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THE COMPREHENSIVE TEST BAN TREATY AND NUCLEAR NONPROLIFERATION

HEARING

BEFORE THE

SUBCOMMITTEE ON INTERNATIONAL SECURITY, PROLIFERATION, AND FEDERAL SERVICES

OF THE

COMMITTEE ON GOVERNMENTAL AFFAIRS UNITED STATES SENATE

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THE COMPREHENSIVE TEST BAN TREATY AND NUCLEAR NONPROLIFERATION

WEDNESDAY, MARCH 18, 1998

U.S. SENATE,
SUBCOMMITTEE ON INTERNATIONAL SECURITY,
PROLIFERATION, AND FEDERAL SERVICES,
OF THE COMMITTEE ON GOVERNMENTAL AFFAIRS,
Washington, DC.

The Subcommittee met, pursuant to notice, in room SD–342, Dirksen Senate Office Building, Hon. Thad Cochran, Chairman of the Subcommittee, presiding.

Present: Senators Cochran, Stevens, Glenn, and Levin.

OPENING STATEMENT OF SENATOR COCHRAN

Senator COCHRAN. The Subcommittee will come to order.

I would like to welcome everyone to today's hearing of the Governmental Affairs Subcommittee on International Security, Proliferation, and Federal Services.

Today's topic is the Comprehensive Test Ban Treaty and Nuclear Nonproliferation.

The White House working group on the Comprehensive Test Ban Treaty has listed seven reasons for ratification of the CTBT. Five of the reasons deal with nuclear nonproliferation.

Today we will examine each of these five arguments, trying to determine the treaty's effect on nuclear weapons proliferation.

The witnesses who will assist us in this undertaking are John Holum, Director of the Arms Control and Disarmament Agency and Acting Under Secretary of State for Arms Control and International Security Affairs, who testified before this Subcommittee last year; Spurgeon Keeny, president of the Arms Control Association; and Dr. Kathleen Bailey, a senior fellow at Lawrence Livermore National Laboratory and formerly the assistant director for nuclear and weapons control at ACDA.

Secretary Holum, we have your prepared statement. We thank you for that and it will be printed in the record in full.

We invite you to make any comments or statements you think will be helpful to our Committee's understanding of the issue before us.

You may proceed.

TESTIMONY OF JOHN HOLUM,[1] ACTING UNDER SECRETARY OF STATE AND DIRECTOR, ARMS CONTROL AND DISARMAMENT AGENCY

Mr. HOLUM. Thank you, Mr. Chairman. I will have only a brief opening statement so we can get to your questions.

I want to thank the Subcommittee for holding hearings on the Comprehensive Test Ban Treaty and I salute your leadership on what is a critical issue, both the test ban in particular and nonproliferation, more generally.

At its very foundation, I believe that the Comprehensive Test Ban Treaty overwhelmingly serves our national interest and I would like to take a few minutes to describe why that is true.

First, by constraining the development of more advanced nuclear weapons by the declared nuclear powers, the CTBT essentially eliminates the possibility of a renewed arms competition such as characterized the Cold War. Without the ability to conduct nuclear explosive tests, all five declared nuclear weapon states will be effectively frozen at the current levels of weapons development. A 50-year spiral of escalation will be ended and the strategic arms reduction process will be bolstered.

The United States is currently in a position to reap maximum security benefits from such a freeze. Prompted by the Congress, we have effectively left the test business. The last U.S. nuclear test explosion was in 1992. We have no plans and no military requirements to test. All the more reason then to hold others to the same standard we already observe.

Second, the CTBT is a nonproliferation treaty. Even if a non-nuclear weapon state was able to assemble a simple fission weapon, the CTBT would force it to place confidence in an untested design. The design of a two-stage thermonuclear weapon is even more complicated and the confident development of such a weapon even more dependent on test data.

Some observers rightly point out that the bomb used in Hiroshima was never tested. Remember that we had to dig a hole under a B–29 bomber to load it aboard. It would be a challenge to say the least for any country, without explosive tests, to design nuclear weapons in the sizes, shapes and weights most dangerous to us, compact weapons deliverable in long-range airplanes and missiles, or very small, low-yield nuclear devices to be used by terrorists during regional conflicts.

Third, quite apart from the sheer technical obstacles to nuclear weapon development posed by the test ban, the existence of the treaty will strengthen international nonproliferation standards and the Nuclear Non-Proliferation Treaty regime.

CTBT ratification is critical to our ability to effectively enforce the NPT's global nonproliferation standards which discourage most states from even considering nuclear weapon programs. Not all states feel bound by norms or treaty obligations. Even states that appear to be complying with the legal obligations of the NPT may go quite far in pursuit of nuclear weapons capabilities.

So, a challenge for the United States is to insist on strict compliance by the non-nuclear weapon states with both the letter and the

[1] The prepared statement of Mr. Holum appears in the Appendix on page 37.

spirit of the NPT. That requires a united world, with the means to isolate and sanction those who do not respect the law. It requires a strong global commitment to the NPT, so countries will be prepared to negotiate new agreements with the International Atomic Energy Agency incorporating the strong new safeguards we finally achieved last year.

Consider the potential proliferation consequences of an extended delay in our CTBT ratification. Such a delay would likely open the door to postponements by Russia and by China. These could be seen as repudiations of the commitments made at the NPT Extension Conference and during the test ban negotiations themselves.

It risks sending the message that the weapon states insist on perpetuating indefinitely their Cold War reliance on nuclear arms. We would effectively undermine our own efforts to persuade the international community to join us in insisting on strict compliance with the NPT, and in the process our failures on CTBT could subvert a good and effective NPT regime.

The fourth reason to ratify the test ban is that it is effectively verifiable. The United States successfully fought for tough verification provisions in the negotiations and would not have signed the treaty if we were not satisfied on this score. Indeed, the CTBT will strengthen our means to monitor nuclear testing worldwide.

Our judgment that the treaty is effectively verifiable reflects the bottom line conclusion that U.S. nuclear deterrence would not be undermined by any nuclear testing that the United States might fail to detect. It further reflects our belief that the treaty will effectively deter violations in light of the significant possibility of detection, in combination with the high political cost if a violation is detected.

Moreover, the treaty's verification regime, along with our national intelligence means and diplomatic efforts, will limit an evader's options and provide us with the means to take prompt and effective counter action should we suspect a violation has occurred. In sum, we believe that the benefits of the treaty to U.S. national security clearly outweigh the potential costs and likelihood of potential violations.

We would be concerned about the possibility of any violation, even a test with a nuclear yield of a few pounds. Quite apart from the potential military significance of such a test, it would have serious political consequences and would warrant a strong response.

Remember that with or without the CTBT, monitoring the nuclear related activities of the nuclear powers and potential proliferators will continue to be a high priority job of the intelligence community.

