



## Stanford eCorner

### Dedication to Innovation and Nation [Entire Talk]

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Former U.S. Secretary of Defense William Perry recalls major chapters from his illustrious career with entrepreneurship educator Steve Blank in a discussion that spans Silicon Valley's evolution, digital technology's emergence and its adoption by the military, to Perry's time in Washington and his deep expertise in world affairs.



#### Transcript

(applause) - Mr. Secretary I have a first question I'm not sure you've ever been asked which is you have a PhD in math, why didn't you become an academic? - I started off my PhD program with the intention of becoming an academic. In fact my whole life was a set of accidents when you think about it. I never really planned what happened to me in my life it just happened. Sort of a random walk process. But about halfway through my PhD program we had our third and fourth children they were twins. And my GI bill had run out and I couldn't live on the salary I was making. So I went to get a part-time job to supplement my research assistant job. And it was with a defense company. I found I liked the job, I found I was good at the job and so by the time I actually finished my graduate school I applied both to defense companies for a high tech position there and to universities.

I got offers to start at universities and I got tech and I sort of flipped a coin and took the tech companies that came out. Probably what persuaded me was the company that made me the offer was in Mountain View California. And I really wanted to go back and be near Stanford so that helped swing the (mumbles). And the real reason why I couldn't afford to go on to finish my PhD without getting a part-time job and was in defense electronics and I liked it. - And the world's a better place for it. So I'm glad to hear that story. So when you were 37 you were the head of a lab in a big company but decided to leave and start a start up at the time when there weren't many start ups being started. There was (mumbles) Apple were barely any... First of all, what happened in that company that made you decide to get up and leave? - Well let me set this stage first of all for this audience which for whom entrepreneurial activity and starting a new company is considered the right thing to do. This was back in 1963.

Before there was a Silicon Valley. It used to be called Santa Clara Valley. When Cupertino, instead of having Apple, had apricot orchards. And when Mountain View, instead of having Google, had truck farms. There was so much difference then you can hardly imagine it. When you can buy a lovely new four bedroom, two bath house for \$25,000. So the world was very, very different then. But in particular, people were not going out and starting companies. The idea of a startup the idea of a Stanford graduate rushing out and starting up his own company was just unheard of. Everybody worked 10, 15, 20 years in other companies and really planned on making their career doing that.

So back to your question, why did I leave, I had a very good job with a very good company. Two reasons. I just got annoyed by the administrative apparatus which was on top of me with Sylvania which is the company originally I'd worked for had been bought by GT and E which is a big electronics company, a big (mumbles) company and with that came a whole set of procedures and processes and just pain in the neck as far as I was concerned. And the second thing that happened about that time was the digital age was starting. To talk to this audience the digital age was starting would seem hard for them to imagine but just to put it in context then all the military equipment, 99% of the military equipment, you had vacuum tubes in it. It was a

very, very different world. But the digital age you could see was going to change everything. I wanted to introduce that big time in what I was doing in my laboratory. The parent company Sylvania was the world's largest manufacturer of vacuum tubes. (laughter) And they understood that semi-conductors were going to make a difference.

They had semi-conductor laboratory. It was very clear to me that they could not seize that opportunity. It's what I called then the liability of leadership. If a company has a leadership position in a particular field or a particular technology and a new disruptive technology comes around. That company is almost never able to seize the new opportunity even though they see clearly what the opportunity is. It's like they had to kill their own baby to do that. - And why is that? Is this (mumbles)? - It's psychological. - Psychological. - Yeah. - In the leadership of the company? - In the leadership of the company.

They've so much invested psychologically and financially also in their current products they cannot really grasp the idea of bringing along a new product to kill the one that's been successful for them. So I saw clearly in Sylvania... Sylvania, although they had a semi-conductor laboratory had a head start on all the other companies, way ahead of Intel. Who's heard of Sylvania's semi-conductors lately? They just never made it. Intel took the field. Another clear example of that time of liability of leadership was IBM. Who sees the personal computer field? The largest computer company in the world IBM? Or an unknown upstart company called Apple? So I think this idea of liability in leadership is very, very important. - So at that time you were already-- I saw that liability and I thought I'm going to get out of here and start my own company. - But at that time you weren't just an anonymous engineer, you had a pretty substantial reputation in the intelligence community and you participated in the Cuban missile crisis and reviewing intelligence that got handed to the President, literally that next hour about what was in Cuba. But it was still an incredibly risky venture.

How did you fund it? Was there a venture capital firm to go to? - It was... You know I never thought of it as that risky. I had so much self confidence that we could do it. I suppose that's true of all entrepreneurs, they just believe they can do it. Who's going to stop them from doing it? - That's-- - On your question of venture capital back in '64 when we started the company there was very little venture capital in the... Most of the venture capital companies you hear of today hadn't even been started by that time. There were a few, and we went and talked with one of them and the immediate problem was we couldn't tell much about what we were doing. It was all secret work or who our customers were going to be so those discussions didn't go very far. Which was a good thing because we decided that instead of going to outside money we would raise the money ourselves. We would form, not an associates company as a company where employees funded the company but a pure associates company.

