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General Schwartz: Thank you. Joe, thanks for having me back. Last year I think we talked about a couple of Greek folks in the remarks, if you may recall, and I got a real tough time from Suzie on it, so there will be no history lessons here today. [Laughter].

I'd also like to thank the wonderful AFA team for organizing yet another world class event. I'm especially pleased, I think, with the extensive reserve component, combatant command and joint presence that is here. I especially look forward to General Mike Scaparrotti's remarks. Scap, of course, is the Commander of the 82nd Airborne, currently serving in Afghanistan. He's the commander of Regional Command East. I certainly appreciate his making time during his home leave to come spend a few minutes with us and give us a bit of perspective of what a combat partner thinks about what his Air Force is doing on a daily basis.

I greatly appreciate the opportunity to spend some time with you all once again and I think to share now a year later some remarks on our contributions to national security. I'd certainly like today to focus, and Bob Kehler is far more expert than I, but today I'd like to give a shot at about matters involving the high ground of space, and the still largely undiscovered possibilities in the emerging medium of cyberspace.

Virtually all aspects of military operations are affected in some way by the capabilities that are provided in these domains. It's difficult to overstate their importance to the success of the armed force generally, and certainly to our Air Force. From precise navigation and timing, to global satellite communications, to space-based surveillance, missile warning, our space assets provide us with an unparalleled degree of accuracy, connectivity and situation awareness. And our exploitation of cyberspace and advanced information and technologies enable us and the joint team to properly command and control our forces, binding virtually all of our advanced capabilities together into precise, increasingly networked and better synchronized operations.

Certainly our reliance on space and cyber power is well established because our nation's diverse interests -- diplomatically, financially, economically, and yes, militarily -- exist around the globe. We have an enduring need for robust space and cyber systems and the inherently globally oriented capabilities that they provide. It would be fair to say, I think, that space and cyber power affects the lives of virtually all Americans every day. Keeping us connected and shaping the ways in which we all view the world.

From an Air Force perspective, space and cyber power will enable our ability to provide global mobility, global strike, intelligence, surveillance and reconnaissance, communications and many other critical capabilities on which the joint team heavily relies on us for operational effectiveness. As such, it stands to reason that our substantial dependence on space and cyberspace creates vulnerabilities that are potentially exploitable by our adversaries, an outcome with profound strategic implications.

Therefore, our efforts to protect these interests in space and cyberspace must be as ambitious as our reliance on these domains. We must be able to deter and to defend against attacks on our space and cyber capabilities and fight through any degradation, disruption or even denial of vital capabilities.

As we move to protect our interests in space and cyberspace we must begin by evaluating these vulnerabilities. Threats to our space and cyber capabilities pose some of the most significant challenges to our national security. Those who pose these threats, therefore must be deterred, or if necessary, compelled to stop. Unfortunately, Cold War methods of deterrence which were founded on the ability to identify our adversaries and influence them with roughly similar capabilities do not always apply today. Instead, we find ourselves in a more precarious situation. One where at times we are much more dependent on these domains than are our adversaries, and one in which it may be very difficult to attribute threats, either to those who are deliberately taking action against us, or perhaps to natural causes from the extremely harsh environment in which our space systems operate. Attributing threats in cyberspace is just as daunting, due to the technological limitations in detecting and finding cyber intruders.

It is also worth noting that what constitutes a challenge to our freedom of action in space and cyberspace can range from a simple tactical disruption with a short

term military implication to broader interference that affects the ways in which our nation, not just our military, depends on these two domains.

For example, attacks on commercial communication satellites can affect an entire universe of civilian uses as well as a very significant portion of military satellite communications that rely on commercial satellite systems.

Or consider that a disruption of the Global Positioning System could affect not only precision navigation and timing for our joint forces, but also civilian banking and finance, commerce, and the transportation sectors.

Or that a hacker could access anything from medical records to financial statements, business proprietary to government sensitive, with malicious intent to disrupt efficient management of a vast magnitude of networked global activity, both civilian and military.

