



United States Strategic Command

Detecting, deterring and preventing strategic attacks against the United States and our Allies

As Delivered Remarks

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Gen. John E. Hyten, Commander U.S. Strategic Command: Thank you very much for that introduction. I wish my mom was here to hear it.

I actually wondered how you were going to get a roomful of people here for this, but then I walk in and you have food, so clearly food is the draw because I remember the times I was at the university. If I could get food, that's where I was going to be. There's no doubt.

I got to be a fellow at the University of Illinois. That was a great year. That was a great year because I got to take time off from a pretty crazy career to think and to talk to people that actually when I came in very few of them agreed with the way I thought. It turned out to be that was spectacular because I think I helped move their thinking a little bit, but they helped move my thinking a lot. Because when you sit down and have a discussion, you actually don't want to have just a discussion with people that think the same way you do. And when you're in the military, you sit down with people that think the way you do a lot, so you end up in a common place. So the fact that the Air Force would deem it beneficial to send me to a program on arms control, disarmament and international security for a year, was a pretty special year.

Now I get to come and talk to you guys as the commander of Strategic Command.

Stanford is part of the academic alliance – 35 universities and partners that are together to try to change the discussion, to change the debate and energize the debate about where we're going as a nation, especially with regards to strategic deterrence. And as I look at the, and I'll talk about this as I go on today. As I look at where we are, it's not a very mature debate that's going on right now. We tend to still talk in terms that were prevalent in the 1960s, if we talk at all. And to me, the 21st century is fundamentally different when we talk about what deterrence is, what deterrence means to the nation. And because of that, I think we have to have a fundamentally different debate, and you guys can help energize that.

I got to spend time with some of the faculty this morning. I got four sessions. Drs. Lin, Holloway, Fingar, Zegart and Sagan, thank you very much for the time you spent with me this morning. I enjoyed the heck out of it. I hope you got something out of it as well.

When I got the invitation, the invitation asked me to talk about space and its role in the 21st century, and I will do that. I promise I will do that, but as the commander of Strategic Command, I feel it's important that I begin every discussion with a discussion of strategic deterrence, because fundamentally that is what Strategic Command is all about. It's our deterrent capability of the nation. And our deterrent capability starts with our nuclear capabilities, our nuclear weapons, our nuclear delivery systems – submarines, bombers, advanced cruise missiles, intercontinental ballistic missiles (ICBMs), and the weapons that go on top of those.

One of the questions that I get asked a lot, especially now that I'm commander of Strategic Command, is don't you wish we lived in a world without nuclear weapons? Can't you imagine a world without nuclear weapons? To be honest with you, in my deepest heart, I wish I didn't have to worry about nuclear weapons. Being the commander of an organization that has the responsibility for all the nuclear capabilities of the nation is pretty daunting, pretty sobering. It's not easy. There's a lot of things we have to worry about every day that I wish we didn't have to worry about.

But can I imagine a world without nuclear weapons? The answer is no, I honestly can't imagine a world without nuclear weapons. Actually, I know what a world without nuclear weapons looks like, because we had a world without nuclear weapons before 1945. And from 1939 to 1945 this planet killed about 80 million people. And if you do the math, depending on the numbers that you use, that's somewhere between 30,000 and 40,000 people were killed every day in World War II.

Think about the numbers. Vietnam was a horrible war. War is a horrible thing. I know that some people in this room have experienced it. I've experienced it. Once you see it up close I can pretty much tell you that it's something that no human should ever want to experience. In Vietnam, the decade-plus of Vietnam, we lost 58,000 Americans. Fifty eight thousand Americans in that conflict, that's two days in World War II. Two days, 80 million people, 8.7 million Soviet soldiers. The death and destruction that happened between 1939 and 1945 is horrendous.

And the world we live in today is horrible. It's a tough world. We have crazy enemies that really don't like who we are, the way we live, and they want us eliminated. But it's not as bad as it was from 1939 to 1945. My father-in-law was in Patton's 3rd Army that headed across France and ended up going to Berlin. He actually did not like to tell the stories, and until he was actually quite old, before he passed away, he finally would tell me the stories, because the stories were horrid. The amount of death and destruction that he experienced were beyond any – our soldiers today are experiencing some horrible things, but what the greatest generation of the United States went through in that period, along with our allies, is beyond the pale.

