CARNEGIE INTERNATIONAL NONPROLIFERATION CONFERENCE

THE FUTURE OF THE CTBT

MODERATOR:
DARYL KIMBALL,
ARMS CONTROL ASSOCIATION

SPEAKERS:
SIDNEY DRELL,
STANFORD LINEAR ACCELERATOR LABORATORY / HOOVER INSTITUTION

AMBASSADOR JAMES GOODBY,
HOOVER INSTITUTION

AMBASSADOR TIBOR TÓTH,
COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION PREPARATORY COMMISSION

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DARYL KIMBALL: If everyone could please find their seats, turn off their cell phones. Welcome to the Polaris room. I'm Daryl Kimball. I'm executive director of the Arms Control Association. I'm moderating this session on the future of the Comprehensive Test Ban Treaty, the CTBT.

The prospects for the treaty this morning are considerably brighter in the afterglow of President Obama's speech in Prague, in which he outlined his vision for strengthening the nuclear nonproliferation system, advancing U.S. and Russian efforts on nuclear disarmament and taking steps to prevent nuclear terrorism. And as most of you, if not all of you, have heard by now, he made his intentions on the Comprehensive Test Ban Treaty quite clear. He said, "to achieve a global ban on nuclear testing, my administration will immediately and aggressively pursue U.S. ratification of the Comprehensive Test Ban Treaty. After more than five decades of talks, it is time for the testing of nuclear weapons to finally be banned."

Before we hear from our speakers, a few contextual thoughts on this issue a day after that speech. Why go for the CTBT? In essence, why is this treaty still – after five decades of pursuing it – still a valuable global security instrument? The simple answer, and we'll hear more from our speakers is that by prohibiting the test explosions of all nations and all environments, the CTBT makes it far more difficult for states with advanced nuclear weapons programs to develop new types of nuclear warheads and it makes it more difficult for could be nuclear arm nations like Iran to proof test if they pursue nuclear weapons, more advanced types of nuclear warheads that could be placed on ballistic missiles and delivered by ballistic missiles.

And as the president said in his speech, the CTBT, of course is a central part of the global nuclear nonproliferation architecture, a key portion of the commitments from 1995 and 2000 NPT review conferences and of course U.S. leadership on the test ban is going to be critical for the success of the 2010 conference.

And entry into force, we should not forget, is also critical to improving national and global efforts to detect and deter secret nuclear test explosions by the countries and making onsite inspections possible under the terms of the treaty.

Now, many people have been asking me and asking one another
how close are we to U.S. ratification of the Comprehensive Test Ban Treaty? On March 27, the chairman of the Senate Foreign Relations Committee, John Kerry, provided what I considered to be the most accurate answer to that question. Not all members of Congress provide the most accurate answers, but I think he did in this case.

He said, quote, "We are very close. We don't have that many votes to win over to win. But they are serious folks" – that is, in the Senate – "and we are going to have to persuade them." He went on to say that his committee will hold hearings on the treaty. He did not say when. He said a vote by the full Senate he said is unlikely before next year.

In other words, and this is me again, not John Kerry, the political conditions are more favorable for ratification – U.S. ratification of the Comprehensive Test Ban Treaty than they

have ever been since the opening for signature of the treaty in September, 1996. And with smart and strong leadership from the president, securing the necessary two thirds, 67 votes, in the Senate before the end of 2010 and perhaps before the pivotal May, 2010, NPT review conference, is clearly within reach.

Now, Obama's call for immediate efforts on the CTBT are important in my view since the task of winning the support in the Senate is going to take some time. We can't go from zero to 67, if you will, overnight. There hasn't been a debate, meaningful discussion about the Comprehensive Test Ban Treaty in about 10 years.

In order to move forward, the president, along with Senator Kerry are going to have to engage with the Senate, as we heard Jim Steinberg say at lunch yesterday, in a discussion to go over the technical issues, to listen to their concerns, to hear their views and to respond to those views. And of course the support of key Republicans such as John McCain and Senator Lugar, the ranking member of the Senate Foreign Relations Committee, are going to be critical. And we should remember that John McCain in his 2008 presidential run said that we should take another look at the CTBT.

Now, the outcome of the debate on the Comprehensive Test Ban Treaty in the Senate will undoubtedly hinge upon the politics of the moment and the various calculations that individual senators are going to make. But it's also going to be based on the same three key technical and security issues that were the center of the Senate's 1999 debate and ultimately it's "no" vote on the treaty. And recognizing that reality, Secretary of State Clinton back in January at her confirmation hearing said, and I quote, "We need to ensure that the administration works intensively with senators so they are fully briefed on key technical issues and receive the best scientific evidence available."

Obama's pledge on Sunday to aggressively pursue CTB ratification in my view suggests that there will be a high level administration led effort, involving the White House and key members of the cabinet. And as we heard Jim Steinberg say at the luncheon yesterday, that effort will, in some way or another, be spearheaded by Vice President Biden.

Now, in light of all this, we've organized a panel discussion this morning on the three key technical issues that I believe, that many believe will be at the center of debate on the test ban in the next several months.

First, how have U.S. capabilities to safely and reliably maintain the existing arsenal improved? Is resumed testing or new design warheads technically necessary to maintain the U.S. nuclear stockpile?

Dr. Sidney Drell of the Stanford Linear Accelerator Lab and a fellow at the Hoover Institution is going to talk about the developments with regard to the U.S. Stockpile Stewardship Program over the last decade.

Second, we're going to hear about verification and how global capabilities to detect clandestine test explosions have improved over the last decade, particularly with the International Monitoring System that is being developed and deployed by the

Comprehensive Test Ban Treaty Provisional Technical Secretariat in Vienna. And we have with us here today Ambassador Tibor Tóth, the executive secretary of that organization, to report on that issue.

And finally and perhaps most importantly, how does the CTBT improve U.S. security by restricting the ability of other states to conduct nuclear test explosions? How does the CTBT today, in the 21st century improve the security situation in dangerous regions like the Middle East and South Asia? Ambassador Jim Goodby, who has a long, distinguished career in the field and particular on the Comprehensive Test Ban Treaty as an advisor to General Shalikashvili with his report in 2001, is going to look at this issue.

And finally, as you listen to these presentations, I would ask you to think about one very important issue and that is that as a signatory to the Comprehensive Test Ban Treaty and with the United States' nuclear test moratorium that's been in place since September, 1992, the United States already bears most CTBT-related responsibilities but has denied itself the political and security benefits of being a ratifying state. Such a situation, in my view, is extremely self-defeating since there is neither the need politically, militarily, or technically for renewed U.S. testing.

So following their remarks, and we'll go sequentially – we'll hear from you. I hope we have a robust discussion.

And first up is Dr. Sid Drell. Thanks for being here from California.

SIDNEY DRELL: I had a few slides, but I think we'll forget them. So in 1999, when the United States took the test ban discussion to the Senate, there was a very perfunctory inadequate debate, but the technical issue of could we maintain a safe, effective, reliable, secure stockpile without testing was one of the technical issues. And what I want to discuss is what have we learned since then? Should that still be a barrier in anyone's mind to ratifying the CTBT?