All employees had an opportunity to buy stock in the company. Nearly all of them. Maybe 95% of them exercised that opportunity. And we sold most stock outside the company as a matter of policy. - Wow. - And the first year we raised about a million dollars just from employees of the company and that was enough to fund the company. And then it was profitable from the first year on and the ongoing profits funded the later growth. But it was a situation which is hard to relate to today. The main point though why this turned out to be such an important decision, even more than I realized at the time, was each of the employees that came to the company, including myself and the other first founders, essentially, none of us had any wealth. We had a retirement fund at the companies we'd worked for ten years.

And so we took our retirement funds and invested them in the company. So if the company failed it was not some poor venture capitalist losing his money, it was each one of the employees' life savings that went out the window. - Wow. - Now that was a huge incentive, believe me. - To get it right. And when you built the company, there was maybe Fairchild, Hewlett-Packard, other technology companies as models, what did you decide to adopt and what did you decide to do different in building a culture? - I don't know that we made such a conscious decision of doing that. We ended up with a very different culture, as you know. It was a Google-like culture today, but Google did it consciously, with a reason. They thought this was a good way of bringing in and stimulating employees. We stumbled onto it.

We stumbled onto it because we were a company owned by its employees. And so the employees have a lot to do and say about how the company was run and managed. And that just led to an environment like a Google-like environment. - And give us a couple of examples. What was unique that was different, do you remember? - It's hard to point to any one thing, Steve but I would say it was most of the employees who worked there would say when I left they told me it was like a family working here. People felt a bond to each other. - It was collegial. - I thought part of that bond and I think all of it went back to the idea that it was a employee owned company. It was their company. I had a Navy captain who was my military aid when I was the Secretary of Defense and he later went on to command a ship.

And his way of commanding that ship which was quite un-military-like was anybody would come to him and say here's a problem, what should I do with it, and he said it's your ship. It's your ship. Do what you think would be best if you owned this ship. Well that was sort of the attitude in the company. It's your company. What's the right thing to do? It's your company, do the thing which you think is best. - You have a view about customers, I remember you transmitted to your employees about how you treated customers and how you thought about them. It's maybe worth sharing with people today who think that customers exist to buy products. - Certainly for our company and I think probably most companies to succeed the leadership of

the company has to identify and associate themselves with the customer's problems. You're there to solve their problems.

And if you believe that and if you act on that you end up with a very successful marketing program and a successful company. But you have to believe it. It's not just about saying it you have to believe it and act on it. So for that reason we ended up with... Became very dedicated customers who understood that we took their problems very much to heart. - And they were incredibly loyal to you. - They were. - And vice versa. They were doing things that were normally sometimes the problem's with the customer. And sitting side by side with them.

- We were acting like the customer sometimes but in the customer's interest. - So back to your days as a line manager inside Sylvania and as the CEO of a company working with these customers how did you sell and convince others that some of the non-consensus ideas that you had for products or ideas made sense when everybody wanted to go down the better version of existing. Do you remember ever having any of those conversations? - Yes, we-- - Because you were great at it, I mean obviously you have a record of being successful selling disruption. - Basically the technical idea of starting the company was to seize the new... product coming out of the digital field, the new semi-conductors and develop products in our field around those new devices. And I was persuaded that it would allow us to make a five to ten time improvement in the performance of the product at lower cost. And to the extent that was true, you couldn't lose of course and that turned out to be true with most of our products. I'll just give you one example which is easier to understand, I think. We had built for Sylvania a direction finding system. This was for airplanes.

You put antennas on the airplane, they receive the signal from several different antennas and then compare the wavelength and determine the direction of the signal. And for reconnaissance that's a very important... You want to locate what the signal is located. That was a very important decision. The problem with doing that is that the signal came to the antenna directly and also bounced off the wing, bounced off the fuselage (mumbles) And so you had a confusing signal and it'd end up introducing substantial errors in your calculation. So we'd end up with maybe two or three degrees error in location because of that problem. And it occurred to us that because we're using digital technology because we had small computers that could be right on the airplane that we could calculate what those errors would be ahead of time to compensate for them and correct them on the fly. - Wow. - And by doing that we made a factor of ten improvement and actually went down a few tenths of a degree. - Wow.

- So once we had done that nobody wanted to buy direct (mumbles) systems from anybody but us because we were the only ones who could do that at that time. It was a simple idea, really. But the fundamental idea was seizing this new technology and say how can you apply it adaptively to this new problem? It wasn't just the amount of replacing vacuum tubes with semi-conductors it was saying once you introduced semi-conductors it's possible to do things you could not have done otherwise. And in particular with the computer it was fast enough that computer could go on an airplane it was fast enough to make those calculations on the fly was the thing that changed the game. - And was that the beginning of the emergence of many computers from HP and others or was that even before that? - We were using what was then called the HP 2000 computer which is a dinosaur today. It was about that big, had less power than one of your laptops today, but still it was a very powerful computer in those days. It was fast enough... It was small enough that you could put it on an airplane it was fast enough to do that job. - And did it require for you to have your businesses at ESL to have counterparts in the government who actually thought like you? - There were a few. And you find them and seek them out and then encourage...