That brings me to the fifth reason to ratify the treaty. It will improve our nuclear test monitoring capabilities.

The CTBT augments the current national technical means for monitoring worldwide nuclear testing with additional tools and data not previously available to the United States. It is a net plus.

The CTBT establishes global networks of four different kinds of sensors—seismic, hydroacoustic, radionuclide and infrasound—that can detect explosions in different physical environments. These networks, made up of 321 monitoring stations, are called the International Monitoring System.

Data will flow in continuously from the IMS. Some of this data will be recorded at stations in sensitive parts of the world to which we would not otherwise have access. Consider, for example, that the IMS includes 31 monitoring stations in Russia, 11 in China and 17 in the Middle East.

The CTBT permits any party to request an on-site inspection to clarify whether or not a violation has occurred, and allows for the use of a range of technologies during that inspection to gather any facts which might assist in identifying the possible violation. With the assent of the CTBT decision-making body, the executive council, the United States would thus be able to ensure that ambiguous evidence is further investigated.

The treaty also provides the legal basis and an international forum with which to promote and enforce a global end to nuclear testing.

We had a demonstration of some of these capabilities last summer, Mr. Chairman, in the Kara Sea near a former Soviet nuclear testing facility where there had been ongoing activity. Seismic sensors detected an event. This raised red flags about potential tests in the area so we began collecting and analyzing data.

The event, with a seismic signal equivalent to about 1/10th of 1 kiloton, was detected by several IMS stations in Russia, Norway, Sweden and Finland. Our intelligence community could confidently locate the event in the Kara Sea, even though a major seismic station in the region was out of commission.

After analysis, we were satisfied that there was no nuclear explosion, based solely on remote sensing and study. If the treaty were in force we could, of course, choose to use its on-site inspection regime or consultation and clarification procedures if there were similar incidents.

The CTBT will also allow us to maintain a safe and reliable nuclear deterrent. In the summer of 1995 President Clinton announced safeguards which collectively recognize and protect the continued important contribution of nuclear weapons to U.S. national security. The first safeguard mandated the conduct of a stockpile stewardship program, for which there must be sustained bipartisan support from the Congress, to ensure a high level of confidence in the safety and reliability of our nuclear weapons stockpile.

A program to maintain our nuclear deterrent under a CTBT was established by the Department of Energy in close collaboration with the Strategic Command and the Joint Staff of the Department of Defense. It builds on DOE's rigorous program of stockpile surveillance and component testing with more sophisticated laboratory experimentation and advanced computations. Its point of departure is a rich database of over 1,000 past nuclear weapon tests that characterize the operation of our weapons and will serve as a benchmark for analyzing the operation of those weapons in the future.

The program has earned the confidence of our military leaders, independent weapon scientists, and the directors of the three nuclear weapon laboratories. During a February, 1998 visit to Los Alamos National Laboratory, President Clinton was joined by the laboratory directors, Dr. Browne of Los Alamos, Dr. Robinson of

Sandia and Dr. Tarter of Lawrence Livermore, who affirmed their confidence that the stockpile stewardship program will enable us to maintain America's nuclear deterrent without testing.

Moreover, in the unlikely event doubts about our ability to maintain the arsenal under CTBT arise at some point in the future, the treaty provides for a withdrawal from the treaty if a party decides that its supreme national interests are jeopardized. President Clinton has already stated that the safety and reliability of our nuclear weapons is a supreme national interest.

And, if our nuclear deterrent cannot be certified, the President, in consultation with the Congress, has made it clear that he would be prepared to withdraw from the treaty in order to conduct whatever testing might be required.

But, as we consider the state of our nuclear weapons, I am pleased to report that the administration forwarded to the Congress on February 12, 1998 the second annual certification from the Secretaries of Defense and Energy that the nuclear stockpile remains safe and reliable. This confirms that the United States will enter the CTBT regime with a proven, well-tested arsenal.

If we believe in the merits of the test-ban treaty, then the issue before us is really American leadership of the world. The United States needs to promote the CTBT's entry into force, not complicate it. Our ratification will encourage other ratifications, just as U.S. ratification of the chemical weapons convention facilitated its approval by Russia, China, Pakistan, and Iran. The most effective means of moving reluctant states is to make them feel the sting of isolation on this issue, not to provide them with the cover of United States inaction.

Mr. Chairman, I have tried to highlight for the Subcommittee the reasons the CTBT is in the national security interests of the United States. Its value has led four former chairmen of the Joint Chiefs of Staff—Generals John Shalikashvili, Colin Powell, David Jones, and Admiral William Crowe—to endorse the treaty. And, significantly, it enjoys overwhelming public support with some 70 percent of the people favoring a treaty to prohibit further nuclear explosions worldwide.

At its very core, here is what I suggest the CTBT issue comes down to: The nuclear arms race is over; arsenals are shrinking; our dramatically fewer remaining weapons can be kept safe and reliable by other means; we don't need tests; proliferators do; and the American people overwhelmingly want testing stopped.

Under these circumstances, I think we should all agree that what the world needs now is not more nuclear explosions; rather, what it needs is more American leadership for another strong tool we can use to rein in the nuclear danger.

Mr. Chairman, I want to thank you for your and your Subcommittee's time and consideration. This concludes my prepared remarks, and I would be happy to answer your questions.

Senator COCHRAN. Thank you very much, Mr. Holum. Again, we appreciate very much your being here today and your assistance to our Subcommittee.

After discussing the first reason, as you see it, that the administration negotiated and signed the Comprehensive Test Ban Treaty, which was to establish a freeze, in effect, on any further develop-

ments by the declared nuclear weapon states, you talk about the fact and in your statement describe the fact that, in your judgment, the CTBT is a nonproliferation treaty. It will erect, you say, a further barrier to the development of nuclear weapons by states hostile to our interests and others.

Isn't that a hope rather than a fact? How does any provision in the CTBT restrain the development of a rogue weapons program in some country that does not have nuclear weapons at this time? If that state is determined to develop a nuclear weapon, can it do so without testing?

Mr. HOLUM. Actually, I would add an element to your question, because obviously a country can stay outside the treaty, and then it could conceivably proceed with testing. But even in those circumstances, I think the establishment of a strong international standard such as we have against nuclear weapons themselves in the nonproliferation treaty, has a constraining influence on nonmembers.

There are countries who would have been able to carry out a nuclear test program and a declared nuclear program during the lifetime of the NPT who have not. And I think part of the reason they haven't is because they are aware that the international community is opposed to that kind of activity and they would be isolated in a variety of ways. So I think even for non-members it has a constraining influence.

Now, for participants, it is possible to develop a simple fission device without testing. Certainly that could be done. At the same time, the ability to develop a boosted weapon that could be reduced in size and delivered in the ways I described earlier would be much harder. I think the experts would say that, without testing, it would very likely be an impossible task.