Since 1999 we've had 10 more years of a very well-supported, multifaceted Stockpile Stewardship Program created by the Department of Energy and the National Nuclear Security Administration. It was first created following the moratorium established under the first President Bush in 1992. During these 10 years since 1999, annually that program has certified the operation of our arsenal, its safety, reliability, and effectiveness. And it should now be said and let me say it with a simple quote from the heads of the weapons programs at the two laboratories, Bruce Goodwin at Livermore and Glenn Mara at Los Alamos – and this is their quote – "To date the SSP, Stockpile Stewardship Program has achieved remarkable successes. It has enabled the laboratory directors to assure the nation that we do not need to conduct a nuclear test to certify the deterrent is safe, secure, and reliable." Period.

Now, there're two fundamental measures of the program's success and they are the ability to discover causes for concern in the stockpile – the so-called significant findings, flaws due to production or design error or aging. And the second one is – its measure of success they've been able to fix these significant findings. And this process is responsive to and independently reviewed by the military's strategic command, who is the customer.

The good news comes together, however, also with a challenge. The SSP is a dynamic program and as the director of Livermore, George Miller, cautioned in recent testimony, "Sustaining the investments in stockpile stewardship is critical both to maintaining confidence in a likely increasingly smaller stockpile and providing the science and technology foundations that allow the laboratory to confront the defining issues of the 21st century."

Here let me give you – it will be listed on a slide, but you can't read it from the back of the room anyway. I can tell you what I consider the main technical achievements of the last decade that the labs have attested to.

First of all, there is what's called the Life Extension Program. We've refurbished the materials and components of the weapons in the stockpile to extend their lifetimes with high confidence. The first two of these LEPs, Life Extension Programs, were done for the ICBM warhead, the W87 and for the Trident warhead, the W76. There are more coming.

Most of the refurbishments and upgrades affect components outside the nuclear explosive package such as arming, fusing, firing, and boost gas transfer systems, which can be tested without nuclear tests under the CTBT. More to the point is has also been possible in the SSP to validate reengineered components within the nuclear explosive package on the basis of a suite of careful experiments and analyses that this program was able to do. And I'll come to that in a minute.

A second very important progress over the past decade is that Los Alamos has reestablished the capability to produce new plutonium pits, which are the core components of the primaries of a nuclear weapon. For the first time in 20 years, ever since Rocky Flats was closed down for environmental violations, the United States can build replacement pits. We have for the W88 Trident warhead and that has been certified for deployment, and if needed, in the future, should something happen to require it, we have demonstrated that capability without testing.

The third one is that a thorough multiyear study by the labs that was independently reviewed, critiqued by the JASON Group has removed the critical concern about the stability of the crystal structure of the plutonium metal due to radioactive decay while it's sitting in the stockpile. And we can confirm that their lifetimes are longer than very conservatively say 85 to 100 years. This finding was achieved as a result of significant advances in understanding.

Let me take a minute to say how can you worry about the radioactive decay of plutonium? It has a 22,000 year lifetime, which means that in any year one out of 22,000 plutonium nuclei decays. However, when that plutonium nucleus decays to uranium and an alpha, a very energetic uranium nucleus is rattling around in the crystal structure. A solid has a crystal structure.

Plutonium, because of the large number of electrons – and for physicists the 5f electron has many phases under physical conditions which are near each other. It's not very stable. And it's one phase you want and you want stabilized. But when the uranium nucleus is rattling

around, it rattles until it slows down by knocking onto about 2,000 – more than 2,000 lattice sites where the plutonium nuclei are sitting. And if in one decay you rattle 2,000, that's one tenth of the one out of 22,000. In 10 years, you've perhaps rattled the cage and you've destroyed the crystal structure. It turns out that
is not so. That's an experimental result. It turns out that the crystal heals itself. The displaced plutonium nucleus finds its place back where it belongs in the face centered crystal structure.

Experiments were done at SLAC and other labs by measuring X-ray fine structure, X-ray absorption fine structure and that is not happening. That is a major result which says that these pits– you're going to [be able to] count on them. And the other experiments showed that is the case in the order of a century.

That concern of having weapons more than 25 years old has been totally removed during the last decade. And another one I would mention is that the boost gas systems, when you have a plutonium implosion, what you do as the plutonium squeezes, you insert some deuterium and tritium into the cavity and as it squeezes and things heat up, you fuse plutonium – the deuterium and tritium join together and create an alpha particle – that's fusion. And you also create energetic neutrons. It's not the energy you get that way. It's the neutrons you get that way. And those neutrons speed up the fission process and that's why boosting – that's how boosting has made it possible to take a big
bomb like the plutonium bomb over Nagasaki into a small bomb which then is the trigger that ignites the big secondary.

Well, boost gas systems have been improved and made more robust and therefore guarantee a large yield from the primary to ignite the secondary.

These are four major technical advances in 10 years. What were the essential ingredients of the Stockpile Stewardship Program that made these achievements possible? Well, the key technical achievement was made possible by advances in our understanding the science of what goes on in a nuclear explosion.

And let me say, looking ahead to an uncertain future, as long as we do have nuclear weapons – and we can all hope that President Obama will make good progress in what we've been hearing with great pleasure this last week – the nation will continue to need a strong, dynamic, science-based Stockpile Stewardship Program that does not call on testing, which has both the talent and the tools necessary to be able to respond to changes and surprises that may come up in the future strategically or technically. And with a strong infrastructure in stockpile stewardship, one can be sure that the president in the future, should he conclude or she conclude that due to strategic problems we may
have to resume testing, we will have that capability. We will have the capability to respond to any future need.

And so what I'm saying is the Stockpile Stewardship Program has been a success without testing and I believe it's one that we have to maintain the success of without testing because we've displayed that testing has not been critical.

And what were the ingredients of the Stockpile Stewardship Program that made it successful? First of all, as a scientist, I can tell you the critical ingredient is to have good

people working it, who know what they're doing and are embedded in the program, which allows them to maintain their skills. All the equipment in the world isn't going to buy you what you need if you don't have good scientists there and they don't come and stay if they're doing nothing.

We also must have a vigilant search for and discovery of problems in the stockpile that may arise from design errors or what not and that's what we've had and we've displayed we can do. Once the problem's discovered, people have to fix the problem. That takes both theory and experiment, theory to be able to try and understand what's wrong, but experiments to find out whether the theorists are right or wrong. And to have experiments, you need equipment and you need a support for a strong program.

Now, during the past 10 years, supercomputers have come. They have increased the capacities of these computers by a million fold. We can now – and this has been critical – do high fidelity three-dimensional calculations of the implosion process, and of what's going on in nuclear explosions. And we can do it for the first time with good, high fidelity, three-dimensional studies. And we have the advanced analytic tools and the codes developed to go with the super computers so that – with the high speed memory – so that's possible to carry out a program.