Plant the ideas with them, let them sell them up the line. - Now that's a big idea for any entrepreneurs in the audience is you find partners at your customer and let them take credit for what geniuses they were. Are there any that you remember in particular who made a difference? - I'll protect their identity. (laughter) - And some who are still being talked about fifty years later. - Fifty years later. Some of the work I was doing then I just had my book published about a year ago and before I published it I had to submit it to the Defense Department for review. Classification review. They weren't reviewing the content of it but whether or not I was saying anything classified. They took out five paragraphs in the book. And to my amazement it had nothing to do with the period when I was Secretary of Defense it all dealt back in 1960's when I was doing the things that I'm talking about now.

But five paragraphs we were saying things about programs we were working on then they consider it still 50 years later, still classified. - Wow. And why do you think that is? - I think its just bureaucratic laziness. (laughter) They didn't get around to declassify, They should have. But also they were very highly secretive I must say very highly secretive. - I talk about security in our country like the Hotel California. Once you check in you could never check out. Now you were president of this successful company, it was growing and all of a sudden you get a call from the US government that says we'd like you to leave Palo Alto and come to Washington DC. And you did it multiple times. It can't be the pay.

What were you thinking? - Well what I was thinking was, no I don't want to do that. (laughter) So I got a call from an old friend Herold Brown was his name and he had been the president of CalTech and then he'd gone back to... He was invited by President Carter to become Secretary of Defense. He was a PhD in physics so a technical background like myself. And he asked me if I'd come back to be his undersecretary for research in engineering. And I said no, I wanted... Today we talk about

entrepreneurs and serial entrepreneurs. People that are proud to say they are serial entrepreneurs. I am proud to say I was not a serial entrepreneur. My plan was simple and plain.

I wanted to take my company and build it into a great company. I had no idea of bouncing off with another idea to another company. That was my plan and since I was firm in that plan that the last thing I wanted to do was leave my company, and go back to Washington so I said no. And after two weeks of protracted discussion back and forth across the country I yielded and said yes. And which was the right answer by the way. But what persuaded me to say yes was... This was 1977 now. And January 1977. And the President and Secretary carefully explained to me that we had a very serious security issue in those days. I won't bore this class with the whole security issues in 1977, but they had some resemblance to the security issues today.

When World War II ended, we ended up with almost a nuclear monopoly but we disbanded... We had an army of 10 million men then we disbanded the army, we disbanded our defense industry. The Soviet Union on the other hand observing what had happened in World War II decided they would maintain a large army and that they would build up a defense industry. They wanted to emulate what the United States had done in World War II. They thought the reason the allies had won World War II was because of America's industrial might. That's an oversimplification but it certainly was a major factor. America's industrial might. They said the next war, we wanted to win with our industrial might. They tried to emulate what we had done. They built up this huge defense industry and maintained quite a large army.

So in 1977 though, with all that background they had an army of about three times the size not to say that we had but which the NATO had at that time. Up until that point we had said so what? We have a great nuclear advantage. But by 1977 they had caught up on nuclear weapons as well. Everybody was concerned. There was serious talk, I think greatly overstated talk about a window of vulnerability to a surprise attack by the Soviets. There was a lot of concern to the point of hysteria I would say. But in any event the serious concern was we had to do something about that. And the President had decided very clearly he did not want to emulate the Soviet Union in the tripling the size of the military. That would huge cost it would have bankrupt our economy doing that. Not to mention the fact it would have been very politically unpopular.

So we're not going to do that, we want to offset their superiority in numbers with a superiority in technology. - That's the magic word, offset. - Offset. You wanted to offset that. And he'd seen what I'd done with the company. And he said what you did was introduced digital technology into your particular field it was very successful, I want you to now to introduce digital technology to all of our most important military weapons. - Great idea. - And use them then to make them so much superior to the Soviet weapons that we'll offset their numerical superiority. So we went then and came to be called Offset Strategy number two. The first offset strategy was we used our nuclear weapons to offset them.

The second was we used our technology to offset them. So he gave me the job to offset. And that was a fascinating job, it had about a hundred billion dollars a year budget to do that. - Kind of like a startup. - You have to multiply that by ten today to get the equivalent dollars so there's a lot of money, a lot of resources and he gave me full authority to do it. - Wow. - So that was just a fascinating challenge aside from being an important problem is a fascinating technical challenge I couldn't turn it down. - So I want to get into some of the technical challenges but just for our audience the chief of the Soviet general staff after you were done said about the offset strategy that it was revolutionizing contemporary warfare and post military threat that the Red Army couldn't match. We cannot equal the quality the US arms for a generation or two. And we'll never be able to catch up with you in modern arms until we have an economic revolution.