Similarly, the ability to design a two-stage, thermonuclear device would be a challenge beyond the reach of countries without testing.

Senator COCHRAN. You mentioned the CTBT has now been signed by 150 countries, including the five nuclear weapon states. Have any countries at this time ratified the treaty?

Mr. HOLUM. There are as of now, 10 countries that have ratified.

Senator COCHRAN. Have either Russia or China ratified the treaty?

Mr. HOLUM. No, they haven't.

Senator COCHRAN. In connection with Russia and China, we had testimony at hearings last year that both countries have come into the possession of advanced supercomputers that have the capacity to help improve the lethality of nuclear weapons and missile systems. In that connection, has the evidence of that kind of activity been persuasive to the administration that it is unlikely that either Russia or China would cease and desist from improving the quality and maybe even the quantity of certain types of its most advanced nuclear weapons, even with the CTBT?

Mr. HOLUM. I think it is unlikely. I think all countries, including the United States, would be facing a very daunting challenge in trying to develop significant improvements in the character of their weapons, even with supercomputing capabilities.

Let me put this in context. We are aiming for a 100,000 million theoretical operations per second computing capability in our

supercomputer initiative as part of our Stockpile Stewardship Program. The kinds of computers that are being considered in the context of China and Russia are between 2,000 and 7,000 as compared to 100,000 MTOPS.

Even with that computing capability, dramatically improved from where we are now, we won't be able to and don't expect to go beyond validating what we have done in the past, drawing on the data from 1,000 nuclear tests. We won't be able to develop new designs even at our advanced stage. So the likelihood is very low that Russia or China at a much lesser level of development, drawing on data from fewer tests, would be able to do that.

Senator COCHRAN. I have some other questions, but at this time I am going to yield to my good friend and colleague from Michigan, the Ranking Member of the Subcommittee, Senator Levin, for any questions or comments he might have.

OPENING STATEMENT OF SENATOR LEVIN

Senator LEVIN. Thank you, Mr. Chairman, and thank you for holding this hearing. It is a very important subject. I wish the other committees that have jurisdiction would hold hearings on this subject. It would be very useful in terms of moving this along either to ratification or rejection, hopefully ratification from my perspective. But it is important that the hearings take place, and, Mr. Chairman, in leading the way and having this hearing I think you are performing a really important service. And, again, whichever side of the debate one is on, I think it is important that these issues be explored so the Senate can exercise its will.

From my point of view, this treaty is clearly in the national security interest. More important, the past four Chairmen of the Joint Chiefs of Staff have so stated. This treaty really carries out the goal of Republican and Democratic administrations since Dwight Eisenhower. The people strongly support it. Our uniformed military strongly support it with the safeguards that Mr. Holum has talked about. And I would hope that the Senate would hold the necessary hearings so that we can have a ratification debate and hopefully ratify it.

One of the points that Mr. Holum has talked about is the connection between the Nuclear Non-Proliferation Treaty and this treaty. We urged the extension of the NPT, the Non-Proliferation Treaty, in 1995, and one of the arguments that we made and the promise that we made was that nuclear weapon states, led by us, would complete a comprehensive test ban treaty in the next year. And we did that.

The argument that we made to the states that we were urging to agree not to acquire nuclear weapons and not to follow the lead of nuclear weapon states—in other words, to reject nuclear weapons for their own inventories—that argument was bolstered by our promise that we would support a comprehensive test ban treaty.

The Non-Proliferation Treaty is vital to our own security. We have supported it here in the Senate. If we don't carry out a commitment that we made to the signatories of that treaty and the people who agreed to extend that treaty, it seems to me we undermine our credibility in arguing for its extension. We cannot be put

in that position. That would be a huge failure of leadership on our part.

I have a number of questions, Mr. Holum, including one on the verification issue. You say that it is going to be easier for us to verify whether or not other countries have carried out a nuclear explosion. As I understand it, this is true in a number of ways, and I would like you to comment on it.

Assuming we ratify the CTBT, then we would have the right to seek on-site inspections, which you referred to. If we don't ratify the treaty, is it correct that we do not have the right to make that request?

Mr. HOLUM. That is correct.

Senator LEVIN. All right. You have talked about a number of monitoring stations. The total number again?

Mr. HOLUM. Three hundred and twenty one.

Senator LEVIN. There is a great deal of data that comes from those monitoring stations. And is it correct that if we ratify, we have access to that monitoring data, but if we don't ratify, we don't?

Mr. HOLUM. That is true in part. Some of the data would probably be available, for example, auxiliary seismic stations that are, for example, posted on the Internet. We would have that information, but not the data coming from the formal International Monitoring System.

Senator LEVIN. How much of that data is posted on the Internet?

Mr. HOLUM. I would have to get a specific answer to that for you. The regime will add roughly 200 additional seismic and other stations to the overall monitoring system that we do not have as of now. So that is an order of magnitude, but I can give you some more specifics.

Senator LEVIN. Would you also submit for the record statements of prior presidents that might be available to you? We may already have them, but I cannot find them readily. If you could make sure that this Subcommittee has them, it would be helpful.

Mr. HOLUM. Certainly.

Senator LEVIN. On the question of the safeguards, you made reference to safeguards, including the commitment of the President to use the supreme national interest clause in the event that the Defense Department or the Department of Energy could no longer certify that our nuclear inventory was secure and safe. Is that correct?

Mr. HOLUM. Yes. It is a combination of the chairman of the Strategic Command, the Nuclear Weapons Council, and the heads of the three nuclear weapons laboratories.

Senator LEVIN. That was my question. So that the heads of the labs have got to join in that certification?

Mr. HOLUM. That is right.

Senator LEVIN. Is that an annual certification?

Mr. HOLUM. It happens annually. We just had the second one.

Senator LEVIN. And which labs join in that certification? All the three labs that you mentioned?

Mr. HOLUM. The three nuclear weapons labs.

Senator LEVIN. And each of their directors must certify safety and security each year?

Mr. HOLUM. That is right.

Senator LEVIN. And if that isn't forthcoming, then at least this President has said that he would be prepared to use the supreme national interest clause to withdraw from the treaty?

Mr. HOLUM. Yes. It would be in consultation with the Congress, obviously, and one of the questions, I suppose, that would be raised is: Is this a problem that testing would solve? But assuming that is the case, then this President has made clear he would be prepared to withdraw from the treaty and invoke the supreme national interest clause and conduct whatever tests were necessary.

I would like to emphasize, too, that we don't expect that to happen because we have very high confidence in the quality of our weapons and in the capability of the Science-based Stockpile Stewardship Program.

Senator LEVIN. In your prepared testimony and in your oral testimony, you made the point that a CTBT would help to preclude a new nuclear arms race and effectively freeze the level of current nuclear weapons technology among the declared nuclear weapon states. I think that has some obvious benefits for the United States.