Additional facilities have been some small instruments in the lab, diamond anvil and what not, and big instruments. One of the things that it's important to do is to see as the implosion process goes ahead how that process is taking place, as you squeeze the plutonium down. Now we've had machines to do that, but now have much better machines. We can see what plasma instabilities are created. We can calculate them. We have models. We can test them with the computers and we can get data from the new machines – the Dual Axis Radiographic Hydrotest Facility. That's a new machine operating in Los Alamos which allows us to make three-dimensional pictures with this X-ray radiography with extremely high precision.

The new ignition facility – National Ignition Facility just completed and beginning its research campaign at Livermore, will allow us to test the codes, these very high power codes with the super computers against data in the laboratory and further confirm their accuracy, their validity under conditions that cannot otherwise be created, except by nuclear explosion.

So I think we have answered the questions that were raised and can now be removed as a barrier.

Finally, clearly there are concerns expressed by other people who don't agree with this and they say that the – as we work to refurbish the weapons we have, small margins of performance get smaller and we lose confidence. What matters is how big the performance margin is, the measure of how much output you're getting above what you need – how big that is compared with the uncertainties.

Now, with the boost system, you can increase the margins, but the main thing that stockpile stewardship has done, in my view, it's decreased the uncertainties because we understand things.

We can do physics now, not just models. So I believe that this increase of the ratio of the performance margins to the uncertainties have given more confidence in our stockpile now than we could have had on scientific basis 10 years ago.

So I disagree with those who say, we're losing confidence or the future is bleak although the present is good. And I do believe, as the head of STRATCOM said recently, the program's been successful. It's not the whole story, but we must have – and his words were, we must modernize the nuclear infrastructure. And that is true. The nuclear infrastructure's old. And so a balanced program maintaining the science, improving the infrastructure so we can continue to operate this way as long as we have weapons is the right answer. But the need for testing, I believe, has been put to sleep.

Thank you.

KIMBALL: Thank you.

Tibor? Thank you.

AMBASSADOR TIBOR TÓTH: Thank you so much. To illustrate the verification capabilities, I would like to take you on a journey and I would like to bring you back to October, 2006 [and the DPRK nuclear test], and to walk you through how the system worked at that time. So it's 9th of October, 2006. For Washington and New York, 8th of October, 2006.

You have to recall that at that time our system was 50 percent in place in terms of the seismic stations. The readiness was lower for the noble gas component, 25 percent at that time and still we were not operating 24/7, around the clock. And of course, as it eventually turned out, the yield was a lower yield for a country to do it for the first time, 0.5 kiloton.

So against this background what happened? The first layer of verification – the seismic stations – recorded the data – 22 seismic stations, primary and auxiliary seismic stations. And we need three primary stations to include the event in our bulletin.

The geographic distribution is quite interesting and let me try to illustrate that point. The distribution of the stations is clear north and south, east and west. And if you have a look, Bolivia, La Paz, is more than 7,000 kilometers away.

The way the system functioned was first of all the stations tested, communication system tested because from the stations we have to move the data to Vienna. The international data center tested because the international data center had to do the analysis of the data and again because we distributed the data, raw data and the – what we call the process data, the communication system again was tested in both directions. As a result of that, we could test the components of the system, important ingredients; number two, functions; and number three, the timelines for all these functions were treaty-based timelines against the background that we were not operating and we are not operating 24/7.

Even a meeting of states signatories-ratifiers were initiated the same day when the test happened. The data generated by the seismic component is very much in conformity with the onsite inspection requirements. For your information, after entering into force, there will have to be an area of 1,000 square kilometers identified for the initiation of the onsite inspection. The area identified by the 22 stations was around 800 square kilometers, very much below the level required for the initiation of onsite inspection.

The next layer of the system is the noble gas component. And it's clear from the seismic data, which was recorded at that time that the data and the data products were leading to a manmade event. At the same time, the link had to be made whether this manmade event had a nuclear fingerprint or not, and this is where the noble gas technology came into the picture. First of all, we had to calculate the venting. We took the 0.5 kiloton as a reference point for that calculation. We had to do it as a function of time and of course as a function of the conditions prevailing in the territory of North Korea. And then with an additional technology, which we call atmospheric transport modeling, we tried to simulate and project how this release of xenon-133 might reach our noble gas stations.

I mentioned to you. We have 25 percent of the noble gas system in place. At that time, we had 10 out of the 14 noble gas stations in place. So we had to see and we had to hope that the closest stations like Japan or Mongolia will record the release of xenon. At the same time, what happened, it was [the station at] Yellowknife, Canada more than 7,000 kilometers that recorded it.

The atmospheric transport modeling is based on an input which is six million pieces of meteorological data per day. So I would like to demonstrate to you in a much simpler way. And here you see the dispersion pattern. And this is a three-dimensional model at the altitude identified with different colors.

The message here that, of course, with replication of a certain exclusion modeling, where other potential sources of release were identified as well and excluded from this dispersion pattern, we could correlate the release as projected by us at the DPRK test site with the time, with the absolute amount and with the pattern of the recording.

The xenon-133 traveled for 12 days. The half life is relatively short. It's – half of that time is the half life of that particular noble gas. And in addition to that, the eventual amount recorded at Yellowknife, Canada, was the equivalent of 300 atoms of xenon-133. So it's a very minute quantity.

The importance of these findings for the noble gas component was, number one, the recording facilities worked, the laboratories functioned very much along the expectations and again we were doing that exercise in the conditions of what we call provisional operation, not the 24/7 type of operation, but against the timelines prescribed by us in terms of releasing the data once the data is processed and the data products.

The yield is, of course, relevant here as well. If you put together the seismic and the noble gas component, practically what emerged as a result of the DPRK test is an unforced test for the test forced upon the verification system. In a situation where the readiness for their own

25-50 percent – that was the range. And the yield of this particular test was 30-50 times smaller than first test yields taken historically from other nuclear weapon countries.

What is interesting to see – okay, we were there in October, 2006. Where are we in April, 2009? And here I would like to mention first of all the build up – the title of this event is "Break or Build." We are in the build-up process. The build up of the stations brought us to 250 seismic stations compared to 180 where we were in 2006 – 180 vs. 250.

The number of the noble gas systems doubled in the last more than two years. So we moved from 10 of those noble gas stations to 22 by now. And if you allow me, this is where we were in October 2006. And this is where we are. I try to illustrate for the back row as well a bit some of the difference. And the difference is 70 more stations and facilities added to the system.

That will have to be translated into what we call detection capabilities. And this is the detection capability back in 2006 and the point which is relevant here, the North Korean test was magnitude four detected event, green. So what you see with green color here is the detection capability, which in the case of North Korea was 0.5 kiloton. What is turquoise or what is moving in the blue, turquoise is 3.5 and blue is magnitude three. And let me show the present detection capability. And again, for the back rows, let me just move back and forth. And for those who are sitting closer, again I would like to call your attention to the blue and the turquoise which quite significantly improved in the last two years. And just to give you some rough calculations and I do not claim that I'm the source of these calculations, but magnitude 3.5 is the equivalent range of 0.1 kiloton. And magnitude three is the equivalent range of tens of tons, 0.0 something, might be 0.3 as
low as that particular number. So I hope that this is giving you some approximate reference point.

