

STRATCOM – Hyten 160125 (no Q&A)

Unidentified Male: You're listening to a podcast from the Stanford Center for International Security and Cooperation.

Unidentified Female: Please join me in welcoming General Hyten.

General Hyten: Is it better for you guys in the back if I stand up, or is it good to sit down? I'll look at the back row. Is it better if I stand up? Are you good?

All right. Thanks 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, the food is the draw, because I remember the times I was at university if I could get food, that's where I was going to be. There was no doubt.

_____ [00:00:55] of the University of Illinois. That was a great year. That was a great year because I got take a time off from a pretty crazy career to think and to talk to people that, actually when I came in very few of them with the way I thought and it turned out to be that, that was spectacular. I think I helped moved 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. When you're in the military you sit down with the people that think the way you do a lot, so you end up in a place. The fact that the Air Force would deem it beneficial to send me to a program of arms control, disarmament with _____ [00:01:45] 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 lines, 35 universities are partners that are together to try to change the discussion, to change the debate, to energize the debate about where we're going as a nation, especially with regards to _____ [00:02:08]. 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. To me, the 21st century is fundamentally different when we talk about 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 with Drs. Lin [PH], Holloway [PH], Fingar [PH], Zagar [PH], Sagan. Thank you very much for the time you spent with me this morning. I enjoyed the heck out of it and 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. _____ [00:03:04] 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

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that is what Strategic Command is all about. It's our deterrent capability of the nation.

Our deterrent capability starts with our nuclear capabilities, our nuclear weapons, our nuclear delivery systems; submarines, bombers, advanced cruise missiles, ICBMs, and the weapons that go on top of those. Questions that I get asked a lot, especially now that I'm Commander of Strategic Command is that, don't you wish you 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 that 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 looks like because we had a world without nuclear weapons before 1945. From 1939 to 1945 this planet killed about 80 million people. If you do the math, depending on the numbers that you use, that's somewhere between 30 and 40,000 people were killed every day in World War II. Think about the numbers. Vietnam was a horrible—or, 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.

Vietnam. The decade plus in Vietnam we lost 58,000 Americans. 58,000 Americans in that conflict. That's two days in World War II. Two days. 89 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 Third Army that headed across France and ended up going to Berlin. He actually did not like to tell the stories 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 are experiencing some horrible things, but the greatest generation that the United States went through in that period along with our allies is beyond the pale.

I know what a world without nuclear weapons looks like and it's not pretty. That world scares me even more than a world with nuclear weapons. Because the nuclear weapons that we have, 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

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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. We're going to have to do that in future. 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. I'll be glad to go down that discussion.

I got the honor of meeting with Secretary Perry, Secretary Shultz, 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 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. Our last command we had space and cyber capabilities underneath. Right now in Strategic Command we have all the nuclear capabilities of the country, all of space. Cyber Command is now under right now they're Strategic Command, although that may move here shortly. I'm the global Command responsible for integrated missile defense. We still have five-star 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.

If you think about space in today's world, space is pretty amazing because space today from a military perspective is fundamental to every single military operation that occurs on the planet today. It's seamless, it's invisible to the soldiers, sailors, and Marines that use systems. 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 powered 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 onboard 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 with that phone, we think it's connected just through a cell phone tower or a microwave tower, an RF tower. It's actually connected through space at the same time. Your map function, your GPS function, your timing, everything comes off GPS. Your time source is keyed off of GPS. The timing system off the GPS system is what all stoplights in most towns are timed off of. It's what the financial network is timed off of. It's what, if you want to use your credit card to get money out an ATM, you can't use it without GPS. GPS is

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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 _____ [00:10:48] center at Schriever Air Force Based 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. 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. 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 owed them four years. That was the plan all along. I actually wanted to just travel, see the world. I came out my hometown of 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. Then I fell in love with the Air Force. The reason 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 Gunnar Air Force Station in Montgomery, Alabama.

If you've been in the service and the personnel system asks you what you want to do, tell them the opposite. It's just amazing. I ended up back in Alabama. But it was okay. I got my master's degree and I was going to just—because I always wanted to get in the space business. That's what I was going to do when I got out. My boss come to me and said, "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. 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 Saturn 5. I got to see the Saturn 5 main engine and the other one tested in Huntsville and every time that engine would test, 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. The thing I remember, and I asked my mom—she just turned 80 on December 23rd. I asked her to remember, because my remembrance is that nobody ever complained and she said, that's right. Nobody ever complained because that was us going to the moon and that's just the price we had to pay. We all knew we were building a rocket and we were going to go to the moon.

Then because I happened to be good in math and science, my teacher got to select a student when I was going into fifth grade to be at the opening of the new school that was actually built in my backyard, right behind my house on

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Logan Drive, Huntsville, Alabama and built a new elementary school. Chaffee Elementary School. They also opened a new high school, Ed White Junior High School. A new high school, Grissom High School. Those names I hope are familiar to some of you in this room because those are the three Apollo astronauts that died in Apollo 1 in January of 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 two-and-a-half years. Maybe even 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 in the same two-and-a-half year period and they opened it up focused on science and math. 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 fifth grade and that was pretty awesome and I got to meet some of the astronauts.