Can you elaborate on that statement?

Mr. HOLUM. Yes. Maybe I could do it this way: We have conducted 1,000 nuclear weapon tests. That is hundreds more than any other country in the world has conducted. We have the most advanced computing capabilities in the world. We have the best labs in the world. We have the best diagnostic capabilities to evaluate and maintain the quality of our weapons, the safety and the reliability of our stockpiles.

Under those circumstances, it seems to me a fairly obvious conclusion that we benefit to the extent that we can lock every country in the world, including ourselves, into place on the nuclear weapons learning curve, because we are at a better position than anyone else.

Now, there is an obvious value to the United States of stopping the arms competition, at whatever state it is. But in the current circumstance, the United States, it seems to me, is in the best position to assure that our security will be protected, to the extent nuclear weapons can accomplish that, through the comprehensive test ban.

Senator LEVIN. A question has been raised about the countries which have not ratified it—or have not signed it, to be more accurate, including India, Pakistan, and North Korea. Again, these are three countries that have not signed it or ratified it.

Is it correct that the treaty provides for a conference of states parties 3 years after the treaty was opened for signature—so a conference presumably would then occur in late 1999—in order to consider alternative options to facilitate early entry into force? And is it true that the only way we could participate in that conference is if we had ratified the treaty?

Mr. HOLUM. That is correct. The conference is only among the countries who have ratified.

Senator LEVIN. What is the advantage to us to participate in such a conference?

Mr. HOLUM. Well, it is hard to imagine the United States, a leading advocate of nonproliferation and arms control in the world, not

being present at a conference of that kind, that we would disqualify ourselves. But we obviously would want to be there in any case to exercise our right to participate in deciding what to do.

This conference will happen if the treaty—or may happen if the treaty hasn't gone into force by September of 1999. Then, all the countries that have ratified will gather and plot a strategy to decide on a course of action. Some people have suggested they would consider something like provisional application or other steps that might move the treaty forward.

The United States would be shut out of that process if we weren't a participant.

Senator LEVIN. Finally, if we do not ratify, another possible consequence would be, would it not, that other nuclear weapon states that have unilaterally declared a moratorium on nuclear testing, such as Russia and China, would be more likely to resume testing?

Mr. HOLUM. That is really my greatest fear, Senator. If the treaty does not enter into force, and particularly if the five nuclear weapon states don't ratify in the near term, it is quite possible to envision a circumstance where others would decide they didn't want to be bound by what are now only political commitments to a moratorium on nuclear testing. And that, in turn, could have very serious consequences, I think, for our nonproliferation efforts. And it is not so much the viability of the NPT itself. I don't think the Treaty is in danger of being repudiated because it is in the interests of the member countries. That was the argument we made in 1995. It is not a favor to us. It is a security instrument for all the member states.

But, we are trying to strengthen that regime. We are trying to be the driving force behind effective enforcement of the Non-Proliferation Treaty. We want the international community to listen when we say it is time to sanction or be prepared to sanction North Korea, for example. We want them to listen to us.

And if we are behind the curve, if we are slowing down the train on the Comprehensive Test Ban, and if testing has resumed because the United States failed to ratify, then I think our whole ability to effectively enforce nonproliferation standards will be undercut.

Senator LEVIN. Again, Mr. Chairman, let me thank you for convening this hearing, and with Senator Glenn here, I also want to just add a thank you to him. He is, of course, the Ranking Member of the full Committee, and he has been such a strong leader in the nonproliferation effort as long as he has been here, that I am just glad he was able to join us here today.

Thank you.

Senator COCHRAN. Thank you, Senator, very much.

Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman, and thank you, Senator Levin. We worked together on a lot of these things through the years, and I know you are going to continue to work on them, too, even though I won't be here next year.

As I understand it, if we don't like what is going on with the treaty, we can withdraw on, what, on 90 days' notice?

Mr. HOLUM. Six months, I believe.

Senator GLENN. Six months' notice. Has the U.S. Strategic Command examined the implications of CTBT for national security and deterrence, in particular?

Mr. HOLUM. Yes.

Senator GLENN. What is their conclusion?

Mr. HOLUM. The treaty has the endorsement of the Joint Chiefs of Staff. That obviously feeds up from the Strategic Command.

Senator GLENN. OK. Strategic Command people also favor it, I presume, then.

Mr. HOLUM. That is right, and as I mentioned earlier, the Strategic Command is involved in the annual certification process to make sure that the weapons in the stockpile will continue to perform.

Senator GLENN. You have been before this Subcommittee many times, and it is good to see you here again today on this same subject. As far as capability of specific weapons, do we have any information at this time that any of the weapons in the current stockpile have given evidence of aging effects that could affect their safety or their reliability if they had to be used?

Mr. HOLUM. No. The short answer is no. A longer answer is that the surveillance process of our weapons as part of the Stockpile Stewardship Program routinely uncovers questions that need to be answered, and we expect that to happen into the future—in fact, more so into the more distant future when the weapons have been around for 20 or 30 years.

But what we find is that we are able to fix those problems either because they don't involve the physics package, through testing of non-nuclear components and replacement or repair, or through computational and other diagnostics if it does involve the physics package.

So the experts will say there will be routine warts uncovered in the process, but they will be things we can repair and deal with. And if we can't, we can exercise supreme national interest.

Senator GLENN. We all want to see that there is a high degree of confidence that the stockpile remains safe and it remains reliable. And there is a system in place to hopefully ensure that. Could you describe that system and what is consists of?

Mr. HOLUM. Well, it is a pretty comprehensive program, and I would like to preface by saying that the testing that was done through all those 1,000 tests, very few of those were for safety or reliability. We tested weapons when we were in the process of designing new ones, but less so when we were in the process of making sure the old ones worked.

Now we have fewer weapons. They have all been well tested. The most recent additions to the stockpile have been around for a decade at least, so we know these weapons very well.

We have multiple labs that will stay in operation, nuclear weapons labs checking each other's work, so there will be peer review. There will be surveillance of the stockpile. Each year 11 samples of each kind of weapons will be removed from the stockpile and dismantled and examined in great detail. One of the 11 will be removed permanently from the stockpile and basically autopsied, or given a very comprehensive review. The others will be checked.

I understand the reason why they selected 11 is that if they do 11 each year, then they will have a 90 percent probability of catching problems that would affect 10 percent of the stockpile within 2 years. I have no idea how that is computed, but that is how it turns out.

It can be testing, obviously, of the non-nuclear part, and replacement. There will be remanufacture of the nuclear parts as necessary because we will use up, through this process, a small number over time.

Then, of course, you have, as you have mentioned, the certification process. Every year the people who basically rely on and have charge of the stockpiles will be called upon to certify their safety and reliability. So it is a very ambitious program. It will cost $4.5 billion a year for 10 years projected into the future.