The detection capability does not reflect, number one, the auxiliary stations. And here some calculations are indicating that through the auxiliary stations, an additional improvement of 0.25, 0.5 magnitude can be achieved. These slides, of course, do not reflect some of the additional capabilities which might be gained as a result of other international systems and other national systems. It's extremely important not to forget those systems internationally functioning, regionally functioning, providing regional seismic data about events. Another technology, noble gas, there is an increase of national noble gas capacities. It is to a certain degree a spinoff of some of our success efforts like creating a noble gas system which can be transported. It's called – (inaudible) – and it was used as well in the context of DPRK by some countries and onsite inspection. Of course, what you see here does not reflect this.

The last points I would like to make and then to sum up what is the message here, the progress which has been made compared to the period 1996 to 1999, let's take this period, when the treaty emerged from the drawing board of Geneva and when the U.S. Senate ratification failed. If you take 1996 Geneva, what was foreseen at that time [was] the seismic component being able to deliver one kiloton detection sensitivity for underground seismic events with a full blown system in place. What the National Academy of Science's report did foresee in 2002– and still this was more a concept. It was not reality. It was a concept. It did foresee that with the full blown system the detection level might be as good as 0.1 kiloton.

The example of North Korea's is a reality not a concept. And the reality, as you could see, that with only 50 percent readiness of the system, the 0.1 kiloton level was achieved in the northern hemisphere for defining areas U.S., Russian Federation, China.

What the 2009 slide hopefully revealed to you that as a reality we are moving to this 0.0 something that is tens of tons of the detection capability, still with a system which is 75 percent ready because 250 stations means the system is 75 percent ready.

And as a last slide, let me leave you with this notion that we will have another 25 percent of muscle just on the seismic system. Especially with addition of national technical means, other international systems, and the onsite inspection component [we have] a high degree of confidence that the treaty can be monitored. {Or in the parlance of} the Nitze-Baker requirements for the verification: no test of military significance can go undetected.

I would stop here, though, I would like to make later on some points. I don't think that the treaty should be approached just on basis of verification, as a low lying fruit, verification around the corner, verification which is needed.

I think what we will have to do is to assess what are the demand-side requirements but as for the supply side, yes – verification in accordance with those criteria apply to other arms control agreements is something which is doable.

KIMBALL: Thank you, Ambassador Tóth, and just by the way, there are a few copies of the executive summary of the 2002 National Academy Science Report on the Tactical Issues on the CTB in the back. If we've run out, they're on the Arms Control Association Web site as well as the Shalikashvili Report from 2001, which Ambassador Jim Goodby will be making reference to in a couple of minutes.

Ambassador Goodby?

AMBASSADOR JAMES GOODBY: Thank you, Daryl and thank all of you for coming out. After five decades of talk, as our president said, it's refreshing to see so many people interested in this subject, which to me is worth five decades if we can achieve some results at the end of it.

I think this is one of those good news/bad news stories that we're telling here on the platform. We've heard very good news from the two previous speakers. Now, I'd like to tell you a little bad news, which in a word is that the nonproliferation regime, which we've tried to build up over five decades, has deteriorated in the last 10 years or so. Just think about it. Just mention a few names: North Korea, Iran, Syria, A.Q. Khan. I don't need to elaborate. Those names speak for themselves.

The splits between nuclear haves and have-nots have widened, and even my use of those terms shows you what the roots of the problem really are. The basic bargain of the Nonproliferation Treaty has lost credibility. People don't believe that it's still operative. The 2005 Nonproliferation Treaty review conference was close to a disaster. The U.N. summit meeting of that same year failed to reach agreement on measures to strengthen the

nonproliferation regime, a real disgrace in the words of U.N. Secretary-General Kofi Annan.

The renaissance in civil nuclear power is poised to spread technology and materials around the world in the next decades. Is it going to be safeguarded? The additional protocols of the IAEA are still a long way from becoming universals. Tensions in the Middle East and South Asia have risen, no end in sight. As summed up by George Shultz, Henry Kissinger, Bill Perry and Sam Nunn in their Wall Street Journal article of a couple of years ago, and I quote, "The world is now on the precipice of a new and dangerous nuclear era," unquote.

They believed – I think they still believe – that reliance on nuclear weapons for deterrence is "increasingly hazardous and decreasingly effective," their words. A comprehensive effort to revitalize and restore credibility for the nonproliferation regime is needed, desperately needed and a Comprehensive Test Ban Treaty must be part of it.

Daryl Kimball mentioned General Shalikashvili's report and I'd like to say a bit more about that. General Shalikashvili was asked in the year 2000, after the Senate had turned down the Comprehensive Test Ban Treaty, to talk to senators, and Nancy Gallagher and I accompanied General Shalikashvili. I think Nancy is in the room. We talked to at least a third of the Senate, people that we thought would be influential and we wanted to hear their views.

And as a result of all those discussions, General Shalikashvili prepared a report, which he presented to President Clinton in 2001 in January. The essence of that report was that General Shalikashvili saw the Comprehensive Test Ban Treaty as one key element in a network of barriers against proliferation – not a panacea in itself, but an element critical to the success of the whole project.

As Daryl Kimball has noted, his report pointed out that a Comprehensive Test Ban Treaty would prevent the advanced nuclear weapon states from making significant improvements in their weapon stockpiles and it would prevent non-nuclear weapon states from entering into a nuclear weapon status, except perhaps through a primitive gun-type atom bomb.

I might parenthetically say here that Sid Drell was one of those who briefed General Shalikashvili about the effects of testing and the effects of discontinuing testing. And I think perhaps he might want to say something later about that particular aspect of it.

Because General Shalikashvili understood that what the nuclear powers do, in fact, does effect the decisions of other countries.

And testing is perhaps the most visible of nuclear weapons activities. It amounts, in my view, to a signal to the world that the testing state has little or no intention of complying with the provisions of the Nonproliferation Treaty, and that it probably regards nuclear arsenals as a nonnegotiable element of its defense posture. That's what testing signals.

Now, each state, of course, that is thinking about the test ban treaty has to make its own mind, make its own assessment of the effect of a Comprehensive Test Ban Treaty because no agreement, especially the nuclear field can be considered risk free. No nuclear weapons program itself is without risk for that matter. And that assessment is always in order. If the

advantages outweigh the risks, one proceeds. If not, one does not.

Now, General Shalikashvili's assessment of the advantages for the United States was as follows. And I'm quoting directly from his report. I think from what Daryl has said, his report is at the back of the room. You can read it.

He said, "The test ban treaty will complicate and slow down the efforts of aspiring nuclear states, especially regarding more advanced types of nuclear weapons. It will hamper the development by Russia and China of nuclear weapons based on new designs and will essentially rule out certain advances. It will add to the legal and political constraints that nations must consider when they form their judgments about national defense policies. The Test Ban Treaty," he said, "is vital to the long-term health of the Nuclear Nonproliferation Treaty, and will increase support for other elements of a comprehensive non-proliferation strategy.

