General William Shelton
Commander, Air Force Space Command

AFA - Air and Space Technology Exposition

“Integrating Air, Space & Cyberspace Capabilities”

17 September 2013

General Shelton: Jerry, thanks for that kind introduction. It's always a pleasure to be back here and speak at AFA's premier convention. And many thanks to AFA for what they do for our Air Force. Many many things that they do that we can't do for ourselves, so thank you for that.

Jerry kind of alluded to this, but in my mind this is a critical juncture for space and cyberspace capabilities in our Air Force. Threats are truly increasing in both of those domains. Budgets are decreasing. Our dependence on both of these domains has never been higher. So let me spend a few minutes with you just talking about the blue space and cyber order of battle. But more important than that, I would like to impress on you the criticality of these systems. I'm not trying to give you a tutorial on space and cyber, just tell you a little bit about space and cyber systems here, but it's really to get you to the place where you believe, like I do, that these are foundational capabilities for our nation.

As we look at our defense priorities in the coming months, it's very clear that some very tough decisions are going to be required because of the budget situation we're in. And our space and cyber forces in many ways are much less visible. In both cases almost like a utility you plug into. It's always there. And we're very happy with that, by the way. We're happy we can provide that capability and it seems to be so seamless. But as long as out of sight also doesn't equal out of mind, I guess we're okay with that. But let's talk about that a little bit more.

Next slide, please.

Space and cyber effects. I would assert to you that space and cyber provide foundational capability to our nation and especially to our joint military forces. There's not an operation conducted anywhere at any level that is not somehow dependent on space and cyberspace. In my mind it's true across the spectrum of conflict, at all echelons of command. Now we've been able to push it down to the lowest echelons. And to make sure these effects are there for the joint warfighter, Air Force Space Command has got to find ways to make it more cost effective in this climate. Certainly with the increasing threats that we have in both domains, we've also got to find ways to make our capabilities more resilient.

I'll tell you, in the synergies that are possible across space and cyberspace, we have just started to scratch the surface. We now talk about space-enabled cyber operations. We talk about cyber-enabled space operations. And trust me when I say that I wish we could talk about what we're doing in each of those areas, but with the limits of classification, obviously we can't talk about those.

But I would present to you that it is a very natural fit to put space and cyber together. And being within the same command it's easier for us to integrate those capabilities together. But the grand challenge really is to integrate these capabilities across all domains to make sure all of our warfighters have access to the great capabilities of space and cyberspace.

We also at the same time want to preserve our freedom of action in space and in cyber, so we need to find ways to use these two domains in new and unique ways. So let me spend the next few moments on space, then I'll switch over to cyber, and then sum it up.

Next slide, please.

First let me talk about the threats to our space assets. They range from the reversible to very destructive and permanent threats.

Jamming. Jamming is relatively easy to do. It's cheap and trust mewhen I say, it's very proliferated. We've got to find ways to fight through jamming. Certainly tactics, techniques and procedures can help. Antenna designs will help as well. But let me tell you also that big jammers are called targets. As they radiate and perform their operations, we can identify, geo-locate and destroy those targets in a campaign.

Lasers are coming along. Blinding and dazzling lasers are already here. Higher power lasers that are destructive to our assets are in work.

Interceptors. The Chinese demonstrated, very capably demonstrated interceptors in 2007 and it's created lots of debris that we're still dealing with today.

Attacking our ground sites. That's always an option. Fairly soft targets, and going after those ground sites is certainly available to would-be adversaries.

A nuclear detonation in space. That is what we would call the least likely but the most severe consequence of anything that's out there.

Somebody that doesn't have much to lose might be tempted to use that attack option, but we don't think it's all that likely.

But the most disturbing thing across the board is all of these capabilities are extent today with the exception of the high energy lasers. So in my mind, we can't continue to operate with this big sky mentality. That certainly will not work for us.

Status quo. It's an option. It's just not a viable one.

Let me talk quickly about our blue space order of battle.

Next slide, please.

Each of these next few slides will give you some insight into the size, weight and constellation size of the various satellites we have on orbit. SBIRS, at geosynchronous orbit, 22,300 miles up in space, and it is literally an IR telescope that's watching all the time for the plume coming out the back end of a missile. We can tell you when something's launched. We can tell you the launch point. We can tell you what kind of missile it is. We can tell you the impact point. Certainly critical to the defense of the homeland, deployed troops and our allies. It gives the President the maximum amount of time to conjure up response options and it cues our missile defenses.