_____ [00:15:21] math and science, that was my dream. My dream was to be an astronaut. You can probably tell if you look at 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 anything. I'm literally blind. I can't tell male, female, black, white. I can't tell. I'm literally blind. 29/100 is my vision. I could in Air Force, interestingly enough. Why could I 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. Basically, if you weren't attached to an iron lung they would take you in the military. Fortunately, I was not attached to an iron lung. I was a good athlete, a good student, I just happened to be blind. I could not get in the Air Force today, but I got a waiver from a great Air Force optometrist that I knew, he wrote me up a waiver. I sent the waiver to the Air Force and I got the waiver _____ [00:16:43].

I loved the space program, and I still love the space program, and I still dream about space. I have great friends, some of you—Susan Helms, Kevin Chilton who were astronauts. They have the greatest home movies of anybody I've ever seen. But _____ [00:17:01] space, but that wasn't going to be my future. I came into 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. 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—it created an environment where information became the key to _____ [00:17:40] space. All the way up until then. It doesn't matter

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whether it was Vietnam, Korea, World War II, World War I, the Civil War. All the way back it was mass on mass, deception to surprise. That was the key of any conflict. Really when space came into being, information became the key. They built it 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 into 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. It'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. It happened because I happened to be involved in the fundamental change in warfare that was created by space. 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 and I take that very seriously. I'll tell you, we're actually very good at it. I can describe stories about how good we are at it in the questions and answers if you want to get to that.

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

One of things that we do when we launch a rocket is that, we have to find a clear window through the earth orbit. We have to make sure there's no debris in the way when we get ready to launch. Right now we track about 22,000 objects. It's really not that hard to find a gap. If you do the math, the space between the surface of the earth and geosynchronous orbit, if you do the math it's 73 trillion cubic miles. If you've got 73 trillion cubic miles and you've got 22,000 objects, space is big. _____ [00:20:51]

When the Chinese intercepted their own weather satellite in 2007 they created about 2,000 more pieces of debris all in the 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. 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

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problem. We maneuver almost 100 times a year to get out of the way of the 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. We took it upon ourselves to basically become the space traffic manager for the entire world. We watch every object in space now, and we track every object in space, and we predict what it's going to do. In space you can actually predict that very well because space is—the earth is not a perfect sphere. If it was a perfect sphere you could predict things exactly, know exactly where they were because they would orbit in very predictable patterns. It's close enough to a sphere that we can predict ____ [00:22:21] we track things frequently enough to know where they are. Then we can predict a collision before it happens. That's how when we know when to maneuver, when to get out of the way.

We took on the job of being the space traffic management person in 2009 for the entire world. We'll notify a commercial asset. We'll notify ourselves, the Navy. We'll notify the Russians, we'll notify the Chinese. It was 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 someplace in the Foreign Ministry in China, the Foreign Ministry in China would somehow get it to the right place. It was a couple years going through this process when finally we just got a note from Beijing that said, hey. Would you just send all those notes right to this address in Beijing? It would really be helpful. There are operations there, so we did. We send the information straight into the people that actually need it. Why do we do that? That's part of protecting the environment.

If we end up having significant collisions in low earth orbit, the debris it would create makes it very difficult to operate. I've had a lot of people come to me that are mathematicians; my son's a math major, a physics and math major, so he's the worst. 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 said, yeah. Let's do the math from another perspective. With 22,000 objects that we know about right now, we think when we turn this new ____ [00:24:15] 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. 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. 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 watch through

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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 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 as the magic orbit by many people.

It was actually invented, if there is such a thing, by Arthur C. Clarke in 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 a standard question that young people ask old people when you don't know what to ask. 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 set it there it would appear to be stationary above the surface of the earth. Therefore, you could put communications satellites there, television satellite, radio satellites. It would always, if you 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." He was living in his estate in Salon [PH] and I'm on this VTC [PH] and he's got this massive place. I think he did okay. He don't have any worries.

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

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. Now if somebody wants to threaten that and if they do something to the geosynchronous orbit, because of where that orbit is the debris that's created will be there forever. Now that one magic orbit that we have is trashed forever.

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. That, when it comes right down to it is, everybody that lives in this world that looks up at the stars. Everybody looks up at that and dreams about that and we could trash that forever, but we have

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adversaries now that are building weapons that will go into each of those _____ [00:28:10]. 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 are 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 we prevent, how do we deter that conflict from ever happening which means it's bigger than the space problem.

Fundamentally, that's the definition and the debate that I would like to see occur in the broader community as we look at strategic deterrents in the 21st century. Because strategic deterrents 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 out. That's what strategic deterrents is in the 21st century.

