

HEARING TO RECEIVE TESTIMONY ON MILITARY SPACE PROGRAMS IN REVIEW OF THE DEFENSE AUTHORIZATION REQUEST FOR FISCAL YEAR 2012 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, MAY 11, 2011

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

The subcommittee met, pursuant to notice, at 2:04 p.m. in room SD-106, Dirksen Senate Office Building, Senator E. Benjamin Nelson (chairman of the subcommittee) presiding.

Committee members present: Senators Nelson and Sessions.

Committee staff member present: Leah C. Brewer, nominations and hearings clerk.

Majority staff member present: Madelyn R. Creedon, counsel.

Minority staff members present: Daniel A. Lerner, professional staff member; and Michael J. Sistik, research assistant.

Staff assistants present: Christine G Lang, Hannah I. Lloyd, and Brian F. Sebold.

Committee members' assistant present: Ann Premer, assistant to Senator Ben Nelson.

**OPENING STATEMENT OF SENATOR E. BENJAMIN NELSON,
CHAIRMAN**

Senator NELSON. I call this hearing to order. My good friend, Ranking Member Senator Sessions, is on his way, but they've suggested we go ahead and start, given the fact that we're interrupted by a vote and the White House. It's amazing how votes and the White House can interrupt a hearing. Maybe it's not amazing at all.

But I'd like to welcome all of you this afternoon and our many witnesses. Today we meet to discuss military space programs. Often I think there is little appreciation or understanding either in the Senate or in the general public of the advantages that space systems provide to the U.S. military and the intelligence community and to our economy in general. Somehow a satellite flowing over a football game just isn't the same as a flyover by a B-2. It just hasn't gotten there yet.

But we as a Nation would be greatly diminished without our space assets. So I thank you for your commitment and dedication to space and I look forward to a good discussion today.

Our witnesses this afternoon are: Ambassador Gregory L. Schulte—we welcome you, new to the position, Deputy assistant Secretary of Defense for Space Policy; Dr. John A. Zangardi, Deputy assistant Secretary of the Navy for Command, Control, Communications, Computers, Intelligence, Information Operations, and Space. Is there anything left?

Dr. ZANGARDI. No, sir, there is not.

Senator NELSON. All right.

And General William L. Shelton, USAF, Commander, Air Force Space Command. We welcome you. Lieutenant General Susan J. Helms, the USAF Commander of the 14th Air Force, Air Force Space Command, and the Strategic Command Joint Force Component Commander for Space; Lieutenant General Richard P. Formica, USA, Commander, U.S. Army Space and Missile Defense Command, Army Forces Strategic Command; Rear Admiral David Titley, USN, Oceanographer and Navigator of the Navy and Director, Maritime Domain Awareness and Space; Major General John E. Hyten, USAF, Director, Space Programs, Office of the assistant Secretary of the Air Force for Acquisition; and Ms. Cristina T. Chaplain, Director, Acquisition and Sourcing Management, Government Accountability Office.

First, congratulations, as I said, are in order for the successful launch of the Space-Based Infrared Satellite System GEO last Saturday. This satellite is years behind schedule and substantially over budget, but it's finally in orbit.

General Shelton, this is your first opportunity to testify before the subcommittee since your confirmation as the new Commander of the Air Force Space Command. Welcome.

I'd also like to note that we have included Lieutenant General Formica in our hearing today representing the Army's small but growing interest in space. General Formica may not think it's small, but by comparison some others do. We've not had the Army testify on space issues in many years and so we look forward to hearing from you today.

Finally, Lieutenant General Helms, congratulations on your induction last week to the Astronaut Hall of Fame.

This past year has been a very active one in the space community. The first Advanced Extremely High Frequency, AEHF, satellite was launched in August, although as a result of a failure in the satellite propulsion system it is not yet in its proper orbit. We would appreciate any update on the satellite's progress. As I understand it, AEHF-1 is supposed to be in the right orbit by later this summer.

The first GPS-3F satellite launched just after our hearing last year and the second one should launch later this year, this summer even. The first Space-Based Space Surveillance, SBSS, satellite launched in September. Operational Response Satellite 1, ORS-1, or ORS-1, should launch in June, and TACSAT-4 will also launch later this summer. Both these satellites are awaiting resolution of a launch vehicle issue. Of course, the Space-Based Infrared System Satellite last week. Quite a year of firsts.

As we all know so well, the Air Force and Navy have struggled for many years with their satellite programs and, while it appears that the many design, development, and manufacturing issues are

mostly resolved, it's been a long and expensive process. So the question we have is, what are the lessons learned that can be applied to future programs?

One satellite program is not out of the woods, however, and that is the Defense Weather Satellite, the successor to National Polar-orbiting Operational Environment Satellite System, pronounced, as they say, "NPOESS." Even though the NPOESS program was cancelled a year ago, the acquisition plan for this much-needed new weather satellite is not finished. We'd like to know the schedule for this program and when there will be an acquisition decision.

While the Navy appears to have solved the technical problems with the antenna on the Mobile Users Objective Satellite, MUOS, a communications satellite which just last year was about 11 months late, with a launch date in September of this year, I now understand that MUOS is approximately 21 months late and will not even be delivered until mid-next year. In the mean time, the Navy just put the fifth satellite on contract. So we'll be anxious to hear and learning and discussing more about this delay as well.

The Air Force has two proposals on the table this year. One is to look at block buys of satellites starting with AEHF Satellites 5 and 6. The second proposal is to look into a commitment to buy at least eight booster cores per year for the Evolved Expendable Launch Vehicle. This would entail a much-needed restructuring of the EELV contract and a better understanding of the actual launch costs. We look forward to a thorough discussion of the very successful, but expensive, EELVs.

The final issue is the space industrial base. From rocket motors and engines to the smallest satellite parts, the supply base is getting smaller. We'd like to hear your thoughts on how to strengthen this industrial base.

We have a large panel today, so I will conclude and ask Senator Sessions for his comments. But what I'm hopeful is that our panelists know that we have to leave at 3:20, I guess we have a vote at 3:00, and for a late-breaking meeting to the White House, so if we could—while you've submitted prepared statements, they'll be included in the record. So if we could maximize the time, if you would each very briefly identify your highest priority in about 2 minutes.