As we complete the SBIRS constellation I believe it's going to do more than just ring the bell for missile defense. It will be a very big part of the targeting process as well.

The scanning sensor we have on board this satellite provides full earth coverage, scans the entire earth. The steering sensor give us much more refined coverage and it can stare at a single point given indications and warnings.

Currently we have two geosynchronous orbiting SBIRS satellites up and two highly elliptical orbit satellites on orbit. Of course this is all supplemented by the venerable DSP constellation that's still living.

This satellite is designed to operate in existential circumstances for the United States. In other words, it's a very hardened satellite and it will continue to operate even in a nuclear environment.

Next slide.

Another satellite that's designed to operate in existential circumstances. The Advanced EHF satellite. Our heaviest satellite has lots of strategic and tactical protected communications packed onto this satellite. Again, designed to

operate in a trans and post-nuclear environment. When the President's command and control directives need to get out to the deployed forces, this is the satellite he'll use. When he needs to do national teleconferencing, this is the satellite he'll use to do that. Very special wave forms and frequencies to penetrate a nuclear scintillation and other jamming operations by would-be adversaries. We've got two on orbit. Another one should launch early tomorrow morning, weather permitting. And we'll have four in the complete constellation which is the minimum needed to assure global coverage.

We have international participation in this program by the United Kingdom, Canada and the Netherlands.

Next slide.

Wideband global satcom is the workhorse for wideband communications across the planet. Our international partners on this one are Australia, Canada, Denmark, Netherlands, New Zealand and Luxemburg. This is a real leap forward in capability for us. Each satellite has the bandwidth of the entire DSCS constellation that preceded it. Having said that, it's still insufficient bandwidth for our deployed forces around the world. In fact about 80 percent of the wideband traffic is now carried on commercial platforms.

Eventually we're going to build about ten of these satellites. As you see on the slide, the constellation size is five.

Next slide, please.

GPS. Everyone knows GPS and all the applications, but not everyone out there really realizes that the Air Force builds and operates this satellite and its constellation. Applications just continue to amaze me. You all benefit from the value of GPS but it's not just the navigation, it's the timing signals as well that provide high speed data network timing, financial transactions, on and on and on.

Guidance and navigation uses are widespread within the military from platform navigation to munitions including things like GPS-guided artillery shells. We have about 31 satellites in the operational constellation now. The specification only calls for 24, but to provide the specified value with a 95 percent probability, we fly the constellation to at least 27.

Lots of jammers out there for GPS. In fact you can buy a jammer on the internet. By the way, that's illegal, but you can find them on the internet and lots of adversaries around the world

have GPS jamming capability so we're going to have to learn to fight through GPS jamming.

Next slide, please.

DMSP. This is our venerable weather satellite program. Very precise weather forecasting for military operations. It gives you things like surface wave height, soil moisture content, cloud cover, storm tracking, on and on and on, which we need these precise forecasts for our joint military operations.

Only two of these satellites left in the barn, one of which will launch in March of '14, and we've got an analysis of alternatives underway to find the replacement for this weather satellite constellation.

Next slide.

SBSS is our dedicated satellite for keeping track of things in geosynchronous orbit. Optical systems, by the way, are the choice for keeping track in geosynchronous orbit because our radars can certainly reach out that far, but they put out a pencil beam of energy and they're not very good for search, so this gives us wide synoptic coverage.

Ground-based opticals also perform well for us in this domain but they only can operate at night and they also are subject to being weathered out. So SBSS flies above the weather, orbits every 100 minutes or so, Hoovers up all the activity in geosynchronous orbit and has very sensitive optics to detect but not necessarily resolve the image, but to detect the light source from those images.

It provides observations to the Joint Space Operations Center at Vandenberg as part of our space situational awareness capability.

Next slide, please.

And speaking of space situational awareness, we have sites around the world, optical sites and radar sites to keep track of the activity in space. There's an estimated 500,000 man-made objects orbiting in space right now. We are only capable, because of sensor sensitivity limitations, of tracking some 23,000. This is a global business. As you see on the map we're spread out all over the place.

We're doing the job of the FAA in space, so to speak. Not that we aspire to that job, but we're the only ones that have that capability. So to keep things safe, we routinely track every object we can possibly track.

Alongside the intelligence community, we work hard to identify objects and to determine capability and intent to the best of our ability. This gives us the ability to prosecute events as they happen, moving to predicting when they happen. We're very reactive now, but as we go into the future we need to get much better at prosecuting these events and become much much more predictive.