So, I know what a world without nuclear weapons looks like and it's not pretty. And that world scares me even more than a world with nuclear weapons. Because the nuclear weapons that we have deterred that kind of conflict for over seven decades and that's pretty remarkable. But you have to make sure you understand them, that they're operated safe, secure, they're reliable. We have to do all those things every day. And then if the worst day in this world ever comes to fruition, we have to know how to operate them. That's the job of Strategic Command, and that's what a strategic deterrent is. And it has done its job, and we're going to have to do that in the future.

So, if you want to talk and I'm going to save at least 20 minutes at the end. Sometimes I end up talking too much, but I'll save at least 20 minutes at the end to answer whatever questions you want to talk about, and I'll be glad to go down that discussion.

I got the honor of meeting with Secretary Perry, Secretary Schultz, Secretary Rice, a whole group of just amazing people this morning. And we had a great discussion and I learned a lot from that discussion. I don't know if they learned a lot from me, but I'll tell you what, I'll always treasure the hour we got to spend together because it was great.

We talked about all these issues. We talked about cyber as well. I've done cyber for a long time. If you have questions on cyber, I'd be glad to go down that path. In my last command, we had space and cyber capabilities underneath.

Right now under Strategic Command we have all the nuclear capabilities of the country; all the space; Cyber Command is right now under Strategic Command, although that may move here shortly. I'm the global command responsible for integrated missile defense. We still have intelligence, surveillance and reconnaissance (ISR) capabilities that we have to worry about, a number of other things. I'll be glad to talk about any of those. But I was asked to spend some time on space in the 21st century, so that's what I'm going to do now.

So, if you think about space in today's world, it's pretty amazing. Space today is, from a military perspective, it's fundamental to every single military operation that occurs on the planet today. It's seamless; it's invisible to the soldiers, sailors, airmen and Marines that use systems. But every operation, from humanitarian operations to major combat operations, is critically dependent on space capabilities. We can't even operate certain capabilities that we have without space. Remotely piloted aircraft could not even be invented without space. They don't work without space. They're navigated by space. They're controlled by space. The payload sensors are reported back by space. The weapons that are on board are operated through space, through a space link with a space feedback. If space didn't exist, those capabilities don't exist. Every fighter aircraft, every bomber aircraft, every ship, every wheeled vehicle, every single soldier, every single airman, Marine and sailor is critically dependent on space to conduct their operations.

Then our own society, everybody in here has a phone. Everybody in here, that phone, you think it's connected just through a cell phone tower, a microwave tower, a radio frequency tower, It's actually connected through space at the same time. Your map function, your GPS function, your timing, everything comes off of GPS. Your time source is keyed off of GPS. The timing system off of the GPS system is what all the stoplights in most towns are timed off of. It's what the financial network is timed off of. If you want to use your credit card to get money out of an ATM you can't use it without GPS.

GPS is operated today by seven Air Force airmen, average age 23, at Schriever Air Force Base, Colorado. Everything that GPS does for the world comes out of seven airmen in an ops center at Schriever Air Force Base outside of Colorado Springs. The commander is about 25. The satellite operators that are operating the system are 19 years old – one year out of high school. And everything that you get out of GPS comes out of the fingertips of those two 19-year-old airmen. That's a pretty remarkable thing.

I've been lucky enough to be in the Air Force for over 35 years now. I guess 35 and a half years. And when I came out of Harvard my whole plan was to be in the Air Force four years and get out. Because the Air Force paid for my college education, I only owed them four years. And that was the plan all along. And so I was actually, wanted to just travel and see the world. So I came out of my hometown is Huntsville, Alabama. I came out of Huntsville, Alabama and I went to Harvard. That was a miracle. I'm sure I could not get in today, but somehow I got in and the Air Force paid for the whole nine yards and I only owed them four years. The all-time good deal from my perspective.

And then I fell in love with the Air Force. One of the reasons I fell in love with the Air Force is because after my first job, which coming out of Alabama, I just wanted to see the world, and I got a four-year tour at Gunter Air Force Station, Montgomery, Alabama. If you've been in the service and the personnel system asks you what you want to do, tell them the opposite because it's just amazing, I ended up back in Alabama. But it was okay, I got my master's degree and I was just going to, because I always wanted to get in the space business. That's what I was going to do when I got out. And my boss came to me and said, "If there's one thing that would keep you in the Air Force, what

would it be?" I said I want to get in the space business. I won't tell you the whole story, but it's a pretty funny story, but I ended up in 1985 getting in the space business.