And the question is whether we can have an economic revolution without a political revolution. And I think that answer came about eight years later. - Huge ... I'm surprised he said it. - He said it and... You know a lot of people claim, I'm one of the advocates, is that the second offset strategy bankrupted the Soviet Union because they couldn't follow and the demise of communism was due to William Perry and the second offset strategy. But this really gets back to what you observed when you did ESL that computers were not just a better version of X that it was a disruption an offset about back then direction finding another intelligence systems and now you have a nation stage to kind of play this out on. What technologies did you see and choose and why and we talk about sensors and stealth and precision weapons. Were those already ongoing? Did you select them? How did you invest? What did the status quo think? This must have been a heck of a time. - I took me about three months to come up with what the offset strategy would be - That's it? Three months? - It's on thing to say we're going to use technology but of course it's how we're going to use it.

One of the things we decided right off is we had to make our weapons smart. What do we mean by that? Well during World War II and during the Korean War when we dropped bombs or fired artillery shells we never knew exactly where the target was. And so we had to drop 20 or 30 bombs and we couldn't guide them accurately so we had to drop 20 or 30 bombs for every target. And so we thought what we wanted was one bomb one target which would make a huge difference. Not just in the actual work but in the logistics detail that were detailed with it. So smart weapons were one part of it and the technology that was available then led us to focus primarily on laser guided bombs. So we'd built tens of thousands of lasers we developed then built tens of thousands of laser guided bombs which are still today a major component of our weapons. We needed to

have a way of guiding things accurately. And the laser turned out to be... That we also had to have a better way of knowing where we were when we fired if you're in an airplane...

So we thought we'd better have a way of accurately positioning so we developed a global positioning system. Which is what we call GPS today and of course everybody uses it on a mobile or a handheld navigator today. At the time I wasn't thinking about the commercial applications of it but the military applications of it were very obvious. - Weren't thinking about Yelp and GPS. - Sure we developed GPS at that time and if you use it in your car you have me to thank for that. (laughter) Also developed from the code the Arpanet. Which later became the internet. - Wow. - And all of that was pretty straightforward in all these applications of things we had been doing. No great leap forward in imagination just a leap forward technically.

Well it was a leap forward in imagination was building an airplane that could not be detected by radars. Airplanes are key components with military warfare and have been since World War II. And because it's so key every country's developed systems for shooting them down that involves radars and missiles to fire at them. And so surface air missiles which are guided by radars so we wanted to develop an airplane that could not be detected by radars therefore that could be not shot down by missiles. And that was became to be called a stealth. It's not stealth in a sense you couldn't see it. If the F 117 (mumbles) flew over and you looked up it'd be quite obvious to you But the radars couldn't detect it. So they had complete impunity at night time. They could operate at night without any... So the stealth was the third component of the...

Those were the three major components we decided that on the first three months. - Wow. - And pulled out all of our throttles to move forward. I wanted to have them done by the end of the... I didn't want to stay more than one term in government so I wanted to have them done in the four year period. Indeed we had the first stealth airplane flying just before I left office so four years later which is pretty unusual. - You don't get the paperwork done usually for four years in the government. But how did the status quo treat these programs? Did you get opposition? (laughter) Note the laughter. - With the hoard. The was a mixture of reactions to it.

The principle opposition was really an organized group which called themselves, I don't know, the Group for Defense Reform or something that was against introducing technology into military on the grounds... And they were particularly opposed to things we were doing on the grounds that they would make weapons too complex for a soldier to use. So complex they would break down in the field. And then be so complex they'd be too expensive. In other words they had... The usability, the reliability and the cost they thought would be all to high. Which are true with some kinds of complexity you introduce into the system. But in fact back in those days they'd just introduce something called the HP 35 which is a Hewlett Packard handheld calculator which is about the size of your iPhone today, small iPhone. And that machine did all the calculations that this calculator did and a lot more for less cost. It was less costly, it was more reliable and it was easier to operate.

So all of the things that they were bringing up against it we just in the opposite direction. They mistook complexity for new technology. So the new technology actually was cheaper, simpler, easier to operate and more reliable. Much, much more reliable than the old technology had been. - Was the opposition in the military itself or in Congress or contractors? - The military was mixed but there was a lot of people in the military who were hoping we were right. And were willing to go along with it. Most of the opposition came from outside the military. It was very... It really stayed with us for about ten years until Desert Storm. The first test of this technology came in 1989 I guess it was, almost ten years later after we'd developed all this stuff.

In Desert Storm, the F 117 flew over Baghdad a thousand times I mean over a thousand sorties over Baghdad. Baghdad at that time was the most heavily defended city in the world. They had hundreds of modern Soviet (mumbles) missiles. And out of those thousand sorties wasn't a single airplane shot down. Not one. - Wow. - They flew them all night as they should have done and there were thousands and thousands of rounds fired at them and they never hit a one. So a thousand missions and no airplanes shot down so the stealth worked like a charm. They carried laser guided bombs that we talked about here and those 1000 air sorties dropped 2000 bombs. 80% of them made direct hits on their target which again was an unprecedented level of accuracy.