Senator GLENN. That sounds like a pretty comprehensive program.

We also have a lot more confidence, I think, in our modeling, our computer modeling and so on, than we used to have. If you go back 12 or 15 or 20 years ago when we were first concerned about some of these matters and we were interested in passing the amendments or the Nuclear Non-Proliferation Act of 1978 and some of those things that we worked on, we almost had to do testing to know what we were doing back in some of those days. And I think what has developed in the computer modeling field now, we have a great deal more confidence now in knowing what the outcome would be than we would have back in those days.

Mr. HOLUM. I think that is right.

Senator GLENN. Thank you, Mr. Chairman.

Senator COCHRAN. Thank you, Senator Glenn. We appreciate very much your participation in the hearing and your previous active involvement and leadership in proliferation issues.

I remember coming out to Cincinnati, as a matter of fact, the first hearing I ever chaired as a Member of this Subcommittee, to chair a hearing at your request to look at the situation at Fernald.

Senator GLENN. You didn't know what you were triggering off then, and I didn't, either.

Senator COCHRAN. We went right into a firestorm of public controversy. I recall that. We had more people at the hearing than we expected.

Senator GLENN. Could I have 30 seconds?

Senator COCHRAN. Yes, sir.

Senator GLENN. Because that was really a seminal hearing if there ever was one. The people at Fernald had complained about some of the uranium dust and so on coming down over the area, and I didn't know that this was—I didn't know how serious it was or was not. But we decided we would have a hearing out there, and so we went out and Senator Cochran chaired the hearing—the community came in, and we had some other science people who came in, too, and we found out the situation there was far worse than we had thought it was going out. Instead of placating the people and coming back to Washington and forgetting it, it was what triggered off, literally—and I will make this a short story.

What happened there in trying to clean up Fernald, we came back, had the GAO do a study of that area, and it came back in-

dicting the whole process out there at that time. We got estimates out of the GAO report how much it would cost to clean up. We came back, and I got to thinking if it is that bad at Fernald, it can't be that bad at other places. Well, we found out Fernald was really better than many other places in the weapons complex, and we now have a stack, I think, probably, of GAO studies, maybe 3.5 or 4 feet high of the studies done through the years, and it went to the 17 major nuclear plants in 11 different states as part of the weapons complex.

At that time, the best estimate was that to clean up the whole weapons complex it would cost somewhere, they estimated, between $8 and $12 billion. And you know what has happened to that estimate? Right now the estimate is that to do the job at all these different places and clean up the way they would have to be cleaned up, it is somewhere around $300 billion and between 20 and 30 years if we can figure out how to do it all eventually.

We have places like Hanford—well, I won't say we will never get them cleaned up. It is going to be a major effort.

Anyway, that is what was triggered off with that first little hearing in Cincinnati out there, and the costs have been going up ever since on this whole thing.

Senator COCHRAN. Is that why you are leaving us and going into outer space? [Laughter.]

Senator GLENN. No. I am going——

Senator COCHRAN. A safer environment.

Senator GLENN. If the schedule stays the same, I will be up on election day. I will go any place to get out of an election now. [Laughter.]

Senator COCHRAN. The fact is that we are all interested in this subject, and I am learning as much as I possibly can about the effects, as other Members are, too, of the treaty on our efforts to try to control the proliferation of nuclear weapons and what relationship there may be to the efforts we are making with the NPT.

This treaty is different in one respect, I am told, from any of the proposals that had previously been made by any other president. We hear the history of the initiative goes back to President Eisenhower where he recommended that a comprehensive test ban treaty be negotiated. But as I understand it, he didn't recommend that it be a zero-yield treaty, and even when other presidents who followed would recommend and—would have a moratorium from time to time—1958 to 1961, there was a moratorium on testing. But even during that, President Kennedy put in place four new nuclear devices that were available for use if needed.

So President Clinton, as it turns out—if this is correct, and I want you to tell me whether it is or not—is the first president who has actually proposed and negotiated and signed a treaty with a zero-yield prohibition. Is that correct?

Mr. HOLUM. I am not sure that is correct, but we can certainly provide that information for you. I don't know whether they had gotten to the point of talking about specific yields. It is certainly the case that during the moratorium under President Eisenhower, when he maintained he had a moratorium on nuclear tests, that he had authorized conduct of hydronuclear tests, or very small yields of a few pounds, in order to correct a problem that they had

uncovered regarding one-point safety in some stockpile weapons. So it is true that he at least considered that hydronuclear tests of small yields would not violate a moratorium.

On the other hand, we looked at that issue very closely during the course of the negotiations and basically concluded that a zero-yield treaty was in our interests, that you could not find among the nuclear weapon states a number for permissible activities that would treat all five the same unless you went into very large numbers, and then it wouldn't be a test ban treaty, it would be a threshold treaty with a lower threshold. But also, it would not be credible as a true comprehensive test ban if we didn't go to zero. And in some respect, although obviously there are huge problems of verification going down to zero, this is easier to verify than trying to decide whether a particular activity was above or below, say, 10 pounds of nuclear yield, which is a very challenging task. It is somewhat easier to determine that there was no nuclear yield.

Senator COCHRAN. There is some statement that you made in your submission to the Subcommittee that at various stages in the negotiations, the five nuclear weapon states have honored some kind of moratorium or there has been, in fact, a moratorium from time to time over the past 8 years in testing. Have all five honored the moratorium as far as you know?

Mr. HOLUM. Yes. Well, when they have said they were in a moratorium, we don't have any basis for believing that they conducted nuclear tests. Remember that both France and China continued nuclear testing, insisted on continuing nuclear testing until 1995 when they concluded their test series and decided they were prepared to go forward with the test ban. But they announced that they were testing. They didn't try to hide it.

Senator COCHRAN. One other question concerns me about this, and it is the recent reports that you hear from Russia from some of the top military leaders saying that with the deteriorating capacity to defend their country in a conventional way, with the sad condition of equipment and armaments, not being able to pay armed forces personnel, housing conditions are deplorable, and all the other things you hear about, that their nuclear weapons are really the only deterrent that they have that is dependable. And if that is true, and then couple that with the fact that the new supercomputer access that they have at the weapons systems labs at Arzamas and other places that we have verified through hearings and testimony from witnesses, it seems that they may put more emphasis on the reliability of their nuclear deterrent than they ever had in the past, even with the START II and—which they haven't ratified, and the things that they are doing under Nunn-Lugar to actually destroy some weapons and some weapon sites.

But to what extent is that a problem? And would the Comprehensive Test Ban Treaty serve our national security interests given that situation in Russia today?