The reason I wanted to get in the space business is because when I was a kid I fell in love with space. Growing up in Huntsville, Alabama, and my dad came to Alabama in 1965 with the Apollo program, and he got to help build the Saturn 5 and I got to see the Saturn 5 main engine, the [inaudible] test in Huntsville, and every time that engine would test, and I got to see it from fairly close a few times. Every time it would test the whole town would shake right to its core. Dishes would go bouncing off our countertops, pictures would fall off the wall, and the thing I remember. I asked my mom, she just turned 80 on December 23rd. I asked her do you remember? Because my remembrance is that nobody ever complained. She said that's right, nobody ever complained because that was us going to the moon and we were just, that's just the price we had to pay. And we all knew we were building the rocket that was going to go to the moon.

And then because I happened to be good in math and science, my teacher got to select a student when I was going into 5th grade to be at the opening of the new school that was actually built in my back yard, right behind my house on Logan Drive in Huntsville, Alabama. They built a new elementary school, Chaffey Elementary School. They also opened up a new high school, Ed White Junior High school; a new high school, Grissom High School. Those names -- I hope they're familiar to some of you in this room because those were the three Apollo astronauts that died in Apollo 1 in January 1967. People say it's a miracle that the United States could go from a complete stoppage of the space program in January 1967 on a rocket that we threw away and never launched, to landing on the moon two and a half years later on a brand new rocket. The biggest rocket ever built by man, and we did it in 2.5 years.

Maybe a bigger miracle if you grew up in Alabama was that the state of Alabama and the city of Huntsville decided to build three schools named after those three astronauts, and they did it in the same 2.5 year period. And they opened it up focused on science and math, and because I was a good science and math student I got to be there when they cut the ribbon, and the person that cut the ribbon was Wernher von Braun. So I got to meet Wernher von Braun when I was in 5th grade and it was pretty awesome. And I got to meet some of the astronauts. And if you're a kid and you're a math and science man, that was my dream. My dream was to be an astronaut. But you can probably tell if you look at me close what the problem is, I'm blind.

If I take my glasses off -- I probably should do this because I'll talk better because I can't see any of you. I'm literally blind. I can't tell male, female, black, white, I can't tell anything. I'm literally blind. 20/20 is my vision. But I could get in the Air Force, interestingly enough, because -- I could get in the Air Force but I couldn't get into NASA. It's actually an interesting piece of our history. I went to apply for my ROTC scholarship in 1976, one year after Saigon, and basically, if you weren't attached to an iron lung, they would take you in the military. And fortunately, I was not attached to an iron lung, I was a good athlete, a good student, I just happened to be blind. So I could not get in the Air Force today, but I got a waiver from a great Air Force optometrist that I knew, wrote me up a waiver and said I'll send a waiver into the Air Force and I got the waiver and I came in.

But God, I loved the space program, and I still love the space program, and I still dream about space and I have great friends, some of you know Susan Helms, Kevin Chilton who are astronauts. They have the greatest home movies of anybody I've ever seen. But man, I love space but that wasn't going to be my future.

But I came in the Air Force and my boss said, hey, if I can get you in the space business would you stay in the Air Force? I said I'll take one more job. That was 32 years ago now, so I think the Air Force got their money back out of me.

But as I came in, I've been involved in something that is truly remarkable, because I've been involved in a fundamental change in warfare, a fundamental revolution in military affairs. An overused term, but it really is a revolution. Because of what space did, and what space did is it really became, they created an environment where information became the key to the battlespace. All the way up until then, it doesn't matter whether it was Vietnam, Korea, World War II, World War I, Civil War, all the way back. It was mass on mass, deception to surprise. That was the key to any conflict. And really, when space came into being, information became the key. And the ability to control information and provide information, no soldier in the United States will ever or should ever again have to worry about what's over the next hill. They should never have to worry about where help is coming from. They should always be able to communicate with higher headquarters. All of that stuff was created because of space.

When I came in the Air Force there was no such thing as Space Command. Then I grew up to become the commander of Space Command. That's crazy, that's impossible, but it happened.