Ambassador Schulte, we'll begin with you. Then Zangardi, Shelton, Helms, Formica, Titley, Hyten, and Chaplain. Thank you. Mr. Secretary.

**STATEMENT OF HON. GREGORY L. SCHULTE, DEPUTY
ASSISTANT SECRETARY OF DEFENSE FOR SPACE POLICY**

Ambassador SCHULTE. Mr. Chairman, thank you for the opportunity to testify this afternoon. In February Secretary Gates and DNI Clapper submitted to Congress a first-ever national security space strategy. This new strategy starts with dramatic changes in space, a domain that remains vital to our national security, but that is increasingly congested, contested, and competitive.

In the face of these challenges, this new strategy seeks to protect the strategic advantages that we derive from space while also protecting the domain itself and the industrial base that is so important to our capabilities there. My prepared statement summarizes

the strategy. I would like to focus briefly on three important aspects: first, promoting responsible use of space; second, partnering with other countries; and third, deterring attacks on our space systems.

Promoting the responsible use of space is one of the new strategy's key approaches. A more cooperative, predictable environment enhances our National security and discourages destabilizing behavior. The United States is leading by example. We are preparing to begin providing pre-launch notifications of our space launches, just as we have notified ballistic missile launches in the past.

STRATCOM has signed agreements with some 23 satellite operators across the world to share data and warnings of possible collisions. The United States is also looking to promote international transparency and confidence-building measures for space. With that in mind, we are currently evaluating the European Union's proposed International Code of Conduct for Outer Space Activities. Our preliminary review suggests that such a code could provide a positive approach to promoting responsible space—responsible behavior, but the administration has not yet made a final determination on the code or changes that would be necessary for us to accept it, and the Department is assessing its operational impact.

Partnering with other countries is another key approach of the new strategy. Partnerships allow us to benefit from the growing space capabilities of allies and other countries, to make our space systems more diverse and resilient, and to improve our ability to operate in coalition. As an important step in that process, we are looking at transitioning STRATCOM's Joint Space Operations Center into a combined space operations center with allies.

Another good example of partnership is the Wide-Band Global SATCOM, WGS. Australia has bought into the constellation and the Air Force is negotiated with other allies to also buy in. This expands the number of satellites, adds coverage and resiliency, and shares the cost, a welcome benefit at a time of budget constraints.

The new strategy also reflects a new multi-layered approach to deterring attack on our space systems, which is important as space becomes increasingly contested. The first layer of deterrence is the establishment of norms of responsible behavior, as I discussed. The second layer of deterrence is the establishment of international coalitions so that an attack on the capability of one becomes the attack on the capability of many.

The third layer of deterrence is increasing our resilience and capacity to operate in a degraded environment. The fourth layer of deterrence is a readiness and capability to respond in self-defense and not necessarily in space.

In conclusion, Mr. Chairman, the Department has adopted a new space strategy to protect the National security advantages that we derive from a domain that is increasingly congested, contested, and competitive, and we look forward to working with you and Congress in implementing this strategy.

Thank you.

[The prepared statement of Ambassador Schulte follows:]

Senator NELSON. Thank you.

Dr. Zangardi.

STATEMENT OF JOHN A. ZANGARDI, Ph.D., DEPUTY ASSISTANT SECRETARY OF THE NAVY FOR COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS, INTELLIGENCE, INFORMATION OPERATIONS, AND SPACE

Dr. ZANGARDI. Good morning, Mr. Chairman. Thank you very much for giving me the opportunity to testify this afternoon on issues of space.

The Navy continues to provide narrow-band satellite communications for U.S. forces worldwide through the legacy UHF Follow-On constellation, otherwise known as UFO. We will continue to lease commercial UHF services to supplement existing capacity as required in support of the warfighter. Navy looks forward to the first on-orbit capability of Satellite No. 1 of the Mobile User Objective System, MUOS, in 2012. As subsequent MUOS satellites are delivered to replace the fragile UFO constellation, it is critical that the Navy remain postured to provide uninterrupted UHF SATCOM services for the warfighter, including preserving the ability to launch MUOS satellites as they are delivered, in order to mitigate a loss of UFO satellite on-orbit.

Sir, that completes my statement. Thank you.

[The prepared statement of Dr. Zangardi and Admiral Titley follows:]

Senator NELSON. Thank you.
General Helms.

STATEMENT OF LT. GEN. SUSAN J. HELMS, USAF, COMMANDER, JOINT FUNCTIONAL COMPONENT COMMAND FOR SPACE, U.S. STRATEGIC COMMAND

General HELMS. Good afternoon, Chairman Nelson. I am honored to appear before you as the United States Strategic Command's Commander for the Joint Functional Component Command for Space. This is my first opportunity to come before you as the Commander and I look forward to working with you and the other subcommittee members to enhance the United States' standing as a global leader in the space enterprise.

It's an honor to represent the more than 3,000 soldiers, sailors, airmen, and Marines JFCC Space, as well as our exchange officers from Australia, Canada, and the United Kingdom. These men and women form a tireless and innovative joint force supporting our warfighters 24 hours a day, 365 days a year.

Operating within the increasingly congested, contested, and competitive space environment requires strategically reexamining our processes, planning flexibility, awareness of the space environment, and collaboration efforts with all spacefaring nations and corporations. Correctly adapting our operations will allow JFCC Space to continue to provide the following capabilities to the joint force:

Unmatched position, navigation, and timing information; missile warning and missile defense; communications, intelligence, surveillance, reconnaissance support; technical intelligence and characterization of the operational environment.

In today's strategic world, JFCC Space is at the forefront of defending our ability to operate freely in space. Yet we continue to search out better ways to support those in harm's way. We will continue to employ systems to enhance our comprehensive space

situational awareness. We will strive to strengthen our relationships with allied and industry space partners, ensuring our global capabilities remain available for those requiring them.

You can be proud of the soldiers, sailors, airmen, and marines of JFCC Space, and I thank the subcommittee for your continued support as we work to preserve and enhance our space capabilities for our Nation.

Thank you, sir.

[The prepared statement of General Helms follows:]

Senator NELSON. Thank you.

General Formica.