Mr. HOLUM. Well, I think the test ban has a particular value in confining the Russians into thinking about what they should, at most, be thinking about, and that is to maintain the reliability of their existing stockpile. I have no doubt that they will conduct very ambitious efforts to maintain a stockpile that they feel is adequate for deterrent purposes. I think the numbers under any cir-

cumstances are likely to come down, the numbers of their overall nuclear forces. I hope that will be within the confines of START II and START III to follow on. But they will want to maintain for the reasons you have indicated—and we have been reading the same reports—the reliability of their stockpile.

It worries me, as I am sure it concerns you, that they seem to be placing more reliance on nuclear forces. It does not necessarily follow that they will be prepared to or would want to engage in a qualitative arms race that would require nuclear testing. What does follow is that they will invest considerable resources in maintaining their stockpile. And we have anticipated that they would. They have been very clear that they plan to.

Senator COCHRAN. Well, we appreciate very much your testimony. Are there any other questions?

Senator LEVIN. Just one, if I could, Mr. Chairman.

Mr. Holum, during your testimony, you said in your presentation that CTBT is effectively verifiable. You said that the United States fought for tough verification provisions, and would not have signed the treaty if it were not effectively verifiable. Then you went on to describe what you mean by effective verification, including that there is no guarantee that we could detect and attribute all tests worldwide should a violation occur. You went on to say that there is a certain acceptable level of uncertainty. But you didn't describe the balancing that you and our administration went through in determining that these provisions would, in toto, leave us in a position where we could effectively verify and effectively deter violations. That is in light of the significant possibility of detection in combination with the high political costs if a violation is detected.

I have tried to summarize your statement about effective verification. The reason I do that is a moment ago you used the term "huge problem of verification." Here you were talking about it as an even greater problem where you have to verify a threshold. Still, on the generic issue, you talked about the huge problem of verification. And I want you now to tell me—can we have a big problem of verification at the same time it is effectively verifiable? And if not, what did you mean by that reference?

Mr. HOLUM. There is no question but what it is very difficult to detect nuclear explosions of very small size, down to a few pounds of yield or even hundredths of pounds of yield, in that range. But it is also a huge problem for anyone to gain any advantage, to gain any significant military value from tests that small.

First of all, it is a hard problem to be able to conduct one that small. You would have to have a great deal of expertise in nuclear weapons and things like decoupling to have the explosion isolated from—the chamber walls. You would have to have expertise in containment, a variety of other things, to be able to keep the test small and evasive.

Once you did that, the "Jasons" who have studied our nuclear stockpile have concluded that even a country as advanced and sophisticated as ours would need a series of tests, an extended series of tests in the sub-kiloton level or much larger, in order to make any significant improvements. So what we are talking about in terms of effective verification is basically two things: First, is the risk of detection and the difficulty of conducting evasive scenarios,

the risk of having a larger yield than you thought, the risk of a whistleblower, the risk of some means of this coming to the attention of the international community; plus the political consequences and potential for sanctions if you are caught will deter countries from conducting even small tests. And, second, after analyzing this all very carefully, we have concluded that any test that we might not detect would not affect our ability to deter nuclear war, would not undermine our deterrent. So it wouldn't have significant military consequences for us.

So there is no guarantee that we can detect every nuclear explosion that might occur. There is a guarantee under this treaty that we can protect our national security.

Senator LEVIN. When you used the term "huge problem" relative to verification, you were referring then to that very small test that might escape detection that you believe would not be militarily significant?

Mr. HOLUM. That is right. It is difficult to detect something of a very small size, but it is also very difficult to do and I think it is unlikely that it would happen.

Senator LEVIN. Thank you.

Mr. HOLUM. And if it did, it is unlikely it would have any significant consequences for us.

Senator COCHRAN. Mr. Secretary, thank you very much for your assistance in our effort to understand the relationship between the Comprehensive Test Ban Treaty and nuclear nonproliferation. Thank you.

Mr. HOLUM. Thank you, Mr. Chairman.

Senator COCHRAN. Our next witnesses will be in a panel to discuss further the issue before us today. Spurgeon Keeny is president of the Arms Control Association. Dr. Kathleen Bailey is a senior fellow at Lawrence Livermore National Laboratory and formerly was Assistant Director for Nuclear and Weapons Control at the Arms Control and Disarmament Agency.

We welcome you both and appreciate very much your attendance at our hearing. Mr. Keeny, we will call on you first and ask you to proceed. We have a copy of your statement, and it will be printed in the record in its entirety, and we ask you to make any summary comments that you think will be helpful to our understanding of this issue.

TESTIMONY OF SPURGEON M. KEENY, JR.,[1] PRESIDENT AND EXECUTIVE DIRECTOR, ARMS CONTROL ASSOCIATION

Mr. KEENY. Thank you. Mr. Chairman, Members of the Subcommittee, I am honored to be here today at your invitation to present my views on the relationship between the Comprehensive Test Ban Treaty and nuclear nonproliferation. I particularly appreciate this opportunity to discuss this issue with you, an issue which I have been involved in in a number of capacities since 1948.

As outlined in my prepared statement, my involvement began as an officer and civilian in Air Force intelligence, tracking the emerging Soviet nuclear weapons program, the first case of nuclear proliferation, and then as an active participant in the initial efforts of

[1] The prepared statement of Mr. Keeny appears in the Appendix on page 45.

Presidents Eisenhower and Kennedy to negotiate a comprehensive test ban.

Looking back on the past 50 years, I am indeed pleased that the CTBT has at last been completed and is now before the Senate for its advice and consent.

Mr. Chairman, I would like to commend you and your Subcommittee for holding hearings on the impact of the CTBT on U.S. nuclear nonproliferation policy. This is the reason that the treaty is of great importance to U.S. security.

As you requested, I will focus my remarks on the five specific reasons for ratification from the White House Working Group on the CTBT.

First, I agree with their first reason: "The CTBT will constrain the development of more advanced . . . weapons by the declared nuclear powers." In fact, as a practical matter, I believe it will prevent such developments by these States. By these developments, I mean not only radical new concepts such as the nuclear explosion pumped x-ray laser or pure fusion weapons, but also new designs for classical two-stage thermonuclear weapons with significantly different parameters from existing weapons.

Even the very sophisticated research facilities and advanced supercomputers called for in the U.S. Stockpile Stewardship and Management Program will not permit the development, production, and deployment of such advanced new weapons in which responsible officials would have confidence. Pursuit of new designs would appear to be even more problematic in the case of other nuclear weapon states that will not share the luxury of the elaborate facilities available to the United States in its Stewardship Program.

Within the U.S. Stewardship Program, one might make minor modifications in existing weapons designs to take into account changes in materials or manufacturing techniques which could be checked out by supercomputers and non-nuclear testing. However, to maintain high confidence in the U.S. stockpile, such modifications would have to be closely controlled and held to an absolute minimum. And there is no reason to think many such changes would be deemed necessary even over a very extended period of time.