Next, please.

The key to that predictability will be the Joint Space Operation Center Mission System, JMS. JMS will provide a replacement for a very old capability we've got now. In fact about a 1994 capability, to be frank with you. So it will take sensor inputs, it will take intel, weather data, blue, red, gray, space order of battle kinds of information, run it through this high performance computing environment we're establishing and out the back end of that will be coming some products that will give us much greater accuracy, will give us much better predictive capability, decision support tools, command and control capability. I'm gushing here because I just can't wait for this capability to get here. This will be a huge leap forward in our capability to do command and control and to do space environment monitoring.

Next, please.

Let me quickly turn to cyber. Same kind of chart. A little bit different in that like space there is a variety of threats in the cyber domain. The problem is, the cost of admission in this domain is cheap, so there is no shortage of threats. If I've got a laptop, if I've got the right software, if I've got the know-how and an internet connection, I've got capability. That's scary stuff.

Simple things like denial of service attacks to very consequential things like attacks on critical infrastructure are certainly possible from those actors.

From a warfighting perspective it is absolutely essential that we have confidence in our data, that when we need to get our data from Point A to Point B we can be assured that it's going to get there.

Adversary actions could make it very difficult for us to assure that our data is going to get through. So it calls for certainly strong defenses. It calls for architectures that assure our data will be authoritative and it will get to its intended user even when we're challenged in this domain. And trust me, we will be challenged in this domain in conflict.

Next slide.

Let me talk about some common misperceptions here.

Information technology and cyber operations are not the same thing. They are not the same thing. Certainly IT provides the great tools and platform that we use, but that is not cyber operations. No more so than the F-22 sitting on the ground is doing air superiority. We have to operate in the domain that's created with IT to accomplish cyber ops and produce the cyber effects that we're needing for joint warfighting.

Next please.

I call this an inconvenient truth for some, but cyber is increasingly a warfighting domain. It's interwoven into everything we do in military operations. It takes very specialized skill sets and it takes lots of training to become proficient as a high end cyber operator. So we need to continue to invest in our people. We need to continue to do our best to retain them. We need to do our best to promote them. We've got to establish a high end cyber operations force that is sustainable for the long term.

I've said it before, let me say it again. The threats are going up, the budgets are going down, but we've got some real priority choices we're going to have to make and cyber is one of those.

Next, please.

We're working very hard to operationalize and normalize cyber operations. We've got to get out of this IT mindset and into much more of a warfighting ethos. So much potential. So much potential to integrate across all of our domains with cyber operations.

We've got to understand better how to assess the probability of success. You need to be able to go to a joint force commander and tell them that your cyber operation will work with a probability akin to how we assure them with kinetic operations now, and we aren't there yet.

There's much room for improvement in our responsiveness to our threats. Right now we're shooting behind the rabbit in many cases, and it is a future really that will depend on automation. Things happening at the speed of light in the cyber domain demand responses at the speed of light and humans just can't be involved in all those decision processes so we're going to have to get to a much more automated future.

Next, please.

We made an important announcement a few months back, and unfortunately it was misunderstood in the press. We designated six systems as weapon systems. Now all of you who are wearing an Air Force uniform understand what that really means. It just means that we have normalized these systems into the weapon system sustainment mode that the rest of the Air Force understands. But there's a subtlety there that was misunderstood.

It gets these systems into the normal process; gets these systems into a much more predictable funding posture; a consistent sustaining, engineering and life cycle management posture as well. Again, these are not weapons, but they are into the weapon system process that we appreciate across the entire Air Force.

Next slide, please.

We are also building the cyber mission force demanded by U.S. Cyber Command. The Air Force will be part of all of these teams, so national mission teams, combat mission teams, cyber protection teams, every one of these will have Air Force representation. 24th Air Force is our Air Force component to U.S. Cyber Command and acts at cyber representing the Air Force to U.S. Cyber Command.

We're going to treat these forces like expeditionary forces so that we can put the ISR and cyber forces together and treat them just like we would a deployed environment, even though they won't be necessarily deployed. This is still very much a work in progress, but I wanted you all to understand that we're big contributors to this and I think you heard the number earlier today, 1264 is what we've been asked to provide and we'll provide those over the next few years.

There's a lot of progress being made in this area and it's under a project task force that's being managed at Air Force Space Command Headquarters.

Next slide, please.