There's no way I should be the commander of Strategic Command. That's the command of Curtis LeMay. It's the command of people that were legends in the Air Force. I'm a blind kid from Alabama. That can't happen, but it did. And it happened because I happened to be involved in the fundamental change in warfare that was created by space.

So it is the thing that defines me in my job as the commander of Strategic Command. I think I have two jobs as the commander of Strategic Command. Job one is to defend this nation against all threats, wherever they might come from. I take that very seriously and I can tell you, we're actually very good at it. I can describe stories of how good we are at it in questions and answers if you want to get to that.

But I have a second job, and that second job is I have to defend and protect the environment of space so that every generation in the future, it doesn't matter whether they're Russian, Chinese, American, Iranian, Korean, it doesn't matter. If they grow up and dream about going to space someday, space needs to be available for that exploration.

And I'll tell you, I watch what's going on in space these days, and I get very concerned about us, the world, destroying the environment that prevents us from having the ability to operate in space.

One of the things that we do when we launch a rocket is that we have to find a clear window through low earth orbit to make sure there's no debris in the way when we get ready to launch. Right now we track about 22,000 objects and it's really not that hard to find a gap. If you do the math, space between the surface of the earth and geosynchronous orbit, if you do the math, it's 73 trillion cubic miles. So if you've got 73 trillion cubic miles and you've got 22,000 objects, space is big. That means there's room.

But when the Chinese intercepted their own weather satellite in 2007, they created about 2000 more pieces of debris, all in low earth orbit. Then when we had an American satellite, Iridium, collide with a dead Russian satellite, Cosmos, in 2009, we created a couple thousand more. Just a few years ago we were tracking about 12,000 objects. Now it's about 22,000 objects. And the problem with all the debris is it tends to be in a single location. We've had to maneuver the International Space Station

three times in the last year to get out of the way of that debris. That debris is still there, it's still a problem. We maneuver almost 100 times a year to get out of the way of debris. Not the International Space Station, but satellites in general.

We in the Air Force, after the Iridium-Cosmos collision, realized that the world had nobody that was doing space traffic management. So we took it upon ourselves basically become the space traffic manager for the entire world. So we watch every object in space now, and we track every object in space, and we predict where it's going to be. And in space you can actually predict that very well.

Space, the earth is not a perfect sphere. If it was a perfect sphere you could predict things exactly and know exactly where they were because they would orbit in very predictable patterns. But it's close enough to a sphere that we can predict objects frequently enough to know where they are, and then we can predict a collision before it happens. That's how we know when to maneuver and when to get out of the way.

So we took on the job of being the space traffic management person in 2009 for the entire world. So we'll notify a commercial asset, we'll notify ourselves, the Navy, we'll notify the Russians, we'll notify the Chinese. And it's interesting, when we started notifying the Chinese we had to go through this convoluted process in the state department, where we would ship the information to the state department, the state department would ship it to some place in the foreign ministry in China, the foreign ministry in China would somehow get it to the right place, and it was a couple of years of going through this process when finally we just got a note from, obviously a note from Beijing, that said hey, "Could you just send those notes right to this address in Beijing? It would really be helpful." Which was their operation center. So we did. So we send the information straight into the people that actually need it.

Why do we do that? That's part of protecting the environment. Because if we end up having significant collisions in low earth orbit, the debris we create makes it very difficult to operate. And I've had, a lot of people have come to me that are mathematicians, and my son's a math major, a physics and math major, so he's like the worst. But people come to me and they do the math and they say hey, 73 trillion cubic miles. Even if we have 200,000 objects, it's still a big place. I say yep, so let's do the math from another perspective. So with 22,000 objects that we know about right now, and we think when we turn this new sensor on we're going to build and deploy in 2019 we're going to see 250,000 objects. Then we have more collisions and we're up to a million objects. Do the math from 22,000 to a million and we had to maneuver 99 times last year. How often are we having to maneuver to get out of the way? It's basically we're maneuvering all the time. And if you're a satellite and you're maneuvering all the time, you're not doing your mission because when you're moving, you can't do your mission. And all of a sudden, space is not useful.

Then the piece that comes with that is that all of a sudden you're not able to launch through the traffic you've created in low earth orbit which means you can't get to the clean elements of space above and you can't get to the most important element of space which is the geosynchronous orbit, 22,300 miles above the planet.