Now, all of this isn't to say that the CTBT can prevent scientists in the weapons laboratories in this country or abroad from thinking about new designs which might be of interest in the unlikely event that the test ban regime collapsed. It is indeed difficult, however, to imagine the circumstances in which responsible political, military, or scientific leaders in any nuclear weapon state would be interested in employing unproven designs in the absence of testing when a wide variety of highly reliable, proven weapons are already available in their arsenals.

Second, I agree that "The CTBT will strengthen the NPT regime and the U.S. ability to lead the global nonproliferation effort." Moreover, I believe the failure of the United States to ratify the CTBT promptly will seriously undercut U.S. ability to carry out its critical role in leading the global nonproliferation effort.

The Nuclear Non-Proliferation Treaty, which constitutes the framework for the nonproliferation regime, is by its very nature discriminatory since it divides the world into nuclear weapons

haves and have-nots. The treaty was based on the correct assumption that most countries are more concerned with preventing their neighbors and adversaries from acquiring nuclear weapons than with maintaining the option to acquire such weapons for themselves or, for that matter, with requiring the existing nuclear weapon states to divest themselves of weapons as a precondition. Nevertheless, serious concern about the treaty's discriminatory nature was, and remains, a divisive factor within the regime.

Article VI of the NPT was included to obligate the nuclear weapon states "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament."

When President Eisenhower initiated the first comprehensive test ban negotiations in 1958, he then saw it as the best hope to constrain both the nuclear arms race with the Soviet Union—vertical proliferation—and the spread of nuclear weapons beyond the three countries that then possessed them—horizontal proliferation. President Kennedy shared these hopes and resumed the negotiations that had been recessed after the shoot-down of the U2 over Sverdlovsk. Unfortunately, these early negotiations failed to produce an agreement.

A decade later, the NPT, which was successfully negotiated under President Johnson and ratified by President Nixon, provided a strong barrier to horizontal proliferation. The NPT also banned nuclear testing for all non-nuclear weapon parties to the treaty since they foreswore the development or acquisition of nuclear explosive devices.

In these circumstances, the non-nuclear weapon states that were parties to the treaty looked on the continued nuclear testing by the nuclear powers as a constant reminder of the discriminatory nature of the NPT. They looked on progress in achieving a global comprehensive test ban as the most visible demonstration of the willingness of the nuclear weapon states to end the nuclear arms race. The global cessation of nuclear testing has become the litmus test of the seriousness of the nuclear weapon states to meet their obligations under Article VI of the NPT.

When the NPT came up for renewal at its 25th anniversary conference in 1995, there was considerable dissatisfaction with the record of the nuclear weapon states in fulfilling their obligations under Article VI, particularly with regard to the nuclear test ban. The conference had to decide whether to extend the NPT indefinitely or for only a fixed period.

In view of the significance of the decision, the conference sought approval of indefinite extension by consensus rather than the simply majority required by the treaty. This consensus was achieved by the adoption of a resolution of principles and objectives which contained many commendable generalizations but one very specific objective: The completion of a universal CTB Treaty no later than the end of 1996.

To the surprise of many, the treat was completed on schedule, in large part due to the initiatives taken by President Clinton, and the CTBT was opened for signature on September 24, 1996. To date, 149 states have signed the treaty, including the five nuclear weapon states, and eight countries, by my count—soon to be joined

by France and Britain—have ratified the treaty. However, most key countries, including Russia and China, as has been pointed out, will not move on ratification until the U.S. Senate acts.

Third, I agree that "The CTBT will constrain 'rogue' states' nuclear weapons development and other states' nuclear capabilities." The treaty cannot by itself, however, prevent such states from obtaining a first generation nuclear weapons capability. When the CTBT enters into force with essentially worldwide support, including the five nuclear weapon states, an international legal norm against testing will have been established. While this could not prevent testing by a rogue state, the act of testing would, by violating a universal norm, put that state at odds with the entire international community and make it a prime candidate for serious sanctions.

Technically, however, such a rogue state could develop a first generation nuclear weapon without testing. Such a weapon would probably be similar to the untested gun-type U–235 weapon that destroyed Hiroshima or the plutonium implosion weapon that had been successfully tested at Trinity prior to use against Nagasaki, or the early U–235 implosion weapons tested by China. Such weapons are known to have been developed without tests by South Africa and presumably by Israel and Pakistan as well.

Such a rogue state would not, however, be able to go very far in optimizing or miniaturizing fission weapons and would certainly not be able to develop thermonuclear weapons without extensive testing or access to detailed plans and direct technical assistance from a nuclear weapon state that had successfully developed and tested them.

Although the undeclared nuclear weapon states—India, Israel, and Pakistan—which presumably already have first generation weapons, are more experienced in the field, they would also not be able to develop thermonuclear weapons without testing or external assistance by a nuclear weapon State. If a state were a member of the NPT, such a program would, of course, be a violation of the NPT and would probably be revealed by the new, more intrusive IAEA inspection program, which can inspect suspicious sites.

Fourth, I agree that "The CTBT will improve America's ability to detect and deter nuclear explosive testing." Under the CTBT, the establishment of the International Monitoring System, with stations in Russia and China, and mandated procedures for on-site inspections of suspicious events will significantly supplement the already impressive unilateral U.S. system of national technical means with which the United States has successfully monitoring nuclear testing worldwide since the first Soviet nuclear test in August 1949.

The International Monitoring System, when fully operational, is designed to have a worldwide detection capability down to about 1 kiloton, although I believe in geographic areas of special interest it will be considerably better than that. The IMS has the advantage that it will be an open international operation so that all parties to the treaty have access to the data and will not be solely dependent on United States conclusions, which are often based on data that the United States is not prepared to share and which some parties may perceive as biased. Moreover, the treaty establishes

specific procedures to allow on-site inspections of suspicious events. The prospect of on-site inspections should act as a powerful deterrent since they would have a good chance of identifying even very small tests; and if the country where the event occurred rejected or obstructed the inspections, the action in itself would strongly suggest that the party in question was trying to hide a clandestine test. In making the case for inspections of a suspicious event, the United States can also present information from its powerful classified national technical means system that it would not be willing to share with the rest of the world on a routine basis.

As discussed in more detail in my prepared statement, the powerful synergistic effect of U.S. National Technical Means capabilities and the International Monitoring System is well illustrated by the earthquake in the vicinity of Novaya Zemlya on August 16 last year. U.S. photo reconnaissance alerted U.S. intelligence agencies when it detected unusual activity at the Novaya Zemlya site in August, activity that in retrospect was probably associated with permitted subcritical experiments of the type the United States was conducting at the same time at the Nevada test site.

Concern that it might be a nuclear test was eliminated when seismic data that became available within days determined it was an earthquake 130 kilometers from the test site beneath the floor of the Arctic Ocean. If the CTBT had been in force and the event had been close to the test site, the United States could have requested an on-site inspection and would certainly have had a strong case to obtain it.