Let me wrap up here and open it up to questions in a few minutes, but a few statements to summarize this.

Space and cyber capabilities I would submit to you are must-haves in modern joint warfighting. As I said earlier, it's across the spectrum of conflict. It’s at all operational levels. And just when the threats in both domains are rapidly escalating our budgets, we find ourselves in a place where our budgets are declining.

Sequestration is now a four letter word in my headquarters. I suspect it is in all of yours as well. If we don't get budget flexibility very soon, we won't be able to sustain the operational capability in space and cyber.

I'll tell you that I think we're in a fairly good place for FY14 as we look ahead. I have no idea how we will be able to close the budget for FY15. Because of the mind-numbing mechanics of sequestration, no program will be spared. What that means is all programs will get broken.

Probably this law represents a bigger threat to our capability than almost anything that we can think of the adversaries are dreaming up. Again, we've got a risk management plan for FY14. We'll get through it. Not without risk, but we'll get through it. But all bets are off for FY15.

So we're working hard to find new architectural solutions that balance required capability, affordability and resilience in the light of the threats that we see coming at us.

If it's true, and if you agree with me that these capabilities are must-haves, in other words we are critically dependent on these capabilities being readily available when we need them, then what follows is we must become more resilient to the threats. Resilient to adversary action, resilient to hardware and software failures, resilient to the unanticipated.

The status quo which some champion is certainly an option. But if you believe we will have less funding for our programs, if you believe that the adversary gets a vote in conflict, including space and cyber, if you believe A2AD is not just in the terrestrial physical domains but that it also applies to space and cyber, then I think you have to conclude that status quo is not a viable option in these two critical domains.

The facts are staring us in the face. We have to recognize it and we have to respond accordingly.

When air defenses became more capable, we didn't abandon the airplane. We adapted with stealth and other defensive measures. We need thinking about space and cyberspace analogous to fifth generation thought and development.

The late Senator Daniel Patrick Moynihan said, "Everyone is entitled to his own opinion, but not to his own facts."

Fighting through the challenges, developing the next generation of systems that will assure our capability will be there when we most need it, facing the facts of the new normal in space and cyberspace. That's the right

response in my view.

Thank you for your attention and I look forward to your questions.

Moderator: Thank you, General Shelton. I've got more questions that we can handle in the next hour and a half, but we're going to go after a few of them.

The first question that is posed by two or three people is, given the inter-reliance of space, cyber and intel, is a merger of the three inevitable? And related to that, how do you integrate black and white space and cyber capabilities? And are we doing enough to coordinate our efforts between Space Command and the intel community?

General Shelton: In response to the first one, we are looking across the entire Air Force at how we should organize and trying to take a ten year look ahead. So how should the Air Force be structured for what we expect to see in 2023?

There are certainly some synergies between space, cyber and ISR. How we will organize in the midst of all that synergy that's possible, whether that be a combination of space, cyber and ISR; or space separate and ISR and cyber together. I couldn't tell you.

Very much in debate. Anybody that tells you that any conclusions have been drawn has not been in the same meetings that we've been in with the senior leadership of the Air Force because this is still very much a work in progress.

In terms of black and white integration of space and cyber, I'll tell you that we are making strides, but as I said in my prepared remarks, we have just started to scratch the surface here. There is so much out there, such a rich field to be plowed. The right people are talking, the right processes are in place. I think you'll see over the next few years -- no, you won't see it because it will be hidden -- but those of you that are cleared will see great progress as we move forward in space and cyber and we capitalize on some very wonderful capabilities that are available to us. The right people are talking, the right people are coming together.

Moderator: One very specific question. When large contractors who provide SE&I support to SMC programs leave the space industry and small industries fail, where will you turn?

General Shelton: That's a very good question and we are concerned about the industrial base.

As we look at these reductions and we're forced to -- Shoot, in my headquarters alone we've been forced to take a 50 percent reduction in that kind of contracting activity and probably the next year we'll take another 25 percent reduction. You're forced to do that to keep the operational capability alive. It's the only place you can go to find reductions that don't directly impact a combatant commander's required capability.

So as we make those reductions we know that we're seeing these industrial base decisions kind of foisted upon us here. It is a matter of grave concern to us, but in the midst of the sequestration, dare I call it silliness? In the midst of the sequestration silliness, that's one of the by-products.

Moderator: Just continuing on that with the sequestration, are there anymore illustrations of how sequester has affected our satellites and our space operations? What does it mean to safety or any other thing you can say that will happen or is happening?