STATEMENT OF LTG RICHARD P. FORMICA, USA, COMMANDER, U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/ARMY FORCES STRATEGIC COMMAND

General FORMICA. Good afternoon, Mr. Chairman, and again thank you for your ongoing support of our soldiers, civilians, and families. I appear today as the Commander of the Army's Space and Missile Defense Command and Army Forces Strategic Command. I'm honored to testify before this committee. You've been a strong supporter of the Army and the key capabilities that space affords our warfighters and we value your continued support.

My purpose today is to inform the committee about the Army as a user of space capabilities, to summarize the Army's space strategy and policy, and to discuss the space capabilities provided by the Army. These are provided in more detail in my written statement which was prepared and provided for the record. I'll briefly summarize those three, sir.

As a user of space capabilities, the Army depends on position, navigation, and timing, communications, intelligence, surveillance, and reconnaissance, assured missile warning, and weather. The space-based services are critical enablers to our forces and assured access to space-based capabilities is a critical element in the Army's ability to shoot, move, and communicate. While we may face localized tactical disruptions, our Army does not want to face a day without space-based capabilities.

The Army's space policy and strategic plan provide our priorities—good afternoon, Senator—provide our priorities and equities for space capabilities and forces. Our focus is on leveraging DOD and national space assets in partnership with the joint community to provide assured access of space-based capabilities in support of full-spectrum operations.

The Army provides critical space capabilities for the combatant commanders and to the warfighter. In our space role, we have three core tasks: providing trained and ready space forces and capabilities to combatant commanders and to the warfighter; building future space forces; and researching, developing, testing, and integrating future space capabilities.

Our command is uniquely organized in the Army to perform these three tasks, with operations, capability development, and material development functions. We are also geographically well positioned in Huntsville, Alabama, and Colorado Springs, Colorado, to capitalize on the tech bases there. Our space capabilities are posi-

tioned in 14 other locations around the globe to accomplish these three core tasks.

So in conclusion, the Army is critically dependent upon the capabilities that space brings to the battlefield and seeks assured access to those capabilities. I appreciate the opportunity to speak on these important matters and I look forward to your questions.

Thank you.

[The prepared statement of General Formica follows:]

Senator NELSON. Senator Sessions, what we've done is we've started the 2-minute comments summarizing their reports. I think we've got three more, so then we're open for your opening comments.

Admiral Titley.

STATEMENT OF RADM DAVID W. TITLEY, USN, OCEANOGRAPHER AND NAVIGATOR OF THE NAVY, DIRECTOR, MARITIME DOMAIN AWARENESS AND SPACE

Admiral TITLEY. Good afternoon, Mr. Chairman, Senator Sessions. I'm honored to appear before you today on behalf of our Nation's sailors to address your Navy's space activities. The Navy is critically dependent on space to meet our maritime strategy's demands for a flexible, interoperable, and secure global communications capability to support the command and control requirements of highly mobile, geographically dispersed, U.S., joint, and coalition forces.

Our Navy's interests in space include communications, intelligence, surveillance and reconnaissance, positioning, navigation, and timing, missile warning, and meteorology and oceanography capabilities.

The Navy expects the demand for space capabilities to grow in the future, especially in the area of space communications. Our major space contribution to the joint community is the Ultra High Frequency narrowband satellite communications constellation. Beginning in 2012, the new system, the Mobile User Objective System, or MUOS, will begin to replace those legacy UHF systems.

Timely delivery of MUOS is a high priority for the Navy and our fiscal year 2012 budget submission continues our investment in this vital warfighting capability.

In closing, sir, I would like to reiterate that space capabilities will continue to be critical to our Nation's success in the maritime domain. As the recently-signed Navy space strategy states: "Space provides the ultimate crow's nest for maritime operations."

Thank you, sir, and I look forward to answering any questions you or Senator Sessions may have.

Senator NELSON. Thank you.

General Hyten and then General Shelton.

STATEMENT OF MAJ. GEN. JOHN E. HYTEN, USAF, DIRECTOR, SPACE PROGRAMS, OFFICE OF THE ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION

General HYTEN. Chairman Nelson, Senator Sessions: It's an honor for me to be here today representing the thousands of men and women involved in the Air Force space acquisition business. It is undeniable that the Air Force has experienced significant chal-

allenges controlling cost, schedule, and performance in our space acquisition programs over the last decade. We acknowledge this and we understand that we must improve our acquisition practices to both continue to deliver the critical capabilities our warfighters need while at the same time achieving better value for the taxpayer. Mission assurance remains fundamental to what we do, but not at any cost.

We believe we've taken important steps to recapture space acquisition excellence. We are finally finishing the development phase of many of our programs, delivering new capabilities, and moving into more stable production. We are placing new and additional emphasis on efficient space procurement that includes new acquisition strategies for acquiring space and launch vehicles included in our fiscal year 2012 budget submission.

We are working to stabilize funding requirements and personnel to ensure programs are more affordable, executable, and delivered as planned. This is hard work and it's going to take time for these changes to have measurable impact on performance. Nonetheless, we're confident that the space acquisition community is moving in the right direction and creating a fundamentally different space acquisition culture.

Again, let me express my thanks and appreciation to the members and staff of this subcommittee for your continued and dedicated support of our space capabilities, but, more importantly, for our soldiers, sailors, airmen, and Marines. I also look forward to answering your questions, sir. Thank you very much.

Senator NELSON. Thank you, General.

[The prepared statement of General Shelton follows:]

**STATEMENT OF GEN. WILLIAM L. SHELTON, USAF,
COMMANDER, AIR FORCE SPACE COMMAND**

General SHELTON. Mr. Chairman, Senator Sessions: It's a true honor for me to appear before you today as the Commander of Air Force Space Command. I'm also honored to appear with these distinguished witnesses, and I'd like to also publicly congratulate Susan Helms on her induction into the Astronaut Hall of Fame. Her people launched SBIRS last Saturday and then shortly after that she was inducted into the Hall of Fame, so all around not a bad Saturday for the Helms household. I'm fortunate to have this talented officer and role model in my command.

In Air Force Space Command, I am privileged to lead over 46,000 active duty, Guard, and Reserve airmen, government civilians and contractors who deliver space and cyberspace capabilities around the world for our Nation. Air Force Space Command space and cyberspace capabilities are integral to the joint fight. Our professionals work extremely hard to continually ensure excellence and mission success in global combat as well as humanitarian operations, ranging from Afghanistan to Libya to Japan.

I thank the committee for your continued and steadfast support of Air Force Space Command and the capabilities we provide for this Nation. I look forward to your questions. Thank you, sir.

