what is the level of certification or qualification? What are the skills that they bring in? Is it going to be officer and enlisted? My approach is I favor a very wide aperture as we deal with that because I really do think that we will define and change the structure of those who operate these systems in the years ahead.

I mentioned networks and what is this architecture that needs to be in place? How do we make sure that for us in the Navy whether we're operating in the atmosphere, on the surface or below the surface, that we don't have even within the Navy stovepiped systems and architectures that just deal with those layers? How do we bring it all together? Then how do we give ourselves the flexibility to make changes to those systems over time within that architecture? So as I had to deal with all of this and based on some experience as an operator, that was in large measure what drove me to reorganize the Headquarters of the Navy and even the operational C2 command and control structure as we deal in the world of cyber and unmanned systems. Beginning today, the Navy no longer has an N2 or director for intelligence and an N6 director for

command, control and communications. We now have a director for information dominance. The reason it started today was the officer who was nominated for that position was just confirmed by the Senate on Thursday and as a former chief of legislative affairs, you never presume confirmation so we waited, but Jack Dorsett is off and running this morning with his fused organization that brings together information, intelligence, command and control, and in doing that we have also moved programs that have traditionally been the purview of what in the Navy we call the platform responders, the ships, the submarines and the airplanes, and we have now moved several of those programs out of the platform directorate, if you will, into the Director for Information Dominance, and unmanned systems fall into this new organization because the vehicle itself is nothing more than a node and it's the architecture and it's the information that is moving through those nodes that will give the war fighter the advantage in the future. So all of that has now been consolidated in there.

This is a significant move for the Navy to do this. We have also stood up a cyber fleet, the 10th Fleet, that will be the global operator of cyber, and how that feeds and fits and supports the unmanned will be evolving in the coming months, but those were the changes that we have made. You probably didn't expect me to quote Machiavelli at an

unmanned systems lecture, but I have a little card on my desk that is a quote from Machiavelli and in it he says that, "Nothing is more difficult to take in hand, more perilous to conduct or more uncertain of its success than to take the lead in the introduction of a new order of things." But this is the right way, this is where we have to go, and it will make us much, much more effective.

As we go forward it will also be very important, and I've touched on it already, to talk about the cost of this, the total ownership costs, and in order to do that we have to look not just at the procurement, not just at the R&D, but I've talked about the manning and that is a key driver, and then how do we fuel these vehicles, what is the right way to do that, and then how do we put in place what I would call the cost to own these vehicles, the maintenance, the upgrades, and what's the scheme that we have for that because it will be extraordinarily important that what we put in play today that my successors many times removed will have to be able to operate it at a cost that's reasonable and gives them the best advantage in the future.

I think you will from the organizational changes, from the investments that we have made in unmanned systems, that we are seeking out and embracing those things that will make a difference, innovative solutions not just to the challenges that we face today, but as

you look into that crystal ball of tomorrow how can you use systems like this to prevent and then prevail in conflict. The technology that we're dealing with is not a panacea for the challenges that we are war fighters will face. Technology will not eliminate the fog and the brutal reality of war and conflict, but it can help us in preventing and prevailing.

It clearly is an area that requires thought, great thought, not simply because of having to deal with the cultural issues, the organizational issues, and new ways of doing things, because if we simply operate these systems as we would another manned system, I question just how far we progress, so that that is an area that requires great thinking and great effort.

I also believe that as we talk about what we in the military can do that we have to take advantage of one of the great strengths of our nation, and that's the innovative power of our nation. In that regard I would submit that as we deal with these and we talk about acquisition and we talk about R&D that we need new ways of making investments that perhaps are made in a riskier way than we have been comfortable with in the past, the idea of a venture-capital approach, if you will, is something that technology demands of us not just in the Navy, but I would say in any service.