General Shelton: Let me tell you what we did in FY13. In addition to taking these contractor dollars out of the budget we also took a very important radar down to operating at quarter power. That didn't work out so well because the combatant commander needed when the North Koreans kicked their heels up. We took another radar down to eight hours a day instead of 24x7, and for those of you that have ever been in the warning business, that's just crazy. But again, we had no place else to go to get money for the last six months of FY13.

Then we had some, again, combatant commander demand that forced us back to a 24x7 posture on that radar. Then we took, for FY14 we've taken the action to take down an old space surveillance capability that's been in existence since 1961. That capability, we call it the Air Force Space Fence, that capability was not up to necessarily modern standards. Even though it collected a lot of modern observations, it didn't necessarily produce accuracy in the space catalog.

So you see that some of those actions are not things that we would want to do, but they are, in the priority scheme of things they are the lowest level of priority that we could go after and actually realize the intended savings.

So sequestration continues to have an impact. The reason I say that FY15 is the big problem -- '13 we were able to do some tricks; '14 we've taken significant risk in our weapon system sustainment area. So things like sustaining engineering, things like study contracts, things that would sustain the current existing capability we've taken significant risk in that area. That bill comes due at some point. As you continue to take risk, that bill comes due. So in FY15 I'm out of tricks. I

can't take that much risk in '15 in weapon system sustainment. I've got no other resources that aren't absolutely critical capabilities for combatant commanders. So if this doesn't get resolved by FY15, clearly we will find a way but it won't be pretty, and it will be direct impact on operational capability for combatant commanders.

Moderator: We'll switch tacks here for just a moment. Let's talk a little bit more on GPS.

Are we moving away from a total GPS dependency? And related to that, what is the Air Force doing to ensure GPS-3 remains on cost and on schedule?

For instance, falling below the desired constellation size.

General Shelton: There are some wonderful capabilities that are being talked about right now. Chip scale atomic clocks. Chip scale inertial measurement units. That would supplement, not replace but supplement GPS. So the great capability you get with GPS is you've got a very accurate update to your navigation system constantly. IT's just pouring in at the data rates coming off the satellite and your system is integrating that into the navigation and guidance solution, and it's always there. If it's not there, what's the capability we're going to depend on?

The problem is, inertial measurement units inherently drift. If you can get to the place where you build this chip scale clock, this chip scale inertial measurement unit, that then doesn't drift as much, you can use GPS all the way up to the GPS jamming environment. Hopefully you're not in that environment too long. Then the IMU carries you through the rest of the way.

A lot of that work's going on. It's a DARPA hard problem. DARPA is working it very hard. We've got a lot of research going on across the country to try to supplement, not replace, GPS.

GPS-3 has a navigation payload problem right now that we're trying to sort our way through. We believe everything else is on track with that program, but the navigation payload, critically important of course, the navigation payload looks like it's going to deliver late. That's going to cause us a lot of problems schedule wise, and that always drives into cost issues.

We think we're okay from an overall program perspective right now, but we are seeing some warning signs on the horizon.

Moderator: How can we leverage the unique characteristics and capabilities of the Reserve and National Guard as part of the total force solution? What are you doing on that?

General Shelton: We already have Reserve and Guard integrated. Probably the Guard much more in the cyber domain than in the space domain. We've got lots of combat com capability now that's in the Guard. We've pushed more of it into the Guard over the last couple of years here. In space we've got both Guard and Reserve capabilities that supplement our active forces. And of course there's a big total force effort underway, study effort underway right now across the Air Force looking at more and more opportunities to go into Guard and Reserve capability versus active.

So I think this is a great time for Guardsmen and Reservists to be involved in these two domains, and there's a lot of opportunity. I think the opportunities will continue to grow as we find more and more places to utilize the talents of Guard and Reserve.

If you take cyber, for example, and you take somebody that's working for a high end IT company by day and then working for us as a Reservists part time. That is great capability for us that comes back to the active force, and certainly ideas and thought process that we don't have inherent in our capability.

Moderator: Switching a little bit to the threat arena, two questions are related here. How vulnerable are our satellites to cyber attacks? Are we getting attacked regularly?

Secondly, and this is really a different question, but how have the space-based assets been protected against electromagnetic pulse and our solar activity? They are protected, but I'd like you to just comment on that.