[The prepared statement of General Shelton follows:]

Senator NELSON. Thank you, General.

Ms. Chaplain.

STATEMENT OF CRISTINA T. CHAPLAIN, DIRECTOR, ACQUISITION AND SOURCING MANAGEMENT, GOVERNMENT ACCOUNTABILITY OFFICE

Ms. CHAPLAIN. Thank you, Mr. Chairman. As you know, our focus at GAO is on acquisition oversight. If I have to sum up my remarks very quickly, I would just say space acquisition has been broken, it is being fixed, but more needs to be done. I just want to spend a few minutes telling you what's on our watch list in terms of what needs to be done. But I do like to say that a lot of credit does go to both the Air Force and DOD for the many actions they have been taking, and they are all detailed in our statement.

First, there are some major programs that face considerable schedule pressures and schedule risks. Although they are attempting to incorporate best practices, it's still unknown at this time the extent that these practices can shorten the schedules by years.

Second, many of the systems on the ground that support space activities and that enable satellite capabilities to be used are still facing a high degree of acquisition risk. These include ground systems like the OCX program for GPS, user terminals for the AEHF system, some of the sensors involved with space situational awareness, and the control system for space situational awareness, known as the JSBOC mission system, which is the linchpin in that mission and it's very critical that it be done successfully.

Also, while there's been a number of organizational changes made over the past year, it's just unclear at this point how they'll shake out and whether they'll really streamline oversight and strengthen it for space acquisitions.

Fourth, there's more organizations involved in space now. You have the Missile Defense Agency taking on a new major program and, as we know, today the Army's taking on some space efforts, and you need to balance this with the dwindling work force. There's key areas of space expertise that have been decreasing in recent years. So I think there's a question as to how we have that capability, is it being stretched too far across the Department.

Lastly, there's just budget pressures that we all know are out there. At the same time, space is very costly, so the question going forward is can we still start new major efforts or is that going to be unaffordable? And when we do start them, are we going to be pressured to take shortcuts, including testing and important mission assurance activities?

That's just what's on our list for this year. I thank you.

[The prepared statement of Ms. Chaplain follows:]

Senator NELSON. Thank you.

Senator SESSIONS.

Senator SESSIONS. Thank you, Mr. Chairman.

I sincerely apologize for not being able to be here when the meeting started. I want to thank all of you witnesses for being here.

Let me start by congratulating the Air Force for the successful launch of the first Space-Based Infrared Satellite, SBIRS. The long-anticipated launch of this first of a kind, state of the art satellite is a significant accomplishment and I congratulate the Air Force upon this major milestone.

I don't need to remind our witnesses of the many challenges that led to the 9-year delay or the estimated \$11.5 billion increase in

total program cost. We just have to insist that the Defense Department reverse that trend as we go forward that's been really taking place over 2 decades. Maybe GAO can help. But we must ensure that the taxpayers' money is spent wisely and that capabilities are delivered without delay or extra expense.

As the Department, and in particular the Air Force, enter a new era of space acquisition driven by decreasing budgets—and we will have some of that—we'll try to protect the military as much as we can. We know space assets cannot be eliminated from our future budgets. Some might think so, but they cannot. Our whole infrastructure, as the chairman knows, and communications systems are space-based that are so critical to the Defense Department. So we can't allow that to be eroded.

But being on the Budget Committee, I have to tell you a lot of people are in denial about how serious our financial condition is. We're borrowing 40 cents of every dollar we spend, and that cannot and will not continue. So I just would share that to you. And I think all of you are committed to the kind of procurement programs and expense reductions that help us strengthen our capabilities.

So I'm pleased that GAO has joined us and look forward to hearing their latest assessment of space acquisition efforts. In the past GAO has expressed a number of valid concerns concerning cost overruns, schedule slips, and capability gaps. With the fiscal year 2012 budget the Air Force has announced its intent to change the way it procures our multi-billion dollar space capabilities, and I look forward to GAO's comments on that.

The fiscal year 2012 budget marks a fundamental shift for defense space. I appreciate that the Air Force has been working to ensure that its space programs are more executable and produce a better return on investment. However, I am concerned that some of this refocusing has come at the expense of needed investments in future technologies. The lack of sufficient technology risk reduction is a key reason we often experience cost overruns. Without that appropriate level of investment, we risk exacerbating the cycle of schedule slips, cost overruns, and credibility gaps.

With the release of the National security space strategy, the Department of Defense and intelligence community have proposed a framework for responding to the current and projected strategic space environment. The NSSS aptly characterizes the congested, contested, and competitive nature of the space domain.

However, I have significant concerns regarding the administration's stated intention of pursuing "proposals and concepts for arms control measures." Since the release of the NSSS in February, it appears the administration is planning to go forward and maybe sign the so-called "European Union Code of Conduct for Outer Space Activities."

According to recent comments by Ambassador Schulte, the Deputy assistant Secretary, who I thank you for joining us today, the Defense Department has tentatively concluded that the EU Code of Conduct should be adopted and is consistent with the Obama Administration's policy interests. I'm uncomfortable with these comments and have a number of questions.

Any pursuit of a multilateral arms control agreement on space capabilities could have a number of highly damaging implications for our National security interests. To date the administration has not consulted with the Senate on its intent, nor shared any specific provisions. Furthermore, it remains unclear if the administration has the authority to enter into such agreement without advice and consent.

Mr. Chairman, this is an excellent panel. Thank you for convening it and thank you for your leadership and commitment to the defense of America. It's an honor for me to work with you.

Senator NELSON. Thank you, Senator Sessions. I feel likewise. We've worked on so many different things for so long; it's a pleasure to continue to do so.

I thought what we might do is have a 6-minute round.

General Shelton, you assumed command of the Air Force Space Command in January. On a broad basis, what do you see as your greatest challenges? What did you see when you took your responsibilities? What was the greatest challenges that you could see out there?

General SHELTON. Senator, I think there's probably three things that I have established as top priorities. First is to continue to support the joint fight, continue to support our brothers and sisters in harm's way. Second is to get control of the cost of space programs, and you both have talked some about that, and we are at that work mightily. Then the third is to operationalize and normalize the cyberspace domain within the Air Force. So those are the three things that we've been focused on at the top level.