In short, the implications of attacks on our space and cyber capabilities are potentially more consequential than we would infer from a purely military perspective. Because of this, we need to expand our definition of what constitutes a threat to our space and cyber capabilities. Paying attention to a particular asset allows us to assess immediate consequences to operational effectiveness. But we must also consider the broader forms of interference against any element of our space and cyber enterprise, to gain an appreciation for the longer term implications and our adversary's broader strategic intent.

These elements can include legal and regulatory regimes, international agreements, involve the industrial base or anything else that can affect either directly or indirectly our exploitation of space and cyberspace.

We just also consider the broader scope of adversaries. This list includes not only rival nations, but potentially also any number of non-state, sub-national and even individual actors that can threaten the advantage that we currently enjoy from space and cyber borne capabilities.

This reality, ladies and gentlemen, reflects a broader feature of the 21st Century international security environment with potential adversaries who are not merely unitary state actors. We should therefore, not treat them as such. The rub is how to deter potential adversaries in the event of competition in space, for example, when few others, few others, have as much dependency as we do.

This is a difficult issue through which we must still work. For until we see more parity in dependence, it would appear on the surface that we will have limited leverage. But it is worth noting that at least according to some studies, the breadth of space activities by our peers and non-peers, or I should say near peers -- China and the European Union, for example -- is similar to our own range of effort. Also access to space appears to be increasingly widespread, therefore involving more actors who benefit from and increasingly rely on space.

An example would be the proliferation of missile and rocket technology, miniaturization of techniques for smaller payloads and other technological advancements that are enabling more governments as well as commercial space providers to provide launch and satellite services more affordably. This has the ultimate effect of lowering barriers to entry and suggests that we must always be vigilant in discovering further challenges, to be sure, but also opportunities for deterrence options. Other possible deterrence options derived from how our adversaries value space, even though they may not rely on it as much or in quite the same way that we do.

For instance, space can still afford international prestige, much as it did in the '60s and the '70s. And recent efforts on long range missile development by Iran and North Korea suggest that highly technological endeavors and indigenous launch capabilities and advanced conventional weaponry are at least in part about gaining and garnering respect and stature as it is the fledgling technological capability or the achievements themselves.

In addition to prestige, space and cyberspace also offer opportunities for economic and industrial growth, political leverage, and other enablers of national power and influence.

Correspondingly, our efforts to stave off potential interference of our space assets gain other potential avenues of deterrence.

To address these challenges, we must continue to focus our attention on enhanced space situational awareness. Our ability to conduct this vital mission not only helps us to characterize threats as either intentional -- intentional by a potential adversary -- or as a result of electromagnetic radiation, space debris or any number of other hazards in space. They also help us to recognize anomalies in our own space constellations and evaluate our options for such contingencies. Our ability to track space

objects -- currently 20,000 of them -- has operational implications not only for military and civil uses of space, but also the enormously lucrative space system industry. Including sales of business communications, navigation and global positioning system handsets, remote sensing and digital television and music for tens of millions of customers, this segment of the industry topped \$33 billion in revenue in 2008 -- not a small or completely mature undertaking t this point.

To enhance our space situation awareness we must continue to nurture our resurgence in space intelligence, analytical and collection capabilities. This process will take time as decades of knowledge and experience are imported from seniors and senior analysts to new ones and new technical ways and means to collect or develop, manage and implement it. This enhanced situation awareness will not only provide our nation with the ability to evaluate an adversary's space order of battle and clarify our understanding of their fundamental intent, but also to detect, to mitigate and to otherwise respond to threats to our space assets. Increased space situational awareness capabilities will also bolster our space cooperation with international allies and partners.

Through the sharing of surveillance data we provide mission assurance for our cooperative efforts with enduring international partners. Also to maintain our current ability to leverage space we must continue to nurture and further develop our technological superiority. In all likelihood, any form of space competition in the foreseeable future will entail some elements of protecting and preserving our own space-borne capabilities, and this demands that we maintain the cutting edge of technology both from a government perspective as well as the industrial base.

For example, it is well known that dependency on the Global Positioning System has also created vulnerabilities that our adversaries can exploit through jamming and other tactical denial techniques. While we remain unequivocally committed to proper stewardship and use of the world's unparalleled standard in precision navigation and timing as well as advanced capabilities with new GPS Block 2F and next generation Block 3 concepts, we also recognize the need to be able to continue to operate effectively through improvement to GPS and other methods in a denied or degraded, localized environment.