From that point on nobody in the military doubted the effectiveness of it and the critics who, just sort of disappeared, they stopped talking. That was a rare opportunity to prove a new technology in such a dramatic setting. - Wow. You know if the story ended there, that would be an incredible life but you had almost a second career in diplomacy which is the opposite of preparing for war it's actually waging peace and you did a... Just an amazing story there. But before I get off on diplomacy, I do want to ask you a question is we were talking earlier before we came on about there's now a search for a third offset strategy. And maybe we could talk about that for a minute or two and then we'll talk about diplomacy. Why are people searching for... Why is the US government searching for third offset strategy? - Well going back to Desert Storm it was... We were facing really the fifth largest army in the world.

4000 miles away from our home bases. And they were defeated, they were outed in five days. - Wow. - And that made a huge impression, profound impression on militaries all over the world. So all of the other militaries said what can we do about that? And there are two obvious choices, one of them is we try to emulate it which is not so easy if you don't have the

technology base in the first place or we can try to work around it. Work around it means we invent something called asymmetric warfare. And the nations that were the smartest The officers that were the smartest went to asymmetrical warfare. - Can you give us an example of asymmetrical warfare. - Urban guerrilla warfare. - None of the things I've talked about, none of the technologies I've talked about have any relevance to that.

So why should they fight us at things we're good at. Fight us in things we're not good at. - Ah. - The intelligence systems are working in an urban guerrilla setting. The intelligence to the benefit of the guerrilla, not to the other way around. So we, I think became overconfident. We thought because we had this capability for defeating an army in the field, our military could do anything it wanted to. And so the second Iraq war came and we had our head handed to us in my opinion. Now we quickly defeated the Iraqi army the second time around just like the first time around. But that turned out that wasn't the real war.

The real war ends up being fought in the cities which in urban guerrilla warfare and we did very poorly in that. So began to dawn on people that the military has to be tailored to deal with what the threat actually is not what we would like it to be. And the military we had designed to fight attack warfare in the desert. That wasn't the problem we were going to be facing. And so that led people to think we need a new offset strategy to deal with these new kids of threats. The new threats are different in nature, they're guerrilla warfare, they're cyber warfare there might be conflict in space you can think of three or four or five possible threats to our military for which the military we built isn't really appropriate. So when the new Secretary of Defense came in a year and a half ago, Ash Carter who had been by the way my assistant secretary when I was Secretary of Defense and who is very familiar with all this offset strategy stuff-- - Another PhD. - Another PhD. Physics, this kid. In fact his PhD was in theoretical physics and renaissance literature.

(laughter) He's a real renaissance man. He decided he was going to try to introduce offset strategy three. And it just got started a few months ago and one of the things he did to realize that recognizing the importance of digital technology and information technology is what he wanted to do was he set up an office out here in Silicon Valley. It's called DIUX which means what Defense Innovation Unit Experimental. - So do you think he found it? Is there a third offset strategy yet? - I don't know. That's off job. It only took us three months to come up with what we wanted to do the last time around but in retrospect it was a lot easier job than what he's facing now. They've been working on this for six months now and have not yet come up with a concrete strategy yet. - Because back then we had one nation state facing us which was Soviet Union. - That was so much different.

And it was easier to think of. It was easier to describe. It wasn't so hard to deal with but it was easier to describe anyway. This one's not quite through. - Now we have non-nation states, we have nation states we have, so it's kind of messier. - It's a very different problem. And I think a much more difficult problem that he's facing. And technology will play an important role in dealing with it but certainly not the only role. And he's trying to figure out how to tailor the technologies to deal with those particular problems. That's what the offset strategy three is all about.

- Got it. And so that kind of segues into almost a second career when you were starting your first and that was diplomacy. I remember President Carter kind of put you on some diplomatic missions at the time and for diplomatic negotiations with China as well as Israel and Egypt following the Camp David agreements. How'd you feel about taking on this expanded role? Did you think of yourself as a negotiator? Was there some manual they gave you to figure out how to do that? - I didn't think there was anything special about negotiating with people that... You have to think about what they're trying to achieve where they're coming from and listen to them, to learn that. To the extent there was an art in negotiation. It comes on in the brilliant things you say but how carefully you listen. So diplomacy to me at least, a big part of it is listening to what other people say and trying to figure out how to accommodate them. - Can you give me an example? That's an interesting insight. Is there anything you remember that struck you that no one was hearing and you-- - Well when I was secretary we had a tragic situation in Bosnia.

Where there was sort of a civil war going on there between the Bosnian Muslims and the Bosnian Serbs. And hundreds of thousands of people had been killed and millions displaced and put in concentration camps. It was the worst atrocity since World War II really. And the NATO Peacekeeping mission had been sent in there to deal with it. That was totally inadequate, they couldn't handle it. So finally NATO decided to send in a NATO force to bring order to the country and to stop the killing and to say get out to people get back to their homes. One of the problems in doing this where NATO readily agreed to do that and United States were leading the mission. But there was Russia. And Russia is a Slavic country and Serbia is a Slavic country. There's a brotherhood relation between them really.