Senator NELSON. What plans do you have, let's say, on item number 2, to get control over the costs, which is obviously one of the things that is foremost in our minds as we deal with budgetary issues?

General SHELTON. Yes, sir. A couple of things. First is to do a better job of writing the requirements, such that we are not pursuing absolute state of the art technology and pushing—I should say that differently: pushing the state of the art of the technology, but rather that we accept very mature technologies. SBIRS is a very good case in point, where we pushed pretty hard on the state of the art and we ended up with long development time lines and over cost in certainly over schedule.

The second thing I would tell you is to manage the kinds of contracts that we write. We have in the past gone with much more of a development sort of approach, as opposed to acquiring with a fixed price sort of approach. Where government has shared the cost with the contractor, now we want the contractor to identify the cost up front such that we can be much more deterministic in how we develop our cost estimates.

Senator NELSON. In, General Shelton, some recent remarks at the National Space Symposium, you discussed the growing problem of space debris. You mentioned that the Air Force tracks approximately 20,000 objects, most of which is debris, and there are probably ten times more objects that are too small to track at the same time, any one of which could be lethal to a satellite.

I'd note that when China tested its anti-satellite weapon in 2007 space debris increased by as much as 25 percent. The collision of two satellites in 2009 added even more debris.

Is there any possibility to remove some of that debris? For instance, we've heard of proposals to use laser to remove that debris. Is there any other concept that's technically possible that you might think of or that we might be able to develop? And if it were feasible to have it, who would pay for it? Not just the United States, I would hope, but others who have contributed.

But if it can't be removed and we're faced with it, what indeed are the options? One of the concerns, of course, is that more debris increases the chances of a collision that, oddly enough, creates more debris. So perhaps you can share your thoughts on that?

General SHELTON. Senator, you're exactly right. Debris begets debris, just from a probabilistic point of view. We have not found a way that is either technically nor economically viable to eliminate debris. What we have done, both nationally and internationally, is encouraged the conduct of space operations in a way that it minimizes debris. So as we launch new satellites, as we reach end of life on satellites, we think about disposal of those satellites. We think about mitigation, minimization of debris. And we're encouraging others across the world to do the same.

Senator NELSON. General Helms, to protect satellites you have to know what you're protecting them from. Improving space situational awareness, including the ability to detect and determine interference, is one of your major responsibilities. Obviously, there are many sensors that provide or could provide space situational awareness data. One of the problems, however, is the computer system that Joint Space Operations Center, pronounced, as you know, "JSPOC," mission system that utilizes this data to provide meaningful information, that's old and it no longer is able to handle the available data.

So upgrading this system has proven to be an acquisition challenge. Do you have, and if you do what's your vision for, how this system should work in the future?

General HELMS. Well, thank you, Mr. Chairman. Yes, we do have a vision, and you're exactly right. The SPADOC system, which is currently the capability that we use in order to track objects in space, not only our satellite operations but also the pieces of debris, we have a sensor suite that's all over the world, that basically contributes to a catalogue, that in effect allows us to have knowledge of what is going on in space.

The system on which that catalogue resides is aging rapidly. It's pretty much past its design life. It will be unsustainable at some point because of the nature of the computer system that it rides on. This JSPOC mission system capability, known as the JMS, is in effect a critical capability that we need to get in order to continue to do the mission that I'm responsible for, which is to have space situational awareness of all objects in space.

The vision is that, first of all, we get that replacement in a timely manner so that we don't have a gap, which I would call an absolutely critical gap, between what we have today, being able to sustain what we have today, and then bringing something on board that in effect replaces it.

The second thing we need to do is have a vision of an open architecture. What I mean by that is there are the sensors that we have in JFCC Space, but there are also other sensors that are available, potentially through the Missile Defense Agency, for example. If we set this up right, we'll have an open architecture that will in effect allow us to leverage the exposure of sensor data from all over the world, not just from my own sensors, but from others' as well.

If we build a system with an open architecture such as that, then what we will have is a multiplying capability that will allow us to bring more capability to bear, to fuse data, to watch the space environment.

The third thing that comes along with this joint mission system capability is the interface to the space professionals. Right now what they're faced with is basically lines of text. I've seen the products myself. It's very, very cumbersome to work with. It slows them down. They have to use sneakernet, as we call it, in order to manage the knowledge that's necessary to understand what's happening in the space environment.

If we were to be able to put some user interfaces in front of them that was more pictorial and much more comprehensive than what we're working with today, as is envisioned with the JMS capability, my young space professionals will take off. They will basically become much more sophisticated. They already are really sharp. What they just need to do is have their creativity unleashed.

The way that the JMS capability is envisioned will allow that to happen, and we will really have some pretty amazing forces at work here to try to understand what's happening in the domain as we acknowledge it as congested, competitive, and congested.

Thank you.

Senator NELSON. Thank you, General.

Senator SESSIONS.

Senator SESSIONS. Thank you.

Admiral Schulte—Ambassador Schulte, as I mentioned in my opening remarks, I am concerned about the so-called "European Union Code of Conduct for Outer Space Activities." Can you tell us whether the administration intends to inform Congress prior to signing any multilateral commitments in space activities?

Ambassador SCHULTE. Sir, I'd be honored to be an admiral. I think that's a more honorable profession than being an ambassador.

Senator SESSIONS. Well, it is an honorable - ambassador is pretty fine, too.

Ambassador SCHULTE. The headline that came out of my speech in Colorado Springs was "Pentagon tentatively okays EU code." That headline was wrong. I trust that never happens here.

Let me step back and explain what we're trying to achieve and where we are, and try to address some of the concerns that you, Senator, and I think at least 36 other Senators have raised, too. The national space policy from the President says, as you mentioned, we will consider arm control in space. But it sets out three criteria: It has to be effectively verifiable, it has to be equitable, and it has to serve our National security interest.

So far we haven't found an arms control agreement that does that. There's one on the table. It's been proposed by Russia and

China. We have declared it, not very politely, but we've basically said it's fundamentally flawed because it's not verifiable and it's not clear it would even capture a lot of the Chinese counter-space systems that worry us.

So instead of pursuing arms control at this point—we're open to it, but instead of pursuing it, we're looking at what we call transparency and confidence-building measures, voluntary measures to encourage responsible use of space.