The geosynchronous orbit is the magic orbit. It's been referred to as the magic orbit by many people. But it was actually invented, if there's such a thing, by Arthur C. Clarke, 2001. I got to talk with him in 1993 and one of the questions I asked him was, what's your biggest regret? It's kind of the standard question that young people ask old people when they don't know what to ask. I said, so if you want to ask me later, you can. He said my biggest regret was in 1947, which also interestingly enough is the birthday of the Air Force. In 1947, I wrote an article and I did the math and I figured out that 22,300

miles above the planet was this orbit, that if you put a satellite there and sat it there, it would appear to be stationary above the surface of the earth. And therefore you could put communication satellites there, television satellites, radio satellites, and they would always, you could put one dish on the ground and you could look up and always access it. That was the magic orbit. He said, I wrote that in a science fiction article and I sold it to a science fiction magazine for 100 bucks. I did not patent it. That's my biggest regret. Because he was living in his estate in [Ceylon] and I'm on this VTC, and he's got this massive place behind him. I think he did okay. He didn't have any worries.

But it's just amazing, how recent that is when you think about it, that people figured that out, where it was going to go. And then you figure how much we depend on it for our daily living. How much we depend on all the satellites. For television, for communications, for everything that we do. And all of a sudden, you wouldn't be able to get to that orbit anymore because you trashed the low earth orbit.

And then we have valuable military satellites that we put in geosynchronous orbit as well. That's where we do missile warning. That's where we do our special communications. Our national command and control communications go through the geosynchronous orbit. That's where our nuclear business is done from. Then if somebody wants to threaten that, and if they do something in the geosynchronous orbit, because of where that orbit is, the debris that's created, will be there forever. And now that one magic orbit that we have is trashed forever.

So what does that require when it comes to space? It requires deterrence. We have to deter bad behavior in space. We have to deter conflict in space. I never want to fight a war that goes into space. I hope I've made my point clear as I've gone through the discussion is that war in space is bad. It's bad for the country, it's bad for everybody, and it's bad for everybody that dreams about going into space in the future, and that, when it comes right down to it, is everybody that lives in this world and looks up at the stars. Everybody looks up at that and dreams about that. And we could trash that forever.

But we have adversaries now that are building weapons that will go into each of those regimes. We have adversaries that are building weapons in low earth orbit and weapons in geosynchronous orbit. Weapons that will deploy from the ground to low earth orbit and from the ground to geosynchronous orbit. They're building them today, and if you think about what my first job is, my first job is to defend this nation. That means I have to figure out with the 184,000 people that work under Strategic Command, how do we defend the nation against that kind of threat? And how do I prevent, how do I deter that conflict from ever happening? Which means it's bigger than the space problem. And fundamentally, that's the definition and the debate that I would like to see occur in a broader community as we look at what strategic deterrence is in the 21st century. Because strategic deterrence in the 21st century has to think about deterring that conflict. Deterring conflict in cyber. Deterring a nuclear conflict, yes, but it's just not nuclear. It's all those elements that we have to figure how to – that's what strategic deterrence is in the 21st century.

So our adversaries. I talked about them generically, let's talk about them a little more specifically.

China. China has stated publicly in their own country and in Geneva, that their goal is only to use space for peaceful purposes. They have been one of the most vocal supporters of the Conference on Peaceful Uses of Outer Space under the United Nations that meets in Geneva frequently. And at the same time, they're the most aggressive nature in the world building weapons that will challenge space in the future. That will challenge the United States in space in the future. They tested the low earth orbit capability in 2007. And I'll tell you without getting into classified, they continue to test that capability today and they continue to test it at multiple orbital regimes. In the not too distant future

they'll be able to use that capability to threaten every spacecraft that we have in space. They also are building capabilities that they put into orbit that can threaten our space capabilities. And many of those capabilities, most of those capabilities, have the potential to create vast amounts of debris. That's just a horrible thing.

So China plays the yin and the yang, they play both sides of the equation. And they have an amazing space exploration program they're doing. There's been announcements in the last year about their moon and Mars exploration programs, and I'll tell you what, if you talk to the Chinese, and I've got to meet in the past with some of the Chinese astronauts in Colorado, I've got to meet with some of the leaders of the space program, their nation is as excited about going to space as our nation was in the '60s.