The United States is well positioned to sustain its nuclear deterrent under the test ban treaty. The verification regime established under the Treaty will enhance the United States' own very capable nuclear test monitoring system and foster new techniques to improve verification. The Treaty will make it easier to mobilize domestic and international support for clarifying ambiguous situations and for responding vigorously if any nation conducts a nuclear test."

Much has changed both for good and for bad in the past 10 years. But those assessments, I believe, remain correct.

Now, the past 10 years have shown us how unilateral moratoriums work and how they don't work. We've learned some things about them. And one lesson is that instabilities are inherent in moratoriums. When any participant can drop out with little or no notification, an atmosphere of the temporary is inescapable. This makes it difficult to support institutions like the CTBT office that are essential, in my view, to the long-term consensus in favor of banning explosive tests.

Another instability is that since there are no agreed standards regarding the scope of a moratorium, there are always bound to be doubts about whether there is a leveled playing field among the countries observing those moratoriums.

And a third is that there is no agreed way to remove doubts about other nations' actions: no on-site inspections, no transparency at test sites. The general expectation that a binding treaty is not in the cards obviously discourages any state that might be thinking about refraining from nuclear weapons program from doing so. I think, for example, that a CTBT would be a higher barrier for Iran to jump over than is a moratorium, probably the same for North Korea as well. I think there is no real alternative to a fully ratified CTB, in short.

The importance of the context for a CTBT cannot be overstated. President Obama has said that he will work to put us on the road to a world without nuclear weapons. What the end of a two tier system, if that is in sight – as I hope it is – my guess is that it will easier for CTBT holdouts to accept the test ban. I hope therefore that all possessors of nuclear weapons will rally around the vision of a world without nuclear weapons. It isn't a simple or an easy thing

to do, but it provides a goal and it provides a compass. It should help nations to think more positively about a test ban.

But conversely, if we can't get a test ban and enforce the outlaw preliminary nuclear weapons is bleak.

And I wind up by paraphrasing a statement made by Shultz, Kissinger, Perry and Nunn, and this is it: without a Comprehensive Test Ban Treaty, the vision of a world free of nuclear weapons will not be perceived as realistic or possible. It's that important.

Thanks.

(Applause.)

KIMBALL: Thank you very much. All right, everyone. Now it's your turn to ask questions, pose thoughts. We've got a very expert audience here. It's quite an amazing gathering today. There's a microphone in the middle. Please state your name. Try to get to your question quickly.

We'll begin with you, sir.

Q: I'm Bob Civiak. I'm an independent consultant most recently working with Nuclear Weapons Complex Consolidation Policy Network.

Dr. Drell gave a very good defense of the Stockpile Stewardship Program, but there are other more cheaper and more reliable and more certain ways of maintaining the United States stockpile and that's simply stopping making changes to nuclear weapons. That's a complicated issue and I don't want to go into that here.

What I do want to mention is that the NNSA spends more than 50 percent of its budget on nuclear weapons doing research and development primarily to improve the codes to predict the behavior of an exploding nuclear weapon. Most of that work is important for designing new nuclear weapons and the NNSA has proposed two new nuclear weapons over the last few years, and now they're proposing to continue to develop nuclear weapons through an advanced LEP program.

And my question is, is granting additional money to the Stockpile Stewardship Program and the ability to continue to make changes to nuclear weapons consistent with President Obama's view of decreasing the importance of nuclear weapons? Is it consistent with our CTB obligations to end the nuclear weapons arms race? Or is it making a deal with the devil to spend more money on stockpile stewardship in order to get a CTBT?

KIMBALL: All right. Thank you. Before you jump into that, Sid, let's take one more question and then we'll respond.

Q: Thank you. Rebecca Johnson, Acronym Institute for Disarmament Diplomacy. I'd like to thank all the panelists for really very, very good presentations – very thoughtful, very useful.

A couple of weeks ago, I was speaking to Ambassador Stephen Ledogar by phone, and some of you may know he was appointed by George Bush senior to complete the Chemical Weapons Treaty negotiations and then retained by President Clinton to head the U.S. delegation for the CTBT negotiations in Geneva in the 1990s. And he was very, very troubled and had said to me that there was a story or there was a story circulating in Washington that the Russians had not accepted the zero-yield interpretation of the scope of the finalized treaty. And anyone who was involved in the negotiations at that time, and I know that the chair of the final year, Ambassador Jaap Ramaker is actually here, would know that that's complete nonsense. But my question for the panel is from where are such false accusations arising? Are they being taken seriously? Are they playing in the attempts to get ratification? And what can be done to put the record straight?

KIMBALL: All right. Ambassador Goodby, you might want to handle that one, but let's – Sid, do you want to answer the first question that Bob Civiak just put forward?

DRELL: Yes. The Life Extension Program is not in any way, I believe, involved in designing new weapons. The discussion of the reliable replacement warhead, the RRW, was different from – the LEP program said there were parts in the weapons chemicals, tritium, and so forth that have to be changed periodically, they age.

And the Life Extension Program was a program which was refurbishing -- sticking as close as possible to the existing designs. Some manufacturing processes have changed over the years and you have to take that into account.

The RRW program was moving more toward changing some of the components significantly for reasons of making the margins bigger rather than the uncertainties smaller.

And I think it's wrong to mischaracterize the program that way. These weapons are living longer than we've had experience with. And I believe it is important to do the science, to have the computer codes and so forth, so that our confidence in these weapons can be attested to without getting new data unavailable without testing. So I think a healthy SSP program is part of what's going to be the sensible policy without testing.

The technical definition of zero, to answer your question, is that no sustaining chain reaction be created. There is no ideal zero. Plutonium-239 made in a reactor comes with another isotope in small percentage, Pu-240. And that does spontaneously fission. And that point is being abused by those who oppose the CTBT because the energy released without a chain reaction from spontaneous fission is so many orders of magnitude below what the high explosives is yielding that it's silly to even talk about.

AMB. GOODBY: Rebecca, the question you asked has been around since the very days in which the treaty was testified to by the Clinton administration. Not only Steve Ledogar should be troubled, but also former Secretary of State Madeleine Albright should be troubled because she very specifically told the Senate that there had been conversations with the Russians and other nuclear weapon states and that there was agreement that zero means zero.

There were discussions among the nuclear-weapon states, not widely revealed because there were a lot of non nuclear weapon states also negotiating this treaty, which simply picked up the language of the existing Limited Test Ban Treaty which has been in force now since 1963.

And behind the scenes, the nuclear weapon states agreed that zero meant zero. They specifically agreed that hydrodynamic tests would be permitted, hydro nuclear tests, which do have some sustained fission yield – very short – would be prohibited. We've talked to a lot of people who were involved in those discussions as well as read the testimony. That seems to have been widely agreed. I think there's no doubt that the Russian ambassador at the time stated this, and I understand that in testimony before the State Duma they said the same thing. So there should not be any doubt about the agreement as to what the scope of the treaty is. And still these rumors persist.

KIMBALL: Yes, and I think those rumors are based upon opponents of the CTBT selectively quoting officials from the Russian government, mostly in the late '90s, that was ambiguous about this issue. But, as Ambassador Goodby said, there's a definitive statement from 2000 during the course of the State Duma deliberations on the CTBT in which the senior Russian government official said, and I quote, "Qualitative modernization of nuclear weapons is only possible through full scale and hydronuclear tests with the emission of fissile energy, the carrying out of which directly contradicts the CTBT," close quote.