Current realities continue to suggest the inevitability of contested space, and to prepare we are starting at the very top. Back in December, Secretary

Donley ordered a top-down evaluation of our management of military space responsibilities. Since 2001 when the last significant restructure took place, new legal and regulatory requirements as well as new agencies and authorities have affected the structure and roles and responsibilities and our stewardship of national security space. We will ensure from the Pentagon to our space wings and centers that appropriate structures and relationships are present to address the various challenges I've just discussed, as well as other issues.

Our overall approach for the future must be capabilities based. That is, instead of emphasis solely on protecting satellites, we should also focus on preserving through appropriate redundancies the force-enhancing capabilities that our space systems provide.

For example, space-based ISR capabilities should at least be in part backed up by other systems. And in some situations, our highly capable, remotely piloted aircraft might be capable of providing some compensating capabilities. They may not be identical, but we need to think in a cross-domain way when seeking such resilience, and this is a foot-stomper, that we will be looking at this in a cross-domain context.

Also while we continue to pursue efforts on operationally responsive space, to build reliable and responsive operational enablers and focus them on timely satisfaction of the joint commander's needs. True agile responsiveness should emphasize effectiveness in meeting operational demands, irrespective of whether the solution is space-based or otherwise. And because equipping our satellites with defensive capabilities requires tradeoffs with weight and fuel capacity and service life and service utility, we should also take a capabilities approach to space defense.

Protecting spacecraft is certainly a consideration, and in some cases it no doubt will be the very best approach, but we must first emphasize protecting capabilities. If a defensive posture can be achieved not only by hardening and improving the maneuverability of large and complex satellites, but also by smaller and simpler satellites, and we might emphasize further development of some less exquisite augmentation systems. With flattening budgets and what no doubt will be declining purchasing power. These sorts of tradeoffs, while difficult, must be considered.

Also perhaps some solutions to satellite defensibility can be found in broader efforts to address the root causes

of potential rivalries in space or in other efforts to deter broader conflict.

Perhaps through bilateral or multilateral cooperation we can end up creating disincentives to attacking shared space capabilities. These partnerships can be political, they can be financial, material, or any combination of the above. There are numerous options to be discovered with international engagement and partnerships in space.

Finally, in addition to technological superiority, there must also be significant investment in human capital. We benefit from over 46,000 total force Airmen, including contract employees who are dedicated to space from acquisition to operations to logistics and who must continue to be strengthened through robust training and education as Chief Roy discussed earlier, and equipped to tackle these challenges in others. While space and cyberspace certainly showcase our innovation and advanced technology, let us not forget that it is our Airmen through their dearly professional efforts who make it all happen.

The American people rightly expect unwavering dedication and excellence from them, and it is our responsibility, our obligation, to ensure that our Airmen have the breadth of knowledge, the tools, and cost/domain perspective they will need to succeed.

I've just outlined a few thoughts today. There remain innumerable others, for this continues to be a critical time for our Air Force. Our nation and our joint team mates rely on us to be at peak performance daily, in all aspects of our unique and enduring service capabilities.

I'm greatly encouraged by the gains that we have made in making our space capabilities more available to the warfighter. With more than 2500 Air Force Space Command Airmen forward deployed around the globe in 2009 -- 2100 of whom were supporting operations in Afghanistan and Iraq and on the Horn of Africa. We are providing crucial timing and timely capabilities for our communications, for GPS, and early warning for space surveillance, for space and terrestrial weather, for ISR, all of which is being transferred directly into theater.

It is appropriate that for the ultimate high ground and for the virtual domain that is unconstrained by physical barriers we take as broad and holistic a view as possible to address the pressing issues that face us as a space-faring and a cyber dependent nation.

I look to you and other bright and talented professionals in and out of government, to engage in robust debate as we move forward together in discovering the various ways and means to meet these challenges. AFA and each one of you are part of a proud history of our nation's development of and preeminence in air and space power. Your celebration of that history will assure that we never forget over a century of success in meeting challenges, including the often contentious debates as well as attempts at potential solutions that we had to ultimately discard.