And they were, by God, going to send in a brigade also. Well having a brigade of Russians and a brigade of Americans and a brigade of British under different commands fighting a war, seemed like a recipe for disaster. That's what we're doing in Syria by the way today. But it was a big larger scale going on in Bosnia then. So President Clinton and President Yeltsin agreed that we were to have a unified force. They didn't know how to do it but they said we ought to have one and they turned to their defense minister myself (mumbles) of Clinton and minister Grachev in the case of Russia and said solve this problem. Find a way of bringing these forces under one command. So that was my greatest exercise in negotiation, I think. - How'd you solve the problem? - The word that I heard most during those negotiations was net. That over and over again.

And it took us four meetings really... Over a period of two months, we had two months to solve it and I met once in Geneva, once in Washington, once in Whiteman Airforce Base and finally we went in Brussels. The third meeting we got a formula for a solution and the fourth meeting we signed it. But it was a question of listening to what was really bugging Grachev why he didn't want to do that. We finally ended up... He put his brigade, one of his best brigades reporting to an American division commander. - Wow - Our brigade in one of our divisions. He did not want to report to NATO, but he was willing to have to report to an American commander. - Wow. - And it took me awhile, and I'm a slow learner, it took me three meetings to figure that out that's what was really bugging him.

And we finally got a solution to it. But it's listening to the other people. - That segues begin to something you said in your book about Russia, which I thought was just a little sobering. If I got it right you said that in less than 15 years, the relationship between the US and Russia went from being quite positive to an all time low. And you listed a series of policy decisions that we've made that you believe contributed to the deterioration of relationships. And I won't list them all but what do you think we should be doing? Is there anything solvable with Putin? Or is some of it on us? - There are many significant problems we're facing that seem to be getting worse on a month by month basis. I don't think we can solve any one of those problems just by attacking that problem. We have to get at the underlying issue which is the hostility between the United States and Russia today. I think nothing can be solved without addressing that problem directly. And that has to be done at the highest level it has to be president to president to deal with that.

And that's not happening. That's not likely to happen in the near future because based on their experiences with these other... President Putin and President Obama do not like each other at all. To say they hate each other's maybe too strong, but they hate to be in the same room with each other. (laughter) It's a bad situation. And I think each of them ought to be able to sort of get over that and work for the common interest but that may or may not happen. What I and several others, Senator Nunn have proposed is that we at least go to Russia with the proposal that we form from a working team, high level working team, to deal with the problem of nuclear terrorism. Which is equally dangerous to Russia as it is to the United States. And find a way of working together on that one problem. If we can do that, if we succeed on that one problem, then maybe we can work out for broader basic cooperation.

The President's job is to find those areas where we can cooperate and try to make that cooperation happen. Then find the other problems where we have completely hostile and not going to cooperate and sort of isolate that, and minimize the danger from those. - So interesting way to think, I just got smarter right there. Find the areas of common interest, there must be between nation states. - Oh certainly, the danger of nuclear terrorism. - And I want to-- - Nuclear bomb is as likely to go off in Moscow as it is in Washington. - And I do want to spend time on that but let's just take what you said about Russia finding common interest. Is the same true for China? Our relationships have deteriorated and we need to find some common interest or is there different issues going on there? - Ask me that again. - Are there different issues that are going on with China than there are with Russia? - Oh, yes. A huge difference between the US, China versus US Russia.

We have a very profound economic relationship with China. Huge bilateral trade with China. Exchange of technology... There are many, many common interests we have with China. Every objective reason that the United States and China ought to be working together on a friendly basis in cooperation to advance the common interests of both countries. And to a large degree that has been happening. But there has been notable exceptions in the last few years which worry me a lot. - Which ones are those? - Well the most obvious one are the... Back up a little bit. There was earlier a major problem over Taiwan and we worked very hard I think.

I worked when I was in office, I worked when I was out of office and the Presidents have worked very hard to resolve that problem. And I think that today Taiwan has gone away as an issue between the United States and China. That is very unlikely that it would be a war between China and Taiwan that might drag the United States into it. And that's a separate issue and I don't want to discuss it right now but good things have been done in that area to mitigate that problem, I think. But more recently the problems have come up in the South China Sea. There's a clear difference of perception between the United States and China about what the South China Sea is. We look at it as international waters where our ships can pass freely and some in China regard it as sort of a Chinese lake. And they have rights to and have rights to keep American ships and American planes out of and so on. The differences are very great, not just with the United States but with the Philippines and with Vietnam, Taiwan, all of those countries, in particular the Philippines I think and Vietnam have major disputes with China over the rights in the South China Sea with respect of ownership of islands, with respect to drilling rights and so on. So the big disputes for maybe a decade between Vietnam and China and between Philippines and China.

The United States were staying off the side because all we care about is we want these issued to be resolved peacefully and we want to maintain sailing rights steaming rights through the South China Sea. This was being brought to a head by the Chinese starting to build airbases on some of those... Making a reef in and build an artificial island, putting an airbase on it and that's leading, I think to some kind of showdown which I'm very concerned about. - And do you think China's looking for a showdown? Or doesn't think they'll get one? - It doesn't make sense. I have to say, I fully do not understand what's behind the

new Chinese president who is a very different leader than his predecessors have been from all the way back to... - (mumbles) - Well since 1983, 1984. All the leadership are working towards a cooperation with United States and not making waves on territorial issues. But I don't know, I just don't know. I can't really say where this new leader is headed. But it would be a huge mistake, it would be a tragic mistake if the United States and China were to get into some sort of a military conflict over these relatively minor issues on ownership of who owns this reef and who owns that reef.