Next question, Bruce McDonald.

Q: I'm Bruce McDonald with the Strategic Posture Review Commission. I find the arguments that our distinguished panelists make quite compelling.

But let me – with that is a – and I'm a supporter of the CTBT, but with that as a preface let me raise one question that's been rattling around for a while and it comes as no surprise that it's been rattling around more lately. I'm sure we're going to hear a lot more of it as well, and that's the question of decoupling.

The concern that some have expressed is that, while the international monitoring system is quite good, that it is possible in doing tests in a cavern and with various enclosures and that sort of thing, that it's possible to muffle the effect of a nuclear blast by anywhere from a factor of 10 to 100.

And so that being able to restricting or to tech down to a few tens of pounds, I guess that would be – or tons rather of explosive yield that one – again, I'm quoting them, this is not my argument – that you're talking about – you know, yields up to maybe a kiloton or so, and that being able to conduct tests such as that on the sly would provide some significant advantage, particularly in the area of small scale tactical weapons which right now Russia is probably less concerned about their strategic arsenal than their tactical arsenal, especially vis-à-vis China.

So what I'd like to ask our panelists, what is your response to this question that is not new, but it has strong legs, apparently? And I'd be interested if you all could shed some light.

And then as just one postscript really to thank you all for your unstinting service on behalf of this cause over many, many years. It's really a gift to the country and the world. (Applause.)

KIMBALL: All right. Thank you. We'll take one more question and then we will try to answer the questions. Jay Coghlan.

Q: I'm Jay Coghlan with Nuclear Watch New Mexico. And Mr. Drell, you cited the JASON pit lifetime study as one of the four technical breakthroughs or achievements over the last decade that will help enable CTB ratification.

As a brief background, a gentleman that you no doubt knew, J. Carson Mark at Los Alamos, the ex-director of the theoretical division, but he told me in 1996 that Los Alamos had set aside plutonium pits for decades for the express purpose of studying aging. And in his own words, I quote, "The big news was no news." And then I filed a Freedom of Information Act request for that – denied, classified. That didn't sit well with me.

So when I heard in 2004 that NNSA was doing their own pit lifetime studies, I then went to an aid of Senator Bingaman asking that there should be required independent review of those pit lifetime studies. So the senator subsequently got an amendment in the 2005 Defense Authorization Act and enhanced the JASON pit lifetime study. Now, since that time, NNSA has been alleging other problems – possible problems with weapons reliabilities, specifically with secondaries.

My question to you becomes if the JASONs were to do another study on weapons reliability, and if it was up to you, what issues would you like to explore?

KIMBALL: All right. Thank you. But let's first try to address the decoupling question which I think has been around as long as going back to Edward Teller and folks like that.

Ambassador Tóth, would you like to take a crack at that, and maybe, Jim, you can add something more.

AMB. TÓTH: Yes. Let me recall the detection capabilities slide first. So I made a reference to this 0.03 level, and if you make the computation, then, if you go to the lower end of this range, you need a decoupling factor of 100 to have this one kiloton event decoupled and muffled to this level, making it noticeable by the system.

As a layman, as a diplomat, what I came across in the literature is the decoupling factor of 70 which was achieved in the United States in an experiment back in 1966 with a yield of 0.38 kiloton.

So that level is practically beneath the level which the National Academy of Sciences and JASON is identifying as a military significant one. And another element here is that this decoupling was carried out in a sort of cavity which was created by a previous blast of 5.6 or 5.8 kiloton.

As for the Russian Federation, what you come across in the literature is a factor of 12, historically. This is going back to 1976. This is based on a cavity created by an explosion of 70 kilotons and the decoupling led to this factor of 12.

There is another complexity here besides the detection, and I think Dave Hafemeister, who was sitting in this room, has an amazing series of publications about that. He is naming practically six criteria of how to address the issue of decoupling.

And the point he is making that these criteria have to be applied together, and with this criteria one can move from a 90 percent probability level down to 50 percent probability in the case of three tests 15 percent probability that a test would go undetected.

What he is mentioning, the excursion of the yield, especially for a country which is doing it for the first time, this is something very difficult to fix the right way. And here you might recall the DPRK test because earlier, before the test, some of the early indications were of a higher yield than eventually turned out, so it might have been a sort of a not just a fusion but a phenomenon which might be quite close to an excursion yield.

Element number three, besides the two ones I mentioned already, the venting. The venting, number one, is related and correlated to the yield. For those who are knowledgeable in this area, the lower the yield, the better the chances are in a cavity environment there is a venting happening – that the noble gas particulates will be seeping to the surface. So this trade off is again working against too low yield events going on because of the venting.

And for your information, there was a reference about a one kiloton event decoupled. But what I tried to point out in the context of the DPRK was a 0.5 kiloton event, a 0.5 kiloton event which the 25 percent readiness of system was in very extreme circumstances recorded and attributed.

In addition to that, there are other elements like new technologies – InSAR technology which could identify the change of the surface up to the precision of a couple of millimeters as we understand from the literature as well.

So there are a number of ifs and question marks, and especially for a new country, these ifs are extremely complicated to handle in the conjunction and there is a question for both a practitioner, a nuclear weapon state. But here, the question of, again, the Nitze-Baker definition of verification is coming in place, whether those potential cheatings are of military significance or not or rather they can be identified and intersected innovate that the benefits can be readdressed and denied of those who are carrying off.

KIMBALL: Thank you. And as we consider the questions that will arise regarding verifiability, I think we shouldn't lose sight of the reality that today the United States has an interest, and the world has an interest in detecting with high confidence clandestine nuclear explosions. And the fundamental question we've got to ask is, are we in a better situation with the treaty in force or without? And the answer is clear. So that's the other thing to keep in perspective as these questions do arise.

So, Dr. Drell, do you want to respond or answer the question that Jay Coughlin asked about?

DRELL: I generally believe that as long as we have an arsenal and we want to know that it's safe, reliable, and secure, we should have continual reviews and analyses of what's going on.

So you asked, if there any special problem about a secondary or what not. I think that it should be studied like we were called upon at JASON to study the plutonium lifetime. I just think, though, a strong scientific program studying the processes that are going on in a very complicated event; namely, a nuclear explosion, is part of maintaining a community of weapon scientists who will be prepared should something we haven't anticipated come up in the future or should the strategic situation change and we may need to go back to thinking more seriously about nuclear weapons.

I can't think of any one thing, but I do believe a strong program to show that one has the vigilance along the way. There are many areas where predictive physics still does not exist. The Congress is supporting now something called the national boost initiative. The boost physics is very complicated and getting more fundamental predictive physics involved I think is good. So my belief is we do need a healthy stockpile stewardship program, and I consider that a part of the CTBT world that I aspire to.

KIMBALL: All right. We'll take two more questions. Another round, please.