And at the same time, the other side of their government is building the capability that can destroy that for the entire world. We have to deter that. We have to prevent that. And the best way to prevent war is to be prepared for war, so the United States is going to do that, and we're going to make sure that everybody knows we're prepared for war.

They're not the only people that are going down that path. Russia is building weapons as well. Russia had a covert ante-satellite (ASAT) capability back in the 1980s that was a debris generator. And in response to that the United States built a program called the F-15 Anti-Satellite program, and we tested a capability in 1985 where we shot down one of our weather satellites. Interestingly, 22 years before the Chinese did the same thing. And the Chinese came under significant international pressure for destroying the environment. Why didn't we? I guess there were two reasons. Space at that time was very pristine, almost empty. Not much stuff up there. And the satellite that we shot down was very low, in fact all the debris that we created from that, which was similar to the amount the Chinese created, has already come back down and reentered the earth. The Chinese intercepted at a higher altitude and the debris they created will be there for at least a century, maybe more. It depends on what the sun does over the next 100 years.

But Russia knew how to do that back in the '80s.

Then when the wall came down, those programs stopped. A lot of those things stopped. But now they're exploring significant anti-satellite capabilities both from a direct ascent perspective as well as a directed energy perspective. Yes, lasers. They're building all kinds of capabilities that would threaten our satellites. Again, many of which would create debris. We can't allow that to happen.

So what's the United States been doing? So when the Cold War came down, we quickly surpassed Russia as the dominant space-faring nation, and we continued to pursue space. A lot of people call the first Gulf War, Desert Shield, Desert Storm, the first space war. As a space guy, I was involved in it so some of me takes pride in that, but some of me kind of laughs at that too when I think about the capability that we had, because we had these strategic systems. The Defense Support Program was a missile warning. And the first time I went to SAC Headquarters, the predecessor to Strategic Command in Omaha, was to brief the commander-in-chief of Strategic Air Command, Gen. Jack Chain. I was a captain. That was probably the most scared I've been. And I've been shot at now, and I still don't think I was as scared as I was when I walked in to that headquarters the first time to go see the commander-in-chief of SAC. I was just a captain.

And my job was to explain to the commander-in-chief of Strategic Air Command whether the Defense Support Program satellite, the old missile warning satellite, would see Scuds when they launched. And to be honest, we didn't know. We had built that satellite to see ICBMs coming out of the Soviet

Union. We hadn't built it to see Scuds. So as an engineer, you can do the math. But we never tested it so I didn't really know. That's why I was scared. I didn't know whether it could. Because I was going to tell him it could, and we were going to base a lot of what we did with Israel, a lot of what we did in the Middle East, a lot of what we did with force protection based on whether it could see it or not. I told him it could. And he just closed the book and looked at me and said, you guarantee that it will see Scuds. And I was an idiot captain, so I just looked at him and said yes, sir, it will see it.

I came out five pounds lighter, because I had just you know, sweat bullets. But that was space in the Gulf War. We had 16 GPS satellites. Pretty much eight hours a day we had no GPS coverage in that first Gulf War because we didn't have enough satellites. We had to plan the whole left hook, the whole invasion about when GPS satellites would be in view. A lot of people forget that part of history. We were neophytes in that, but we saw the potential. Then right after that we just went all in. I was part of a Blue Ribbon Panel on Space that said how do we bring space to bear on the tactical fight all the way down, and we started doing that. We fleshed out GPS. I know the "Father of GPS" works out here at Stanford, Brad Parkinson. Some of you may know him. He's been a mentor of mine for a long time. He keeps me honest when it comes to GPS because he knows it better than anybody. But I'll tell you, if you ask Brad, he'll tell you that he never saw the civilian applications for it.

The Air Force and Department of Defense tried to kill GPS every year when I was first in the Pentagon because why the heck would we need a satellite navigation system? We have inertial navigation systems on our airplanes to begin with. Why the heck would we spend billions of dollars for a satellite navigation system? My service tried to kill it every year. And every year Congress put it back in. And Brad fought that fight every year.

And now, we have 31 operational satellites, eight on orbit, four spares. It's fundamentally changed our way of life in the country, our way of life around the world. It's just amazing how it's transformed our society.

We weren't oblivious to what was going on in the rest of the world. Secretary Rumsfeld before he was Secretary of Defense chaired a space commission back in 2001 and pointed out in 2002 that warned of a space Pearl Harbor that was coming on unless we did something about it because they could see the threat coming.