- They seem to be symbolic of something. - They're symbolic. - Of something bigger for China. - They're certainly symbolic and the underlying symbolic issue with China I think is has been their righteous grievance over the abuse they took for a hundred years by Western power. Mostly not the United States but mostly European powers. And they call it Century of Humiliation. That's a serious issue in China and it's one which they have, as I said a righteous grievance but now they're bringing that forward into the modern day. The thinking for it into the modern day I think could lead to mischief. - And let me segue from China a bit to something else you were personally and deeply involved with which was North Korea. In fact, if I remember you stated we were this close to having an agreement in 2000 and then five years later we were facing a nuclear armed North Korea because of some policy decisions that have been made on someone else's watch.

Are you optimistic or pessimistic? Or scared? - I'm pessimistic right now. - How do you think that's going to end? - We've had problems with North Korea many times in the last 30 years over their aspirations to have nuclear weapons and up until the year 2000 we were able to hold off those aspirations. And I went to Pyongyang and met with the leadership in North Korea at the request of President Clinton in 1999 I guess it was. I was out of office at that time but he asked me to go over to his personal envoy to deal with it. North Koreans And I made a proposal to them whereby the United States would recognize them as a full country, we don't recognize them today, we don't have an embassy in their country for example. We recognize them, we just give them technical assistance, got both South Korea and Japan to get them economic assistance and in return they would give up their nuclear weapon program and long range missile program. And we were very close to a deal, I think. President Clinton was ready to sign a deal. They sent the senior military person over to meet in Washington said they were ready to sign the deal and funny thing happened. It was an election and a new administration came in.

In 2000. Election was 2000. The new administration came in January 2001. I was not too much concerned, I was sorry we hadn't gotten it done ahead of time before the election, but we didn't. And I talked with Colin Powell who was the incoming Secretary of State. He said not to worry we'll bring this deal to a conclusion. And two months later the South Korean president came back to meet with President Bush and President Bush says we're cutting off all discussions with North Korea. - Wow. - For two years there was no contact at all. Next thing we knew they were starting build nuclear weapons.

I've oversimplified a complicated story but I think we made a major misstep there. I think we could of stopped the program, now I don't see any good way of stopping it. They have a dozen or maybe even more nuclear weapons they're building more fissile material, they're testing long range missiles, they're testing submarine missiles. So I think we let ourselves in for serious unnecessary problem. - And do you think there might be a proliferator as well? - What? - Do you think they might be proliferating nuclear weapons? - There's certainly a proliferator. There's been two ways between them and Pakistan some of their technology came from Pakistan. And they have also assisted Pakistan. They sold a nuclear reactor to Libya. Pardon me, to Syria. Which the Israelis obliged the Syrians by bombing.

So it doesn't exist anymore, but it came from North Korea. - Really? - Which was a... Not legal really. - On that high note, you and George Shultz and Henry Kissinger and Sam Nunn are still working to reduce the nuclear threat. Tell us about why you're doing that and what you want to see happen. - In 2006, October 2006 with the 20th anniversary of the Reykjavik summit, some of you may have never heard of the Reykjavik summit, but in one of President Reagan's, I think most brilliant diplomatic strokes, he met with the then President Gorbachev of Russia in the Iceland capital of Reykjavik. And they talked for two days without notes without aides except George Shultz was there, about the idea of giving up nuclear weapons altogether. It was unique and unprecedented. - Right. - In the end they could not come to an agreement.

But they talked about it. But they did not come to an agreement. And just 20 years before the anniversary George Shultz said why don't we have a Stanford conference? Seminar, it wasn't a conference, on the Reykjavik summit revisited 20 years later. What were the lessons from the Reykjavik summit? And so we did in 2006. And the conclusion of that seminar in Stanford was that we ought to revisit the idea of eliminating nuclear weapons. And Shultz and Sam Nunn, who was there, myself and we later got Henry Kissinger to join us banded up to write an op-ed for the Wall Street Journal which said just that. Number one nuclear weapons today are more of a danger than they are an aid of security. Number two they'll always be a danger until we find a way to eliminate them and in the meantime we ought to find ways of reducing their danger. That was the essence of the op-ed. And it caused quite a stir.

Not because the ideas were so new but because the ideas were coming from four people who are certified Cold Warriors. I mean, I'd help build up this nuclear arsenal. As had Shultz and as had Nunn, in his role as head of the Senate Armed Services Committee, as had Kissinger as Secretary of State. - So you were now a bunch of radicals. - So this was a dramatic statement coming from these four people. It caused quite a stir in the international community. And it actually caused some progress

along that line for a number of years. Most dramatic progress came when President Obama was elected in 2008 because just two months after he was inaugurated, he went to Prague and gave his first international speech as a president, which among other things he said I state with conviction the intention of the United States to seek the peace and security of the world without nuclear weapons. There's a stunning statement coming from a President of the United States and it stunned the world. And for a couple of years after that we actually had progress in that direction.