We must focus now with equal vigor and boldness and creativity on the unfolding histories of our nation's continuing leadership in space and developing the virtually boundless opportunities in cyber. These are challenges that require government and industry-wide partnerships, and certainly nation-wide emphasis if we are to succeed.

I want to thank you again for the opportunity to address these very important matters and for your daily efforts in supporting the Air Force's continued ability to provide global vigilance, global reach and global power. I wish you the very best. Thank you very much for your time.

[Applause].

Moderator: We do have time for a couple of questions. We do thank you, Chief, for sharing those thoughts on the high ground of space and cyber with us.

Could you perhaps maybe get a little bit more specific on any requests you might have for our industry partners as to how they might assist in this very important discussion and dialogue?

General Schwartz: Well more broadly for the industry partners is deliver what you promise. [Laughter and Applause].

Moderator: Sir, might you have any suggestions for our young Airmen and Officers here as they pursue careers and perhaps considering opportunities in the space and cyber career fields in our great Air Force?

General Schwartz: Sure. And I must offer tribute to AFA for your undertaking of trying to inspire interest in cyber through the effort which we'll go see here momentarily in terms of the competition between folks, these youngsters who understand the domain far better than you and I do.

I think the key thing here for all the youngsters, the Airmen and the ROTC cadets and so on, it is amazing what you have to look forward to. Those of us who have been around a while, sometimes you tend to look back more than you look forward, but for you the future is extraordinarily bright.

We will pass an Air Force to you that is still the most envied on the planet. Not without problems, not without challenges. But you can ask any of the international partners here in the room, if there was an Air Force with whom you would want to partner on the field of battle, whose Air Force would it be? Unequivocally it will be America's Air Force. That's your future. And the guys and the gals here that are in the front row are getting ready to hand it off to you. So get ready.

Moderator: Chief, some of the young people who might come into our Air Force will be here as part of the Cyber Patriot Competition that's going to happen here tomorrow.

What would you say to them about choosing a career, as they look towards the very strong demands that we put on them from private industry and others, and you touched on it briefly, about why they should come and perhaps consider something in our United States Air Force.

For all of the folks here, you are all supporters -- not just of the Air Force but the armed forces more generally, and of course of public service. I think the key thing here for us is to make the point that in the end this is really about a competition for talent. This is not just inside baseball. This is not those who have served and who are currently serving and those about to serve. This is a question about whether America gets the kind of talent in the national security lane that's required to do what's needed in the fashion that's needed with the expectations that are naturally attached.

So what we need to do is to make those youngsters who might aspire to be millionaires by 25 to understand that that's not the only aspiration to have in life. That public service is a noble undertaking. And service in uniform or a suit in the armed forces of the United States is equally noble.

I think the message for us today, collectively, and this includes industry, to gather the kind of engineering talent, for example, that the country needs to be successful going forward is to remind Americans generally that service is a prerequisite of good citizenship. And each of us can practice this in a different way, but

frankly, I'd like to see a few more, I should say a few fewer hot rocks on Wall Street and a few more hot rocks in our armed services.

Moderator: Sir, one final question, and it's really about our Airmen and it picks up on what Chief Roy had to say about his travels around and what he sees with our Airmen.

Would you share with this group some of the thoughts and some of the things that you see as you visit our Airmen doing extraordinary things around the globe?

General Schwartz: I think the Chief hit an important point. We have an obligation to ensure that our youngsters are properly equipped to do the jobs we ask them to do. But I think the spirit, the sense of mission, the understanding of the contribution they're making -- whether they're deployed forward or whether they're deployed in place at Creech or Malmstrom or Minot or F.E. Warren or wherever it may be. The key thing is there is a profound sense of mission. I offer a compliment, likewise, to AFA because you help stimulate and cultivate that sense of mission in the broader population.

So the most wonderful thing that I see out there is, again youngsters that appreciate the sense of possibilities. Think about it. That even the son of a typewriter salesman might grow up to be a Chief of Service in one of America's armed forces. Anything is possible. That's what our Airmen embody, in my view, as I visit with them.

Moderator: Chief, we thank you for being with us at this symposium and for your great leadership.

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