But I am also keenly aware as we deal with this topic of unmanned systems and the world of cyber warfare that regardless of what the vehicles may be, we will still depend upon the innovation, the initiative, the competence, the skill, the professionalism and the standards of the young men and women who will operate, build and maintain them, and for that reason as I deal with this topic it's extraordinarily important to me that we look to the future with respect to the young men and women who are coming along, and it's also extraordinarily important to me that the system that provides the basic fundamentals or science and technology and engineering and math be something that we are as passionate about as we are about the vehicle itself because if we do not do that, we will not have the innovative base that will be required, nor will we have the inherent skills in the young people that we'll need to do this.

So on that note, I will stop and take any questions that you may have.

MR. SINGER: First, thank you for some great remarks that cover a wide set of areas. It's really fascinating. I have all my notes laying out here to look over again. What I'd like to do is kick off with the first question and then turn it to the audience. Last week I was out in Coronado at a military robotics conference that looked at the naval side of things in particular given the location. It was interesting, just as you

raised, the technical side was seen as less of a challenge the policy, political, bureaucratic, all of these other areas. In my mind I kept thinking back to that quote that history doesn't repeat itself, it rhymes.

ADMIRAL ROUGHEAD: It rhymes a lot, yes.

MR. SINGER: Given that you used a quote from Machiavelli, I want to push this to you which is what are the episodes or lessons from history that you think about, you bring to bear when wrestling with this topic? What do you think are some of the key lessons to pull from history in terms of thinking about the future of unmanned systems?

ADMIRAL ROUGHEAD: I think for me the key lesson is just how hard it is to overcome the cultural inertia of trying to make change. If you look at patterns of operations over the years, even patterns of lay down of forces, it really derives back from a previous time. If you look at where many of the bases were pre-World War II for naval forces, the locations where were the coaling stations were. They became the base structure that we then dealt with for many, many years. I think that is a lesson.

The other aspect is just how hard it is to predict the future, and to put yourself into an exercise from time to time that goes back in history and taking the facts of history at that point in time, then predict where you would be several years hence and see how accurate you were,

and changes are you haven't been that accurate. So the flexibility that has to be put in place and the idea that because we're experiencing certain things today that 5, 10, or 15 years from now the view that we have today is what we're going to be dealing with, and to be able to put in place the means of really fleshing that out and taking in many different perspectives of where we have to be in the future I think is important. That's why I like to be stimulated by groups outside of my headquarters, not that I don't have tremendous people working extraordinarily hard on delivering capabilities to the war fighter, but sometimes you need a little bit of a different perspective and I think those are the things that for those who are involved in this process to be mindful of all the time.

MR. SINGER: If you could stand and introduce yourselves.

MR. FULGHUM: I'm Dave Fulghum with "Aviation Week." Let me start off by saying I know that Afghanistan is landlocked, but if General McChrystal doesn't get the number of combat forces that he wants, what could you provide in the way of new technology? I think of things like corporal (ph) which incorporates electronic attack, UAVs and the Marine Corps radio battalions. What kind of technology could you put in to compensate for the lack of combat forces?

ADMIRAL ROUGHEAD: I'm not going to speculate on Afghanistan. I'm not even going to near that question. I think that what

we're seeing in warfare today is a desire to use different technologies, different capabilities to sense the battle space and then to operate in that battle space that gives faster, more accurate, better information to war fighters. I believe that when you look back on the conflict that we're in right now, Iraq and Afghanistan, and I'll put them in collectively, and you say as in any conflict there are lessons that come from that conflict and changes that come from that conflict, when asked about the fight that we're in today what it would be, and my prediction is the fusing of information and intelligence into operations in ways that we've never seen before and that is enabled by the networks that we use and it's also enabled by being able to put up in the form of unmanned systems very persistent ISR. But it's not all new things either. As many of you know, in the Navy we are heavily committed with our Maritime Patrol Aircraft into the fight. In fact, we have more P3 airplanes that are flying over the desert than are flying over the ocean. It's a question of being able to use that capability. So I think those are some of the key areas that when we look back on these operations that will go down as were some of the great changes that have taken place.

MR. FULGHUM: May I do a follow-up?