We made another arms treaty with the Russians where we each agree to reduce nuclear weapons. I think one of the most important things the President did was he started something called the Nuclear Summits where the 50 nations that have fissile material, these are materials what takes to make a nuclear weapon, but it's also used to run nuclear reactors. 50 nations had that fissile material, came together and agreed on improved ways of controlling that fissile material so it could not fall into the hands of a terrorist. So for about I'd say four or five years a lot of good progress made. Now there's been a retrogression. The retrogression I think sinks almost completely with the growing hostility between the US and Russia. Because Russia then said we don't want to have any more arms treaty. We don't want any more arms negotiation with the United States. And they started building a whole new round of nuclear weapons. The United States now decides we need to build a whole new round of nuclear weapons so we have the Cold War and nuclear arms race starting all over again.

We're moving backwards now. - Well on that assuring note (laughter) But before we take some questions from the audience the last question for you is what role can Stanford students, entrepreneurs play in solving national security problems? Engineering or policy problems? What can students do? - In the case of my example I didn't even start addressing these problems for 20 or 30 years into my career. But what I had done in my career which is a technical career turned out to be a hugely important background for what I ended up doing. So even if you have this aspiration you don't have to move directly to it. You move to developing your skills so that when you do decide direct them to security problems or government problems you have those skills already. But beyond that if you want to address the issue today, I'd say the first thing you need to do is understand what the issues are. Take the time to study and understand what the issues are. Many sources are available for you to do that including courses at Stanford. So the first issue is get smart on the issues. Then the second is you've done that is start to involve other people, your friends, your colleagues your family in the issues.

Spread the word. Because the reason we are slipping into another Cold War into another nuclear arms race is because the people in this country do not understand the dangers of what is underway, what is about to happen, what is already in process of happening. And so we have to have a better educated... You have sort of a delayed gratification in saying education but you have to educate yourself. That's the first step. And you have to help educate others. If we become and informed citizenry then we will take informed and intelligent actions. We are not today an informed citizenry on this problem. - Okay, well thank you Mr. Secretary.

What I'd like to do is take at least a question or two before we end. Who has a question? Yes. - [Voiceover] I was curious. I came a little bit late so I hope you didn't talk about this in the very beginning but could that third edge or whatever could it be something related to cyber security and could you talk about cyber security a little bit? - So the question is can cyber security be one of the components of the third offset strategy? - Cyber security? Yes, one of the most important components of the third offset strategy. Already that is already pretty well established. Yes, good question. - Great question. Other questions? Going once-- - Cyber security is an asymmetric warfare really. - Yes, a question. - [Voiceover] I was at a Zika conference yesterday and it was brought up about even closing the Olympics down or move them someplace else because of the-- - Because is the question about the Zika virus? - [Voiceover] Yeah and the Olympics (mumbles) has brought up closing it down even.

- And what's the question? - [Voiceover] Thoughts on the Zika virus and the Olympics. - Do you have any thoughts on the Zika virus as a national security issue? Or is it a security issue? - I don't know any more about the Zika virus that you do. But what I read about it, it sounds like a serious problem. - Other questions. Yes. Right there. - [Voiceover] Hi. How do you see Iranian and American relations developing going forward? - So the question is how do you see Iranian and American relationships going forward? - I think the agreement was made with Iran on their nuclear program was a necessary but not a sufficient condition for establishing good relationships. It was certainly necessary. It poises us and it poises Iran to try to work together in a more cooperative and friendly manner.

So it's possible now for that to happen and I hope it can happen. There's a lot of opposition in the United States all you have to do is read the newspaper to understand a lot of people not only don't want that cooperative relationship but they didn't even want the nuclear deal. There is a lot of opposition to it. There's also I think a lot of opposition in Iran to it. We've got our side but the Iran Revolutionary Guard is entirely opposed to the deal and they want to go ahead and build nuclear weapons. They're very clear about that. So there's a big opposition in both countries who will prevail remains to be seen. One can hope that in the United States at least it will move forward trying to seek a positive relationship with Iran. The last time I visited... I should say I've met four times with Iranian officials.

One of them now is the foreign minister and the National Security Advisor, talking about this problem. Trying to see if I could... This was before we actually started negotiating. See if I could find a foothold for our negotiators on this. And I was

persuaded that we could make a deal with them. Although the deal we ended up with I would say was better, more favorable than the one I thought we were going to get. I also have visited Iran a number of times, most recently as a tourist and met with a lot of Iranians. There's a wellspring of good feeling for Americans among Iranians, whatever the government says or does. There really is a basis, I think for a positive relationship so I'm truly hoping that we can get something going positive with Iran again. It's stupid for us to be at (mumbles) with Iran.

- Well Mr. Secretary I got smarter this last hour so thank you very much for your time. (applause)