The one such set of measures that we are currently evaluating is the proposal from the European Union, its proposed Code of Conduct for Outer Space Activities.

Senator SESSIONS. Let me fundamentally tell you my concern, and I've seen this for a number of years since I've been in the Senate. That is, we have in space the most capable program in the world by far, I think. We've advanced further technologically and in development and actually deployment of systems than anyone else, and agreements, codes of conduct, tend to be—to constrain our military. And our military is fundamentally configured so it depends on space capability.

So I would be a bit nervous and am a bit nervous and want to examine carefully whether or not through some agreement we've constricted our ability to effectively defend our interests.

Let me ask you a few questions and see if you can answer them briefly, and if you can I'd appreciate it. Has the Air Force Space Command or Strategic Command reviewed and provided an assessment at this date to the draft code of conduct?

Ambassador SCHULTE. Mr. Senator, we are currently in DOD conducting an operations assessment of the EU code to see what the impact would be. Our goal isn't to constrain ourselves. We think we act pretty responsibly in space. The goal is to try to constrain new emergent space powers, to ensure they adopt procedures that would, for example, mitigate the creation of debris and avoid mishaps and instability in space.

So the goal—and believe you, the intelligence community and Department of Defense, we want to protect our National security equities. But we also, as the strategy says, we have a stake in a domain in which others are operating that's a bit more predictable. And we want to encourage other countries to apply the same type of standards that we do in space.

Senator SESSIONS. Would there be any impact such as this in such an agreement, would there be anything that would impact in any way a U.S. decision to deploy missile defense interceptors of any sort in space?

Ambassador SCHULTE. Sir, the EU code is about behavior in space, it's not about capabilities in space. So it would not, for example, prohibit the deployment of space-based interceptors. Now, if somebody wanted to do that and they're going to create a lot of debris by doing so, we might sort of say that's a bad approach. But it doesn't prohibit deployment of space-based interceptors.

Senator SESSIONS. As a practical matter, would it or could it impede our ability to do that?

Ambassador SCHULTE. No, sir, not as we understand it.

Senator SESSIONS. Is there anything in it that would impact the development, test, or deployment of an anti-satellite weapon such as the one successfully used in the Burnt Frost 2008 operation?

Ambassador SCHULTE. Sir, it would not do that. It would not—it doesn't constrain—

Senator SESSIONS. Well, we—

Ambassador SCHULTE.—capabilities; it constrains behavior. And in fact, the Burnt Frost operation—and I was in Vienna at the time and we did very well there, not just from a technical standpoint, but from a diplomatic standpoint. We showed how we were acting responsibly to minimize debris. In fact, the draft EU code as it now stands would allow such operations in the future.

Senator SESSIONS. What about, would it impact in any way the research and development, testing and deployment of a kinetic defensive system in outer space, one that could take out a satellite and that maybe—let's say we're in an area of serious maybe even hostilities. There's a satellite that's providing intelligence information that places our military personnel at risk. Is there anything that would in any way impact our research, development, and testing of such a kinetic defense system in outer space?

Ambassador SCHULTE. No, sir. It would discourage any activities that, again, would create a lot of debris.

Senator SESSIONS. Well, but it would be hard under our current technology to destroy a satellite that's spying on our military—would this satellite keep us from doing that—would this agreement keep us from doing that?

Ambassador SCHULTE. Mr. Senator, actually there are many ways, that we can't discuss entirely here, to neutralize another satellite, and you can certainly do it without creating a lot of debris.

The other thing I should mention, sir, if I could, is that—

Senator SESSIONS. Well, I'm not sure that I'm totally sold on that, that you can necessarily impact all satellites without creating debris. Are you sure that's accurate?

Ambassador SCHULTE. Sir, we could go into another session for that, but there are—certainly the Chinese, for example, are looking at ways of neutralizing satellites that don't create a lot of debris.

The other thing that—

Senator SESSIONS. Well, looking at it and doing it are two different things. Excuse me; go ahead.

Ambassador SCHULTE. Sir, I just wanted to mention, the code is voluntary, so it can be put aside if you have to. It's not a treaty. It's not legally binding. It also is full of references to the inherent right of self-defense, and you can imagine as the Defense Department we appreciate that. And it allows actions to be taken for self-defense.

So we think, as General Kehler told another panel recently, we see it as largely consistent with our operations plans, with our current practice, but we are doing a detailed assessment.

Senator SESSIONS. And what are your plans about advising and briefing Congress on this before anything is signed?

Ambassador SCHULTE. Sir, I would actually defer to the State Department about how to handle that with Congress. Having said that, though, we—in response to the letter that you and many of your colleagues signed, there was a response. We offered briefings

to your staff. I'm happy to come meet with you separately on this. We understand that many have concerns about this and we're prepared to come and talk to you about them.

Senator SESSIONS. Are Russia and China involved in these discussions?

Ambassador SCHULTE. Russia and China is interesting. You know, the two countries that are most nervous about the EU code are Russia and China. And I think part of that is because they see the code as a competitor to the arms control agreement that they've proposed, which we've found as fundamentally flawed. So they've been a little bit reluctant to look at the code.

But I think as they see more and more countries looking at the code they're thinking, gee, maybe we should look at this, too. And we have encouraged them to consider it, making clear we haven't made a final decision. But again, we see this as a possible way to get the Russians, to get the Chinese, to act more responsibly.

If only we sign the code along with the European Union, it's meaningless. We want to get—we want to get the Russians, the Chinese, into this type of framework. We want to get the Indians in there, we want to get Brazil. Again, the goal is in many ways to export the best practices that we use to other parts of the world, to create a more predictable space environment, while still protecting our defense equities.

Senator SESSIONS. Well, we've spent billions of dollars to produce a fabulous communications satellite network that is a critical part of our defense structure. I would hate to see us take any action that would neutralize any part of that capability we've invested so much to achieve.

Thank you.

Ambassador SCHULTE. Thank you, sir.

Senator NELSON. Thank you, Senator.

General Formica, the Army is heavily dependent on space systems for much of what you do, particularly in theater. This subcommittee is worried about disconnects between the equipment that enables the warfighter to utilize space systems, particularly the GPS and communications, and the satellites themselves. Improved capability is on orbit, but the equipment is not fielded. Do you see this as an issue for the Army? What are your thoughts?