MR. SINGER: Real quickly. Just not in Afghanistan.

MR. FULGHUM: No, nothing to do with Afghanistan, but you were talking that you were moving some of the programs out of programs and then into the info war. Is P8 and EPX going to be a couple of programs that move over into the information area?

ADMIRAL ROUGHEAD: EPS is, P8 currently is not, and it's the movement of those programs that I think are critical and why as we look at this from the Navy's perspective I wanted to bring the unmanned sensors into the information-dominance area, because as I said, they're nodes, they're nothing more than nodes of information and to be able to bring all of that into one area where now our unmanned systems in the Navy of all types, air, surface, subsurface, reside in one organization that we then can look at more closely and you have a little different construct when it comes to manned and unmanned perspectives so that the cultural inhibitions that perhaps an unmanned system would face are now living in their own universe and able to be seen at the highest levels of the Navy and not as mixed in with the manned as they used to be.

MR. SINGER: Let's get this one in the back.

MR. TOSCANO: Michael Toscano from the Association for Unmanned Vehicle Systems International. Sir, as Dr. Singer mentioned, the Navy is not the only service that's getting involved with unmanned systems and understands the potential that they bring forward. Commonly

you have the same issues with the hurdles that you have to overcome, the cultural changes that you need to address and the policy issues that you have to conquer. Are you working collectively with the other services and what initiatives are being taken to do this in a more systemic way so that we can do this in field systems unmanned across the board in all the services?

ADMIRAL ROUGHEAD: Absolutely, and we're working with the Coast Guard for example on their interest in Fire Scout. I think that for us, and this takes me back to networks again and information flows, for the Navy and Coast Guard with the relationship that we have to be going forward in developing ship systems and unmanned aerial systems that are not interchangeable with one another is not a good idea, and as part of our Navy-Coast Guard war fighter talks, looking at not just what are the technical things that we have to do and the investments that we have to make in that regard, but I also believe, and I talked about manpower on a couple of occasions and the cost driver that the services face and I would even say industry faces with regard to manpower costs, are there organizational constructs that we can use? For example, can we have composite squadrons where maybe when you look down the flight line you see some Fire Scouts that have the Navy flat gray and then maybe there are a couple that have a stripe down the side, but that the maintenance,

the operation, the investments that go into it are all optimized to be able to provide the capability to both of the services. General Schwartz and I as we look to the future, he is buying Global Hawk, I'm buying BAMS. They don't look that different, they also happen to come from the same contractor, but we have two program offices. We have a lot of people both sides. So is there some commonality there? But I come back to the point that I made that we can talk about the vehicles themselves, but it's the commonality of the networks that I think will give us more power than simply being able to buy a vehicle more efficiently.

MR. SINGER: I want to follow-up on that because General Schwartz spoke here a few months back and one of the issues that he brought up related to for example Global Hawk, and you've mentioned it here as well, is the challenge isn't so much the gathering of information, it's the making use of that data, turning that data into information, it's the analytics side of it and he pointed to how they were making some personnel shifts in their structure. How is the Navy looking at this similar problem?

ADMIRAL ROUGHEAD: I would submit that that is probably one of the areas where the Director of Information Dominance is going to be greatly advantaged because what we have done is we have taken networks, the transport mechanisms, the sensors, what I would call the

knowledge systems. We have even in the N26 brought our oceanographers into that. We have taken the communities that have normally made up the information aspect of naval warfare. We often think of electronic warfare experts, information professionals, cryptologists, intelligence officers, we have brought our oceanographers into this as well because quite frankly, we in the Navy have some of the best oceanographers around. The amount of information that they are processing on any given day is huge. The best predictor that I have of pirate activity comes from the oceanographer because when do pirates go out? When the waves aren't big and they can see pretty far. Who's the best guy to tell you that? The oceanographer. So by bringing all of these disciplines together we have one view of how do we make the best investments to get to delivering the right information to the right person at the right time in the right form, and that's what it's all about. And even though we have retained the individual community identities, we have taken those communities and merged them into a core of information professionals and that core in the Navy is 44,000 people, and they will be managed, developed and qualified as a core of information professionals. We have never done anything like this in the Navy before, but it's all about putting information and knowledge and how that is sensed, moved and

used into one field of view and I think it's going to give us a much better opportunity to get our heads around this.