Q: Good morning. My name is Rebecca Davis. I work with the Air Force's International Treaties and Agreements branch. My question relates to the issue that I think is going to be the hardest when we talk about getting the votes for the CTBT and that is stockpile reliability. I believe it was back in the fall at Carnegie that Secretary Gates said that he believes for the future, we either need an RRW, or the ability to test for a stockpile. When you go back to the congressional testimony over the past couple of years, the lab directors always talk about the increased risk that we face with the aging stockpile.

So when this debate comes up, rational people are going to disagree on this issue and I'd like to hear how you make sense of that, and then, do you think there's going to have to be certain concessions, the six safeguards like they had in 1999 concessions to have an RRW? How do you think that issue is going to resolve?

KIMBALL: Okay. I mean, Sid Drell's whole presentation addressed that fundamental issue about whether new designed warheads are necessary. But Sid, do you respond directly to what Gates said at Carnegie?

DRELL: My point was that your confidence in the weapon depends upon how big your performance margins are compared with the uncertainties. And that if you're going to change the weapons – the RRW approach was to change the weapons, make a hybrid or something.

And to do that without testing the new combination is no way to decrease the uncertainties

in how well you know the margins. The LEP approach concentrated very much on trying to make the weapon as close as possible to the one already has if you take into account changed manufacturing process and things like that, including environmental factors in order to decrease the uncertainty.

And I think that, first of all, the political decision has been made, no RRW. We're going to stick with LEPs.

Secondly, I think that scientifically that is the right one for this time because the margin over the uncertainty is being improved by, first of all, making modest improvements in margins by better boost systems, but making significant decreases in uncertainties and, therefore, making the ratio larger.

But I do believe that part of maintaining a Stockpile Stewardship Program and confidence in the stockpile is to have the ability to meet future unknown problems that may arise.

And you do that by a good research program which maintains good people, hones their skills, and opens a spectrum of possible responses to potential needs.

That's why I thought it was interesting that the chairman of STRATCOM talked about maintaining the ability to respond by modernizing the infrastructure – no longer saying modernizing the weapon in that statement, if you read it, which I thought it was interesting. So it is not a trivial problem to maintain a confidence in a deterrent as long as we have it without testing and to convince people that we know what we're talking about.

And therefore, one has got to continue what I consider a strong program. And that's going to mean that in the present budget cycle, one is going to have to see that the weapons labs are going to come in and going to say, if the budget continues to go down in the science and technology part, they're going to begin to question their ability to maintain the stockpile just based on a diminishing Stockpile Stewardship Program. And they're going to have to be listened to on that point because I do believe that we need to keep a healthy program for scientists and to prevent surprise.

KIMBALL: On the political point, very quickly, before we get to the other questions –we're running out of time – on end-game trades. This has been in the air for months as the proponents of RRW have sought to revive a program that is dead.

The starting gun on the discussion on the Comprehensive Test Ban Treaty has just sounded.

What the end-game bargains may be to get the final consent it may have absolutely nothing to do with any of the issues we're talking about today. It may have to do with a road project somewhere or something else.

So I think it's premature to talk about what is it going to take, especially if you consider what I said at the beginning which is that there hasn't been a serious debate about this subject in 10 years.

Most senators probably couldn't tell you what RRW is if you ask them what it is. So there's a

lot of time we go before we can really answer the question what are the end-game bargain is.

But the other thing -- and I would be remiss in not mentioning this -- in all my contacts with diplomats from various countries, there's another issue that comes up that the United States – Democrats and Republicans – have to consider with respect to a new design warhead program. It is that if the United States is pursuing a new design of warheads in the name of ratifying the Comprehensive Test Ban Treaty, the purpose of which is to end the qualitative improvement of nuclear weapons arsenals, countries will ask, well, what is the point of the CTBT? And countries with nuclear weapons who are trying to maintain their weapons or maybe modernize their weapons, they're not going to believe anything that the U.S. administration says about "no new military capabilities."

So I think this would severely undermine the entire purpose, and going back to Jim Goodby's point, the Comprehensive Test Ban Treaty is a key part of the global nonproliferation architecture and it would make that part of the architecture wet cement rather than solid cement. So that's another thing to consider.

Next question. Jennifer?

Q: Jennifer Mackby from the Center for Strategic and International Studies. And I just thought I would mention to the people in the room there is an independent scientific study going on to determine and evaluate the verification capabilities of the system. These are top scientists from all around the world in their fields, whether it's infrasound, radionuclide, seismic, et cetera, all the technologies involved in the treaty –

KIMBALL: And when is the event coming up?

Q: – in addition to data fusion and data mining. And they will their final results in June in a large conference in Vienna, and we, CSIS, and AAAS will be bringing those results here to Washington, D.C., in July for those of you who are interested. So stay tuned. Thank you.

KIMBALL: All right.

Q: I have no idea – of course, the U.S. will be doing its own studies and they're unlikely to listen to those internationals. But you never know. There will be some American scientists involved in this international study.

KIMBALL: I wouldn't be surprised if the United States didn't start listening to others. But all right. Thank you, Jennifer.

Larry, your question.

Q: Surely that the CTB is the most frustrating endeavor in the history of diplomacy. Fifty-two years ago, Jim Goodby and I in London were dealing with this and exchanging cartoons on the subject. For the young ones here, 52 years is more than a half of century. (Laughter.) He doesn't look it, but I do. (Laughter.)

But seriously, in London, 52 years ago, if they hadn't had a horrible diplomatic error on the

part of the U.S. negotiator, we very well might have had the first arms agreement be a CTBT. And we had Eisenhower as the president who would have gotten it ratified fairly easily, I believe.

In the early '60s, the argument got down to, did Ambassador Dean agree to four inspections, as the Russians claimed, or six to eight on-site inspections? That was the difference. People weren't that involved in the technicalities then. And we had people like some very distinguished scientists arguing you're going test back of the moon, the Russians would test back of the moon. And they will always have arguments against this.

My question that I'd like to put now to the panel is what do they think is the most serious argument that has to be overcome of all of the various arguments that will be raised in order to get the 67 votes? And related to that, what do they think will be the role of the public in this? Because, let's not forget: it was the discovery and the increased awareness of strontium-90 and carbon-14 and mother's milk in the bones of children that had more to do with the ratification of the limited test ban treaty than any technical discussion in or out of the government.

KIMBALL: Thank you, Larry Weiler.

Let's take the last question and then we'll respond and then I'm going to give each of the speakers a couple of minutes to wrap up their thoughts. Yes, sir.

Q: Hi. I'm Shahriar Sharei with the World Federalist Movement. I basically have a management question for Ambassador Tóth or the panel. And the question is that having the fact that IAEA is part of the U.N., but in my understanding, CTBT is a separate organization, its own members and contributions of the members probably were – that's where the budget comes from.

And then we have NPT, yet another organization, and START is being restarted so that would be a bilateral organization.

Has there been any effort, as far as you know, to streamline things, to bring them under one umbrella either under the U.N., if the U.N. is the right organization to handle it, or any kind of attempt to streamline these organizations?