General Shelton: First, vulnerabilities to our satellites themselves. Of course the cyber vulnerabilities are to ground systems and we work very hard on the information assurance aspects of our ground systems to make sure that we aren't vulnerable to cyber attacks or at least have plugged the holes that we know to plug.

In terms of the satellites themselves, they have encrypted command systems, they have encrypted downlink systems. Unless somebody breaks NSA-certified encryption, which creates a much bigger problem than just satellites, we think we're very safe on the satellite side.

Moderator: Rad Hard --

General Shelton: Radiation Hardened parts go on every satellite to protect against what we would call single event upsets on those satellites. In other words high energy particles coming out of the sun affecting the

satellites. We build our satellites with those in mind.

The only satellites that are really hardened for an EMP pulse like Jerry just talked about, are SBIRS and Advanced EHF. Those are, again, designed to operate in a trans and post nuclear environment. The rest of the satellites, if we had a big EMP pulse, the rest of the satellites would be in trouble.

Moderator: Since so many of the folks in this conference are related to business and industry as should be the case, of course, what are your views of leveraging commercial capabilities for some of the Space Command missions?

General Shelton: We are looking at that very hard for, in a couple of different directions. One is to potentially host payloads on commercial assets, but probably more important is wideband communications capability. Should that be depicted military capability? Should that be commercial lease or lease to buy or just buy as a service? We're exploring all those in analyses of alternatives and we hope to in the next couple of years make those decisions.

A I said earlier, 80 percent of the traffic coming back from Afghanistan right now is commercial. So we've by definition proved that this will work. The question is, do we need dedicated military satcom? Unprotected. Protected, absolutely. Unprotected, maybe something else.

We'll continue to look at this, but I'm a big proponent of pushing this out to commercial if we can make it happen.

Moderator: We're going to move a little bit to a couple or three questions on weather issues. With sequestration affecting all programs and the weather prediction was also impacted, how can tomorrow's Airmen move forward to create a more stable, predictable battlefield for cyber without a better developed solar weather protection system?

And in that regard, what I going to replace the DMSP? And are we working with Noah on that.

General Shelton: Those are both very good questions. I think the solar issue, we are going to be just fine on the solar issue. We'll have predictive capability and we will fly those kinds of things in space to determine what the space environment looks like and to be much more predictive of what's coming at us from the solar environment.

That goes directly into the answer to the next question, what's next after DMSP? As I said earlier, we have an analysis of alternatives underway, right now. I think it is reaching some very good conclusions on what the future looks like. That future looks like a heavy dependence on civil capability; a heavy dependence on international capability as well; and then looking to what are the unique military things that have to be there. WE would build a dedicated military satellite to take up the rest of the mission space.

I think you'll find that we won't have that many requirements driving the design of that satellite. I think you'll find that we will be able to accomplish that with a much smaller satellite, a much less expensive satellite. And to me that's what the follow-on program looks to be. But miles to go yet in terms of acquisition decisions. But that's certainly what the information coming out of the AOA looks like.

Moderator: The final question that we'll have relates to putting your view on the future a bit. Has the Air Force decided what will follow SBIRS? Or will you just buy more SBIRS satellites? Or to develop something new?

General Shelton: A great question. This is true of Advanced EHF as well. But I talked about needing to become more resilient. SBIRS and Advanced EHF, we buy just enough, just in time. They're very expensive. So if the constellation is four, we build to a constellation of four, we manage to a constellation of four, we acquire to a constellation of four. Coming down the pike there is just enough capability to get by.

We're on contract with Advanced EHF 5 and 6. On contract with SBIRS 5 and 6. That will take us out through probably the mid 2020s in terms of capability. But we need to determine right now what's beyond SBIRS 5 and 6, what's beyond Advanced EHF 5 and 6. So there's a slew of study contracts going on right now to answer that very question.

If you look at SBIRS and it's got both that scanning sensor and the steering sensor, would we want to disaggregate that capability? And have the scanning sensor on a different platform than the steering sensor? Or maybe we go to all steering sensors but it's a wide field of view staring sensor. All those alternatives are in place. We're trying to determine what the right answer is. Again, affordability, required capability, and resiliency. We've got to have all three coming together and it's that intersection of those three bubbles in a Venn Diagram sense that will drive us to the solution we need.

Moderator: Thank you, General Shelton. You noticed that he didn't pause and say, "I don't know" on any of those. We really

appreciate the depth of your knowledge and the ability to answer these questions. For instance on the disaggregation, there were some questions on that and you already answered that.

WE deeply appreciate your being here.

# # # #