MS. ESA-SHALAL: Andrea Esa-Shalal with Reuters. I wanted to draw you out on your citing of the Machiavelli quote and about the change and how change is so difficult. You're in the throes of this budget process now and what you're suggesting is that the budget process needs to change to take account of these factors as the technology changes. I know you can't speak directly about the emerging outlines of the fiscal 2011 budget, but do you find that you're disadvantaging yourself vis-à-vis the other services by thinking more broadly in terms of the life-cycle costs? Fundamentally if you start to look at unmanned systems in terms of personnel and manning and operating the longer-term costing, those systems are going to look more expensive on paper vis-à-vis perhaps the other services' unmanned systems which raises the question of whether programs like UCAS are going to be able to move along or whether they'll have to slow down to take account of that larger, broader view of costs.

ADMIRAL ROUGHEAD: What I would say is that I believe our approach actually will enable us to make better decisions. I think it is irresponsible on my part simply because of something that may appear important in the near term to deliver something to my Navy that years or a

decade later will be problematic to operate because of the cost. So my job is to be able to put the information together, the logic together, and to be able to make decisions, because I'll be the first one to say great idea, great concept, but if we do down this path, the return on that investment and the costs that I'm delivering to a successor is unacceptable, so I may back off on that. I think that that is an obligation that we all have, to not simply do something because of what we're trying to do in this current budget but, rather, to take the longer view as to what we're delivering for the country.

MS. ESA-SHALAL: A follow-up. Are you expecting major shifts in the emerging fight that is being shaped now as a result of both your thinking but also in terms of the QDR?

ADMIRAL ROUGHEAD: I would say the term major, I wouldn't use major shifts, but I do believe that what we are able to do is to plot a better course into the future, make better investments and bring some of these systems online perhaps a little sooner than we would expect. As you may know, if we had stayed true to plan on the Fire Scout UAV, we'd probably be flying it around Pax River right now. Instead it's flying in the Western Pacific on a deployed ship doing its work and it's doing its work wonderfully well. And it's the ability to take a look at that and simply say this was the plan, the plan has just been superseded and

we're going to push it, much like we're doing with LCS. She's going to deploy 2 years early. That's pretty aggressive. So maybe that's major. I don't know. I'll leave it to you to decide.

MS. LUCAS: My name is Ashley Lucas and I'm with the Campaign for Innocent Victims in Conflict. The drone programs in Pakistan have been raising a lot of significant debate on the effects on civilians. I was wondering if you could touch on whether these are increasing or decreasing the risks to civilians and maybe how the Navy is going to focus on addressing these risks in the future.

ADMIRAL ROUGHEAD: I think that as I said, the role of how the information is moved and where the people are in the loop is not changing the obligation that operators have and leaders have to employ systems in an optimum and appropriate and ethical way. So I believe that you can operate these systems with the exactnesses as you can with what we're seeing in some of the manned systems today. It's a question of what's your process, what's your procedure that you go through in employing those systems.

MR. CLARK: Colin Clark with DoDBuzz. Sir, there's been a lot of focus on the F-35 as a weapons platform. Tell us how you are looking at it in terms of networking and cooperating or running UAVs.

ADMIRAL ROUGHEAD: Thanks for the question.

Obviously JSF not just for the Navy but for the Marine Corps, Air Force and our foreign partners is extraordinarily important. As you know, we've rolled our variant out here a couple of months ago and one of the things that I've been doing in the past couple of months with my leadership is to work through the whole network dimension of the Joint Strike Fighter. But I will tell you right now as we are preparing to introduce and get into JSF testing the idea of making it a mode for unmanned systems is not where I am right now. I'm interested in getting that airplane to the Navy on time and on budget, but I'm also interested in other things that we have to do in the Navy, other investments that we have to make in our ships in order to take advantage of the great capability that will be coming off of that airplane in the form of networks, and so that's where my head is right now and not coupling it in a network sense with an unmanned system at this point in time. But the networks and how we interface that airplane again with the existing capabilities that we have is something that's important to me.