General FORMICA. Senator, thank you. As you said, the Army is invested in space capabilities and require them in order to function in our operating forces in theater and around the world. We are dependent on GPS satellite communications, among others. Having reliable ground systems and being able to push those down to the lowest level is important to us and it is a capability that is something that needs to be developed and that we count on.

Senator SESSIONS. In your statement you mention that the Army—you mention the Army space support teams. Apparently these teams play a vital function in providing space support to commanders in the field. In your view, do these teams have all the support they need or do they need additional support or access to information?

General FORMICA. Senator, again thank you for the question. The Army space support teams and the space support elements which go at the various levels of Army commands and our operational

forces are an essential part of our space cadre. We manage over 300 space professionals as part of the space cadre and they are well trained. They train in a joint environment. They train not only at schools that we've developed at Space and Missile Defense Command, but we rely on the Air Force's National Strategic Space Institute for some of the advanced training that these space professionals get. They go to the Navy Postgraduate School and other advanced civil schooling. So they're very well trained.

We've deployed now our sixtieth Army space support team rotation in support of forces in Iraq and Afghanistan. They provide reachback capability to those forces to access the space capabilities that our joint forces provide. They are a very essential part of what it is we do. We maintain the capability to continue that rotation. I think they get the support that they need, and they're clearly a capability that operational commanders seek when they get ready to deploy.

Senator NELSON. Thank you.

Dr. Zangardi and Admiral Titley, as I mentioned in my opening statement, last year the first MUOS satellite was expected to launch in September of this year. Now it looks like the first satellite will not launch until mid-2012. In your prepared statement you indicate that there's an issue with scheduling the launch. Is that the only reason for the delay, and what is the cost of the delay, both in terms of dollars and operational capacity?

Dr. ZANGARDI. Yes, sir. Thank you for the question, sir. We project that the launch will occur in February of '12. We've been provided with a launch slot and that was firmed up a few months ago. The on-orbit capability for the first space vehicle of MUOS will be available in May of 2012.

As far as the cost for that delay, we'll have to take that as a question for the record. I'm not prepared to answer that today.

[The information referred to follows:]

[SUBCOMMITTEE INSERT]

Senator NELSON. Okay. Is there any danger that that program might experience a Nunn-McCurdy breach?

Dr. ZANGARDI. Sir, in my view, and having talked with the program manager extensively before coming here, our view is that it will not at this point in time.

Senator NELSON. Is there anything that could cause that to happen that you're aware of?

Dr. ZANGARDI. Sir, at this time there's nothing that I'm aware of that could cause that. But that does not preclude the possibility that something can occur, because, as we know, space is very complicated.

Senator NELSON. General Titley, how do you approach this from your perspective?

Admiral TITLEY. Yes, sir, Senator. Thank you for the question. As we look at the amount of UHF capability that is on orbit today and how between a combination of some legacy FLTSATs, some LEASESAT, as well as our UFO constellation, we believe that we will have in excess of 70 percent of that constellation still available by the time that the first MUOS bird achieves on-orbit capability in May of 2012.

There's a number of reasons for that. U.S. STRATCOM has worked very hard along with the UFO program office. We have been able to in fact squeeze more capability out of the existing constellation. We're careful on how we reprioritize. We've been careful with how we've used the leases. That has got us to the point where we believe we will have again in excess of 70 percent of our capacity, which is kind of the benchmark, by the time MUOS No. 1 achieves on-orbit capability.

Thank you, sir.

Senator NELSON. What are your thoughts about a potential Nunn-McCurdy breach?

Admiral TITLEY. I would just echo Dr. Zangardi's comments there, sir. From my perspective, I have not seen anything from the program briefs that at this point in time trigger that, that concern. But, as Dr. Zangardi said, this is something you always have to keep watching for.

Senator NELSON. Thank you.

Senator SESSIONS.

Senator SESSIONS. General Shelton and Ambassador Schulte and Ms. Champlain: Over the 5 years—over the 5-year future years defense budget for 2012, the cost for space launch vehicles has risen. Last year the budget called for 26 launch vehicles from fiscal year 2012 to fiscal year 2016 at a cost of \$6.4 billion. This year's budget for the same time period reduces the number of launch vehicles by three, but the cost appears to have risen from \$6.4 billion to \$9.8 billion. That's three less rockets, but \$3.4 billion increase in cost.

How much of this price increase is related to the cancellation of NASA's Constellation program, which I know is some of it, and a lack of a clear NASA pathway for heavy lift? Would you comment on that?

Ambassador SCHULTE. Senator, I'd be glad to. First, we need to start with an economic order quantity buy of piece parts for the rockets that started with the beginning of the EELV program. When we first started that program, we thought we were going to have a very robust commercial launch market. The vendors went out, bought a lot of parts, got good deals on the buys of those parts. We are expending the end of those parts and it's time to buy new.

We're buying smaller quantities. A lot of the vendors that we used before are no longer in business. So in terms of the cost of upper stages, individual components that go on the components, those prices have increased, as well as the engines for the rockets themselves.

So as we go through with this new strategy to buy eight rockets per year, five for DOD, three for the NRO, we will try to bring those costs down by going at it with a much more fixed price mind set and again get back to an economic order quantity capability for the United Launch Alliance that's our launch provider, and get down to lower costs as much as we can.

But this is just a relatively small market that we're in here and it's just very difficult to contain the costs, but we're working hard at it.

Senator SESSIONS. But the Air Force is dependent and basically required to provide almost the entire support now that NASA has reduced its play, participation, and consuming more than—NASA

used to consume 70 percent of this capability. Has that impacted the price for the Air Force?

Ambassador SCHULTE. Senator, I think you're talking about the solid rocket capability.

Senator SESSIONS. Right.

Ambassador SCHULTE. We're not a big player in the space launch business in the solid rocket business, in the big solid rocket business. That's really the business of the strategic programs of the Air Force and the Navy, and I'm talking about strategic missile programs. But in the space launch business we use liquid, liquid propulsion.

Senator SESSIONS. Either one—Ms. Champlain, would you like to comment on that, please?

Ms. CHAPLAIN. Yes. Specifically about the engines and their effect on price and what's going on in the NASA Constellation program, and I do believe the engine prices are supposed to be increasing because there is a lot of uncertainty of what NASA's going to do in terms of Constellation and that could be factoring into the prices considerably.