KIMBALL: All right. Thank you. Why don't we start with Larry Weiler's question about what's going to be most difficult – I think we might come up with three, or four, five different answers about that. But Sid, Jim, Tibor, your thoughts.

AMB. GOODBY: I think one of the important issues is whether one can get senators to read the treaty. (Laughter.) I don't mean in the insulting way, although I admit, it does sound that way. But I doubt very much that any senator, certainly in the past 10 years has read it.

I read through it again just a couple of days ago. It's a powerful document. It provides for on-site inspection. It provides the mechanics of doing it. It is a document that if senators read through it, they will find that there are review provisions, that there is a potential for setting up a scientific advisory panel on call. There are so many useful things in it that in my

mind outweigh the questions that have been raised that I can't really believe the senators have read it that carefully and understand what it does. So that would be number one.

And number two, I think, would be to convince senators that in fact, a lot has changed as I've been emphasizing the bad things that have happened, but as you listen to the other speakers, we are so much ahead of where we were in terms of verification and in terms of the understanding of how nuclear weapons work that it's almost, in my mind, a no-brainer to say, yes, obviously, we should go ahead and ratify.

So there are some fundamental things that I think have to be done by the Senate. But it's going to take a while to work our way through senator by senator talking about this treaty. But I think in the end we'll succeed.

KIMBALL: Ambassador Tóth, your thoughts, and if you could address the last gentleman's question.

AMB. TÓTH: I think we have to pay the necessary attention to the verification issue. I don't think it took place back in 1999. There is a need to involve scientists, to have a fresh look.

But I don't think this is the defining issue. And to a certain degree, of course, there is a complicated discussion about the stockpile stewardship. Again, I don't necessarily believe if you try to look upon the ratification from a positive point of view that answering the questions of be it verification or stockpile stewardship will be enough.

Probably what we will have to do is to revisit the benefits of the treaty from a wider perspective, from a post-'99, post-2001 viewpoint. And this is what Kissinger, Shultz, Perry and Nunn put forward in the context of the U.S. and the Russian Federation is relevant not only for the U.S. and Russia but relevant for all the other eight countries whose ratification is still needed for the entry into force, how they put this issue in the context of not just a potential miscalculation but how they put this issue in the context of a potential terrorist nexus to nuclear weapons vis-à-vis their own security.

I think the only angle they can answer this question of ratification or non-ratification, would it make a difference for them as a country, would it make a difference for any of those nine outstanding ratifiers from the point of view of the terrorist nexus of nuclear weapons, increasing amounts of fissile material, increasing amounts of facilities, increasing numbers of people and institutions and technology holders, and what might be the link between some of the security issues they are facing here in the U.S., in Asia, in South Asia, and in the Middle East. That question is, of course, relevant from the point of view of the issue of the challenges.

And there was a question over the IAEA, and I might link the two questions here. There is a distinctive delineation between what the IAEA is doing and what the CTBT is supposed to do. IAEA is talking care of the up-stream barriers, layers of defense against the misuse of nuclear technology, fissile material, preventing the weaponization. And what the test ban treaty is doing it's practically the last barrier on that road. This is the last barrier which a

country would have to cross to enter the nuclear club.

The complexity on the upstream elements is that the distinctions are becoming blurred, dual-use technologies. On this final barrier, fortunately, we are not affected by the dual-use nature of technologies. Nuclear weapon tests are nuclear weapon tests. There's no peaceful use of nuclear weapon tests.

From that point of view, the specific cases like North Korea, the specific case of Iran will have to be factored in. Whether this last barrier is to be the last one to be put in place or not – why this is the last barrier probably be it in the context of the DPRK or in the context of Iran or any other issue coming up, this layer of defense will have to be put in place as soon as possible, especially in a situation where the P-5 countries might sign up to a norm and might be undertaking obligations which they would legitimately expect to be respected by others as well.

So this whole issue of discrimination, different obligations, preaching while doing other things is becoming irrelevant. This issue for North Korea, for Iran, for any country will come up not as a part of those particular negotiations but a totally different game plan that these countries will have to follow those rules which others are hopefully following as a result of a hopeful ratification.

KIMBALL: Excellent points. Sid?

DRELL: What an historic moment. For the first time in 20 years leaders of two very powerful countries have said, we want to get rid of nuclear weapons. It's a huge moment.

That's changed the context. Everything is open.

If I worry about the Comprehensive Test Ban Treaty verification, then let's have a little more transparency. That was talked about 20, 10 years ago because there's every reason once the CTBT is in force that the United States and Russia could – I think the real worry about verification comes down to what are the "bad" Russians doing? What are nuclear countries doing that we're not doing?

Of course, you worry, otherwise, about proliferation. But I think the political opposition is based on concern that the Russians are cheating. Let's have on-site stations at Novaya Zemlya and in Nevada. We've offered. People have talked about that. It's not new. It would seem that you just have to ratify the CTBT and that problem will go away. So I think transparency is very important.

We have a six-month withdrawal clause from the CTBT because we have to be prepared in case things change. That's why I say we have to have a good science program so if that six-month withdrawal clause has to be invoked, we are ready and we know what we're doing.

And so, I think maintaining a Stockpile Stewardship Program, one of the issues that wasn't mentioned but has to be is this urgent push for the RRW really was based on an argument which was new. It said, we have to make these weapons more resistant to a terrorist using it

against us if they capture one. That's a point worth looking into. The RRW did look into that. They didn't get all the way there when they were stopped and one didn't know how much you could accomplish that without testing. And so there are legitimate issues which require that we keep alive this idea.

[The} treaty has a six-month withdrawal clause and we'd better not put our guard down. And that's why I think maintaining the Stockpile Stewardship Program healthy is going to be a very important part of the debate.

KIMBALL: Thank you. One final thought in response to Larry Weiler's good question about the role the public and the other tough issue. This is an international conference. It's a public conference. The role of the public is of course going to be important.

Personally, based on my experience working in the field for about 20 years, we're in a different time than we were 20 years ago when the threat of an actual nuclear exchange was quite palpable in the public.

The public is not likely going to be as involved as it was in 1963, 1964 when it was my baby teeth [absorbing Strontium-90], but the public is going to be important.

And the president is going to have to use all of his skills as an orator and as a communicator to tap into that because there is a strong well of support from the public for these kinds of initiatives and actions to reduce the nuclear danger.

The other thing that will be important to address, and this is one of the last arguments of the opponents of the CTB are going to make that we already are hearing about, it is: well, the United States might ratify, but maybe these other countries won't ratify. And that is a challenge and it is going to require the leadership and the hard work of the other countries that are strong supporters of the test ban treaty to work with the president to bring in the other countries that must sign and ratify the treaty for it to enter into force according to Article XIV of the treaty.

And I think one very promising point, and we'll end on this note, is that not only did the president say that he's going to reach out to the Senate to secure a ratification of the CTBT at the earliest practical date, but he will also launch a diplomatic effort to bring on board other states whose ratifications are required for the treaty to enter into force. That's also very important for the entire CTB enterprise.

So I wish to thank you all for being here. Please join me in thanking our panelists.

(Applause.)

The session is concluded. And enjoy the rest of your conference.

(END)