Our adversaries. I talked about them generically. Let's talk about it 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. At the same time, they're the most aggressive nation in the world building weapons that will challenge space in the future. It will challenge the United States in space in the future. They test with the low earth orbit capability in 2007. 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 _____ [00:30:27] that they put into orbit that can threaten our space capabilities. Most of those capabilities have the potential to create vast amounts of debris. That is just a horrible thing. China plays the yin and the yang. They play both sides of the equation and they have an amazing space exploration program undergoing. There's been announcements in the last year about their moon and Mars exploration programs. 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. At the same time, the other side of that, 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. The best way to prevent war is to be prepared for war, so the United States is going to do that. We're going to make sure that everybody knows we're prepared for war.

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We're not the only people that are going down that path. Russia is building weapons, as well. Russia had a _____ [00:31:47] capability back in the 1980s that was a debris generator. In response to that, the United States built a program called the F-1590 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. The Chinese came under a significant international pressure for destroying the environment. Why didn't we? I guess there was 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, have already come back down and re-entered 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.

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 and now they're exploring significant anti-satellite capabilities both from a direct descent perspective as well as a directed energy perspective. Yes, lasers. They're building all kinds of capabilities that would threaten our satellites. Again, which would create debris. We can't allow that to happen.

What's the United States been doing? When the Cold War came down we quickly surpassed Russia as the dominant space pursuing nation. We continue to pursue space. A lot of people call the first Gulf War, 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 have because we have these strategic systems. The defense support program was a missile warning system. The first time I went to SAC headquarters, the predecessor of the Strategic Command in Omaha was to brief the Commander in Chief of Strategic Air Command, General 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 into that headquarters the first time to go see the Commander in Chief of SAC. I was just a captain.

My job was to explain to the Commander in Chief of Strategic Air Command whether the defense support program satellite, the whole missile warning satellite, would see Scuds when they launched. To be honest with you, no. We built that satellite to see ICBMs coming out of the Soviet Union. We hadn't built it to see Scuds. 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 we could. I was going to tell him it could and we were going to base a lot of what we did and at least a lot of them 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?" I was an idiot captain so I just looked at him and said, "Yes, sir. It will see it."

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I came out five pounds lighter because I had just sweat bullets. That was space in the Gulf War.

We had 16 GPS satellites. Pretty much eight hours a day we had no GPS coverage during the Gulf War because we didn't have enough satellites. We had to plan 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 _____ [00:35:49] space that said, how do we bring space to bear on the strategic, on the tactical fight all the way down? We started doing that and we fleshed out GPS. I'll tell you, 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. 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 the Department of Defense tried to kill GPS every year when I was first at the Pentagon. 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 that every year. Every year Congress put it back in. Brad fought that fight every year. Now we have 31 operational satellites, eight on _____ [00:36:54] spares. It's fundamentally changed our way of life in the country and 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, or in 2002. That warned of a space Pearl Harbor that was coming on unless we did something about it, because they see the threat coming.

I wrote a paper in 1998 that looked at what the Chinese were doing. I don't think it was any magic involved in that study. I think that you just looked at what the Chinese were saying and what they were writing and you project it out, you could see exactly where they were going to end up, and that's exactly where they did end up. That was back in '98. 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. If you're building fat juicy targets that are very simple to find and simple to hit, you're encouraging adversaries to build weapons and take them down and that's exactly what's happened.

We're in a place now where we fundamentally have to change our architectures. We have to think about space as a war fighting environment. If we think about space as a war fighting environment, and we treat it as such, and we prepare for it, my hope is that we never fight a war in space. In order to make sure that doesn't happen we've built some capabilities. We recently

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now have some classified capabilities. February three years ago now, I guess, we announced the existence of a program called the Geosynchronous Space Situation Awareness Program. GSSAP. 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. 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. 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 base and missiles. 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, and how would we control the environment to make sure we get there. We developed something called a space enterprise vision that looks out at what a real war fighting environment should look like if we actually build systems from the beginning that are based on protecting ourselves.

Then this last year we created a place called the Joint Interagency Combined Space Operations Center. A place where we really experiment on _____ [00:39:54] sends into space so we understand what that is. We're working with the other 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. War is not against space. It's not against cyber. It's not against the air, or the land, or the sea. It's with an adversary. If it extends into space we have to figure out how to fight it. If you fight a war that extends that into space it will be all the lands.

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. We will have to respond which means we have to figure out to respond all the way, all the time, in the most effective way for the United States of America. 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 in the air, fighting on the ground, fighting the Navy, fighting the maritime and then integrate those pieces together. When in reality, we have to think about all the mains 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. 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 and launch, especially in sidecom [PH], but also in imagery. One web, space X, cube SAS [PH]. 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

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that the United States military will have to defend at some point. 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, that's when we predict the 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 we 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. We needed to be able to respond on an operational timelines. Our timelines have been way too slow.

Space is just a place like the air, like the land, like the sea. We have to treat it like every other war fighting 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 it and dream. I love looking at the stars. 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 war fighting because of our advantage that we gain from space have the risk of becoming threatened. 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.

Those are my prepared remarks. I ran two minutes over. Not too bad for me. I'll be glad to take any questions on any subject from anybody. [applause]

Unidentified Male: You've been listening to a podcast from the Stanford Center for International Security and Cooperation.