When will we know what NASA's going to be doing? It should be this year, but there's still a lot of unknowns about how NASA's going to answer its own authorization requirements. The Senate Commerce Committee laid out an architecture that it desires to see and NASA has not come back yet and answered how they're going to answer that architecture.

So we still have uncertainty and until that certainty comes it's likely that those engine prices are going to be higher.

Senator SESSIONS. Well, I agree. I notice one of the CEOs involved in this said the number one thing going on in our supply base right now is uncertainty, and really it's uncertainty as to what—on what NASA is going to do. So we're trying to work on that problem.

Let me ask this. In their mark of the fiscal year 2012 National Defense Authorization, the House Armed Services Committee chose not to fund MDA's request for \$160.8 million for the Precision Tracking Space System. I talked to General O'Reilly about that and he is concerned that this is a decision that could increase costs.

Ms. Champlain, the Missile Defense Agency programs are part of your GAO portfolio. Do you have any concerns with the MDA's strategy for PTSS or MDA leading the acquisition of a major space system?

Ms. CHAPLAIN. A couple months ago in our MDA report we reported on the PTSS program along with all the other MDA systems, and it's still fairly early in the program, but we did note that the program is adopting some practices that we like to see in space programs, one being that they want to build prototypes before operational satellites.

Senator SESSIONS. In other words, the Defense Department would basically build the prototypes and own the proprietary data, the patents or the rights to procure?

Ms. CHAPLAIN. Yes. They would be working with the NRL and the APL up the road, the two labs, to build prototype satellites. It's unclear whether the prototypes are going to be really what the operational satellites are going to end up being. It's also something

else we're trying to pursue as to the extent to which the schedules for developing the prototypes overlap the operational satellite schedules; are we giving enough time there to actually learn from the prototypes and feed that into the subsequent effort by contractors?

The other thing the MDA has been trying to do that we thought was good is keep requirements simple for PTSS. But there are pressures and ideas for other things that PTSS could do.

We do have a concern about capability in terms of managing the large space program at MDA in terms of just broader work force issues across the Department and are we stretching the space work force a little too thin and the acquisition capability for space a little too thin. But we haven't reported on that issue and we haven't done enough exploration about what MDA has versus what the Air Force has to be able to make reasonable comparisons.

Senator SESSIONS. Mr. Chairman, I would just say that I think it's possible the House didn't have all the information that's necessary on this system. General O'Reilly suggests that it could actually save a lot of money and get more capability.

General Shelton, do you have any thoughts about that, briefly? My time is a bit over here.

General SHELTON. Senator, I talked to General O'Reilly just before coming over here and by what he has shown me it looks like a very capable system. Certainly not my area, but in terms of the way he described the capability and what it brings to missile defense and potentially to space situational awareness as well, it looks like a very valuable capability.

Senator SESSIONS. Thank you. So it may be that we can work together to determine what would be the best thing to do, because a satellite apparently could do more than other systems at less cost.

General FORMICA. Senator Sessions, would it be appropriate for me to comment?

Senator SESSIONS. Please.

General FORMICA. I actually speak from my operational perspective as STRATCOM's Joint Functional Component Command for Integrated Missile Defense. I can't speak to the programmatic—I can't speak to the programmatic of the PTSS. I will leave that to General O'Reilly. But the operational implications of having PTSS or a capability like that is the ability to defend against larger raid sizes. It's got increased capability. And it would reduce our reliance on terrestrial-based radar systems which require host nation basing agreements, or even airborne platforms that require air space. It's a persistent satellite-based contributor to the missile defense and would provide quality control tracking data that we would need.

So it is a viable capability and there are operational implications to not having it. But again I'll defer the programmatic discussions to General O'Reilly.

Senator SESSIONS. Briefly, he indicated that it has exceeded your expectations when you started with that program technologically?

General FORMICA. Again, we know that the STSS, which is its predecessor capability, was recently successful in being able to transmit data during the FTM-15 test a couple weeks ago.

Senator NELSON. Thank you, Senator Sessions. I have to go to the White House following the vote, but I'll be glad to leave this open and it will be in your very capable hands.

Senator SESSIONS. Well, thank you. I appreciate this panel. I might have a question or two and then we'll wrap it up.

Senator NELSON. That sounds fine.

Senator SESSIONS. Thank you, and make sure you figure a way to balance that budget, and not on the backs of the military.

Senator NELSON. I'll do my best.

Senator SESSIONS [presiding]. Thank you.

General Shelton, in January the Deputy Secretary of Defense voiced significant concerns to the Chairman of the Federal Communications Commission regarding the FCC's provisional authorization of LightSquared's new wireless broadband proposal and the potential for interference with GPS signals which our Defense Department relies on in a lot of different ways.

Secretary Lynn states that there's a "strong potential for interference to these critical national security systems" and that the Department strongly recommends the FCC defer final action until proper interference analysis and mitigation studies can be conducted.

Do you agree with the concerns expressed by Secretary Lynn and what are the National security implications if we have an interference problem?

General SHELTON. Senator, at the time he signed that letter and a subsequent letter in March, we had just analytical data from an equipment manufacturer and some of the information that our program office in Los Angeles had been able to gather. We have since conducted actual testing using LightSquared's equipment, using civil, commercial, and military GPS receivers at Kirtland Air Force Base. I would—although the data is still being analyzed, I would tell you that the data appears to be—the empirical data appears to be consistent with the analytical data.

So yes, sir, we have concerns for commercial applications, civil applications, and military applications.

Senator SESSIONS. People with a GPS in their car could have problems also?

General SHELTON. Yes, sir.

Senator SESSIONS. Well, we've got to look at these things as we go forward and I think it's very appropriate to ask FCC to look at it hard.

I realize the vote time is winding down. Thank all of you for your service. We believe in what you do. People do not appreciate the extent to which our space capabilities help SEAL teams, help unmanned aerial vehicles, help Army squad leaders all over the world, Navy ships and capabilities. It's an extraordinary thing that this Nation has accomplished. No nation in the world has ever achieved so much in this regard. It costs a good deal, but it saves a lot of money too in a lot of different ways in making our military more capable and requiring less support.

So thank you for your attendance. We will be submitting some written questions and I hope that you'll be able to answer those within the time required. Thank you.

We are adjourned.

[Whereupon, at 3:13 p.m., the subcommittee adjourned.]