MR. SINGER: If I may ask a follow-up on that, and it actually connects to a prior question, how do you ensure that the massive investment that we're making in JSF, and I say we, it's almost the free world, and as one that plays out over multiple decades, how do you

ensure that that doesn't sponge out the other resources that might be utilized toward unmanned systems in the aviation field if we're making this commitment over multiple decades right now? How do we ensure that it doesn't pull from that?

ADMIRAL ROUGHEAD: I think that that's all really part of this process that we go through every year and then clearly every couple of years and then as we're dealing with the QDR now, where does all of this fit? Where are you making the investments? Where do you fence the investments and how do you account for the costs that could be coming down the road? I would say again to come back and talk about what we have done in the Navy with regard to the visibility that I now have on networks and unmanned systems and now manned systems, it puts me in a better place to make more informed decisions about how we will keep some of these key war-fighting capabilities on track. There is not any formula that I use, but I clearly now have the ability to look at all the gauges in a more prominent way that can allow us to make those budget decisions that we have to go forward with.

MR. SINGER: Let's get someone on this side.

LIEUTENANT COLONEL BEECH: Good morning, Admiral.

ADMIRAL ROUGHEAD: Good morning.

LIEUTENANT COLONEL BEECH: Lieutenant Colonel Brad Beech, Headquarters, Marine Corps Aviation Unmanned Aircraft Systems. This morning my program has moved under N2N6. One of the concerns is that some of the operational capabilities of those platforms may be moved more toward information, intelligence and network-centric and we lose some of those operational capabilities such as the delivery of kinetic and nonkinetic fighters. Do you share those same concerns? What are some of the things that we can do to mitigate these platforms becoming too information-centric and then we don't have something to affect that information?

ADMIRAL ROUGHEAD: I think it comes down to the concepts of operations that we as services employ and being able to make the tradeoffs as to what is the most effective platform that we have. The fact that they being moved under N26 I think has the potential to enhance their capabilities because we can make more coherent decisions on how the information is going to be moving on and off, how the control systems will be robust enough to ensure that they give us the level of confidence to employ kinetic effects, to get to a previous question. And so I think that it actually allows us to make better investments and better decisions in that regard, and it will be a question of do we need a manned or an unmanned system to go in and do something kinetically and if the

desire is for the unmanned system to do that because of the concept of OPS, then are we moving in the right direction with the investments that we have to make there? Also to be able to think in terms of the operating environment and the support requirements that we particularly in the Navy and Marine Corps will have in being able to operate systems like this off of ships which is a different kettle of fish than taking off and landing at a land base. These airplanes operate in very, very complex electromagnetic environments, they have to be able to recover on something that is moving around, and so I think it puts us in a much better place to be able to make those decisions.

MR. SINGER: Let's get one more on this side.

COMMANDER KING: Commander Richard King, British Naval Staff at the British Embassy. Good morning, Admiral.

ADMIRAL ROUGHEAD: Good morning.

COMMANDER KING: Thank you very much for your insight into the future. I just want to come onto a topic of mission command. We in the navies of the world have always prided ourselves on mission command and independence of command because it brings flexibility to a changing situation. How do you see that relationship changing? You talk about fusing huge amounts of data. I take it from that you're ashore and feeding that picture back afloat in our case, but obviously it could be

anywhere in the world. How do you see mission command for something like Coleface (ph) changing in that and how will that affected by the rule of engagement process which has to obviously take into account how the system will be set up for warfare in the future?