I wrote a paper in 1998, that looked at what the Chinese were doing, and I don't think it was any magic involved in that study. I think you just look at what the Chinese were saying and what they were writing and you projected it out and you could see exactly where they were going to end up and that's exactly where they did end up. That was 1998.

So, we saw those things but we really did not embrace them. We continued to treat space as a benign environment, and we continued to build, if you wanted to take them down, what I call fat juicy targets for people to shoot at. And if you're building fat juicy targets that are very simple to find and simple to hit, you're encouraging adversaries to build weapons to take them down, and that's exactly what's happened.

So, we're at a place now where we fundamentally have to change our architectures. We have to think about space as a warfighting environment. And if we think about space as a warfighting environment, and we treat it as such and we prepare for it, my hope is that we never fight a war in space. But in order to make sure that doesn't happen, we've built some capabilities and we recently announced some classified capabilities. February two years ago, three years ago now I guess, we announced the existence of a program called the Geosynchronous Space Situation Awareness

Program – GSSAP. To test satellites in geosynchronous orbit, we have four of them up now that are basically a neighborhood watch program for everything that goes on in that high value orbit, so we can watch everything that goes up there. And the reason we announced that capability is we want everybody in the world to know that that real estate, which is the most valuable real estate in the world, we're watching it every day close, and there's nothing you can do in that orbit that will catch us by surprise.

We started a series of war games called the Schriever War Games, named after Bernard Schriever the Father of Air Force space and missiles, where we actually explore what conflict would look like if it does extend into space someday and how we would fight it and what we would have to do, how would we control the environment to make sure we get there.

We developed something called the Space Enterprise Vision that looks out at what a real warfighting environment should look like if we actually build systems from the beginning that are based on protecting ourselves.

And then this last year we created a place called the Joint Interagency Combined Space Operations Center, a place where we really experiment on war that extends into space so we understand what that is.

We're working with the other combatant commands to make sure we understand that there's no such thing as war in space. Let me say that again. There is no such thing as war in space. There's just war. And war is not against space. It's not against cyber. It's not against the air or the land or sea. It's with an adversary. And if it extends into space we have to figure out how to fight it. And if you fight a war that extends into space, it will be all domains. And a response to an attack in space may very well not be an attack in space, because that may not be in the interest of the United States. But we will have to respond, which means we have to figure out how to respond, all domains, all the time, and the most effective way for the United States of America, and that is not the way we thought about operating for the longest time. We only think about single domains at a time. We think about fighting the air, fighting the ground, fighting the Navy, fighting maritime, and then integrating those pieces together when in reality we have to think about all domains all the time and how that works.

When we started building our current architectures back in the '90s in response to the first Gulf War, there was really no commercial industry to speak of. There was a very neophyte industry that was just starting. But really, we were inventing what space was going to be.

Now there's a huge commercial enterprise in launch, especially in sat com but also in imagery. OneWeb, SpaceX, CubeSat. All those things are out there right now, and a lot of folks that are in the military think that that doesn't pertain to us. It pertains to us in two ways. Number one, it creates an economic environment that the United States military will have to defend at some point and it also creates an opportunity for us to take advantage of a commercial sector that we should be able to take advantage of to do the missions that we have to do.

We've continued to look at space the wrong way. We have a metric called functional availability which is when we launch a new satellite is when we predict that old satellite's going to die. The problem with that is it doesn't take into account that there is an adversary that has a vote. If there's an adversary that has a vote, then it makes sense to have a few more extra in case you lose some for whatever reason. It's really that basic, but for some reason we couldn't think about that in the military for the longest time. And we need to be able to respond on operationally relevant time lines. Our time lines have been way too slow.

So, space is just a place like the air, like the land, like the sea. We have to treat it like every other warfighting domain and look at it, but it is special. It is the domain that people look at and still dream; and I still look at and dream. And I love looking at the stars. And I want to make sure when I look up, I can see stars and I don't see junk. That's going to be a difficult challenge because the advantage we gain in warfighting because our advantages that we gain from space have the risk of becoming threatened. So we're going to defend those capabilities and make sure that doesn't happen. But at the same time we're going to figure out how to defend the environment.

So those are my prepared remarks. I ran two minutes over, not too bad for me. But I'll be glad to take any questions on any subject from anybody.