ADMIRAL ROUGHEAD: I think the biggest change that we will see is that there will be more information available at lower levels within the structure, and I do see rules of engagement having to change as a result of that. I believe that it will require greater training and greater awareness of what's going on, but I actually think it can enhance the idea of mission command and give people more capability than they've ever had, and the commanders are going to have to work through some of the cultural issues. I also like to quote a great hero of mine, Admiral Arleigh Burke when he said many, many years ago, "Going to sea used to be fun and then they gave us radios." So I think this has always been an issue and I believe, however, that as we go forward with the operating concepts and the means of supporting those concepts that we have to make sure that the operators are the ones who are mostly advantaged in the process.

MR. SINGER: Are you seeing the same phenomena that the Air Force and the Army are wrestling with, I call it the tactical general phenomena, it's not just that you have the communications to the ship now via radio, but that you have real-time ability to watch what's happening and

reach down and make decisions from thousands of miles away, so that you have the piracy crisis where not just that destroyer captain can see the video of what's playing out live, but people sitting in the Pentagon? Are you seeing that similar challenge of leadership and the dangers of micromanagement, and what are some of the lessons that we can do to avoid that?

ADMIRAL ROUGHEAD: I think that the way that information is available now that that is a challenge. I believe that you always have to guard against micromanagement and as you vest the authority and address issues of accountability, it requires I believe great thought and leadership and confidence on the part of commanders to vest it where it needs to be. And it's not simply the event of the day either, it is the conditioning of future commanders that I believe is extraordinarily important and the opportunity that you have for those commanders to become experienced and conditioned and very familiar with what's going on. Just in my career I have seen that change as far as how much information is available and where do you allow decisions to be made, and that's something that commanders have to work out and I think have to be very comfortable as we move into these new capabilities that that is part of the thinking process that has to go into play. You're absolutely right that you get a tremendous amount of information, you see a lot and you can

inject yourself into the decision. The question becomes at what point is that necessary, at what point is it not necessary, and then the long-term competency of the force is something that is also at stake when you talk about this because I've learned more from bad decisions that I've made than from good decisions I've made. Sometimes you just have to allow that to happen.

MR. SINGER: Let's do one last question right there.

MR. SNEDEKER: Good morning, Admiral, John Snedeker, retired Navy capital, now with Raytheon Space and Airborne Systems. It's good to see the Navy as a lead innovating force with unmanned systems, specially the UAVs from BAMS and Fire Scout as well as -- Eagle. I wanted to ask you about Navy UCAS. Unlike other UAVs today, they're basically defenseless. They don't have to face an opposing air force or an integrated air defense system. Navy UCAS is a different story. That's going to be a paradigm shift, and to keep those technologies developed to work off a carrier and go into harm's way in today's budget pressures, how do you keep that moving forward?

ADMIRAL ROUGHEAD: We have been able to keep some investments moving in that direction. I think it's important to take a look at it in certain increments if you will. The first challenge that we are going to face is bringing an aircraft like we're talking about for NUCAS on and off a

carrier, do that, and then at the same time I think we can be advancing some of what I would call the war-fighting capabilities, but move into that first piece as our first step. As you get into the application of NUCAS as a fighter, for example, you're talking about some pretty high-end stuff and that's why we're moving forward. I believe we have to move forward with NUCAS, but to get to Pete's point, how do you make sure that you're balancing the investments because at the end of the day we still have to be a Navy that's ready for whatever takes place today while we're building the Navy of tomorrow. So that's why I like my job so much, it gives me the opportunity to deal in making those decisions.

MR. SINGER: That's hitting closing time for us. I want to thank you in particular for three things. The first is for joining us and taking time out of your very busy schedule. You clearly have lots of different fires to put out, but to join us for this discussion, we appreciate it much. The second is for providing a very meaty discussion. You really hit the dot-edu part of Brookings. I think we all come out of this with a lot more information and a lot of serious discussions around this and we appreciate that. Then the third is just the service that you're providing for our nation. So please join me in a round of applause.

ADMIRAL ROUGHEAD: Thank you.

* * * * *