In judging the effectiveness of a detection system, it must be recognized that every system that depends upon technical measures has a threshold below which signals are lost in the background noise. While in the case of the CTBT one can, with high confidence, detect tests down to 1 kiloton equivalent and with less confidence to considerably lower levels, there will always be a range of yields above zero that cannot be detected.

Despite these technical limitations, the verification system can still be correctly defined as effective because the tests below the threshold do not constitute a security risk to the United States. Clandestine testing below the threshold by the nuclear weapon states would not permit development of radically new or significantly improved nuclear weapons. In the case of non-nuclear weapon states, tests below the threshold would not contribute to the production of a first generation primitive weapon, which would either be tested at full yield or be produced without testing since little would be gained by the testing of such weapons at very low yields.

I should add that, in addition to detection by sensors recording the event itself, a potential clandestine tester would have to take into account the possibility that his actions would be revealed by human sources or by a failure of communications security. Such sources of information, although unquantifiable, should have a significant deterrent effect on low-yield clandestine testing.

Fifth, I agree that "CTBT ratification by the United States and others will constrain non-signatories from conducting nuclear tests." Moreover, I believe ratification is critical to the U.S. efforts to maintain an effective leadership role in maintaining and

strengthening the nuclear nonproliferation regime, which is the principal constraint on testing by non-nuclear weapon states.

It has been suggested that the Senate does not have to hurry in considering the Comprehensive Test Ban Treaty since India, one of the 44 countries that must ratify the treaty for it to enter into force, has stated emphatically that it will not sign the treaty. The urgency for the U.S. action derives not only because our leadership role will probably stimulate a wave of ratifications, including Russia and China, but also because it will give the United States a seat at a special conference that can be called after September 24, 1999—3 years after the treaty was opened for signature—to decide what measures can be taken to accelerate the ratification process and facilitate early entry into force of the treaty. If Indian participation does not appear to be forthcoming, the conference can recommend a number of ways to bring the treaty into force provisionally. If the United States fails to ratify the treaty before September 24, 1999, it will only be able to participate in the conference as an observer, without a vote or voice in these efforts to bring into force a treaty in which it has played such a central role over the years.

In the year 2000, there will be a major NPT Review Conference. The main focus of attention at that conference will be on the extent the nuclear weapon states have met their obligations under Article VI and implemented the Principles and Objectives Resolution that accompanied the indefinite extension of the NPT. If the United States has ratified the CTBT and the treaty is moving toward entry into force, the United States will be in a very strong position to press the conference to support its other efforts to strengthen the nonproliferation regime with respect to potential proliferators. But if the treaty has been rejected or is still before the Senate, the United States will be strongly attacked at the NPT Review Conference as the barrier to an effective nonproliferation regime and will lose much of the leadership role it has rightfully achieved over the years.

In summary, I believe the Comprehensive Test Ban Treaty is an extremely important component of the U.S. strategy to establish a permanent global nonproliferation regime. I urge the Senate to act promptly to give its advice and consent to the treaty in order to reinforce the leadership role of the United States in extending and strengthening the nonproliferation regime.

Thank you, and I am, of course, willing to answer questions on my testimony or any other part of this issue.

Senator COCHRAN. Mr. Keeny, thank you so much for your presentation to our Subcommittee.

We have Dr. Kathleen Bailey with us, and unless Senator Stevens has any questions or comments at this time, I am going to call on Dr. Bailey to proceed.

Senator STEVENS. Please do.

Senator COCHRAN. We have your statement. It will be printed in the record in full, and we encourage you to make whatever comments you think would be helpful to the Subcommittee.

TESTIMONY OF KATHLEEN BAILEY,[1] SENIOR FELLOW, LAWRENCE LIVERMORE NATIONAL LABORATORY

Ms. BAILEY. Thank you, Mr. Chairman. I appreciate the opportunity to appear before you and Members of the Subcommittee to address the relationship between the nuclear nonproliferation regime and the Comprehensive Test Ban Treaty, CTBT. The views I express today are my own and not necessarily those of any institution.

Let me start with my conclusion, which is that the CTBT fails the cost/benefit test. Specifically, it will not accomplish the nonproliferation goals as set out for it by the administration and, at the same time, the treaty will seriously degrade the U.S. nuclear deterrent and, thus, will have a high national security cost. I would like to take each of the five principal nonproliferation goals as set out by the administration for the CTBT and give you the bottom-line conclusion that I have made about them.

Goal No. 1 that I will discuss is that the CTBT is alleged to constrain nuclear proliferation. The CTBT will not meaningfully constrain nations that want to acquire a workable nuclear weapons design. A state that wants to produce a nuclear weapon can do so without nuclear testing. As acknowledged by the two previous speakers, the Hiroshima bomb as well as South Africa's arsenal were untested devices.

Furthermore, non-boosted, implosion-type weapons may be designed with high confidence, without testing.

Testing is not essential today as it was in the past for proliferating nations because the information related to nuclear weapons is now widespread. University courses, the information superhighway, advanced computers, new materials, and production technologies—all of these enable a nation to design with high confidence a weapon that would in the not-so-distant past have been considered relatively sophisticated.

Now, critics may argue that new proliferators would want to test a device design, just as the United States usually does, before stockpiling it. However, there are important differences between proliferators' needs, perspectives, and targeting requirements versus those of the United States and Russia. During the Cold War, both sides focused on targeting one another's military sites. A premier objective has been pinpoint strikes against small targets such as silos, rather than cities. This dictated high-performance delivery systems, which, in turn, required tight parameters on the allowable weight, size, shape, safety measures, and yield.

Now, by comparison, proliferant nations are not likely to target silos. Instead, they are likely to target cities. Their delivery vehicles may be ships, boats, trucks, or Scud-type missiles. Proliferators may not care whether the yield they obtain is exact. They may not have tight restrictions imposed by advanced delivery systems or safety standards like those that we and Russia have. And they are unlikely to have highly complex weapons designs. Furthermore, proliferators may have an entirely different standard for reliability. All of this boils down to one thing: It is quite feasible for a nation to develop a device that will work as long as it does not

[1] The prepared statement of Ms. Bailey appears in the Appendix on page 53.

matter if the yield is exactly known and there are no exacting specifications which must be met.

Goal No. 2 is to save the nonproliferation regime. I contend that the NPT is at risk and ratification of the CTBT will not save the NPT. There are at least three major challenges to the Non-Proliferation Treaty which threaten to unravel it: The demand for a timetable for zero nuclear weapons; growing dissatisfaction with U.S. technology transfer restrictions; and erosion of NPT's contribution to security.

Now, I have outlined detail on all three of these in my written testimony, but verbally I will address only one of them now.

A contradiction exists, as Spurgeon Keeny pointed out, in that the nuclear weapon states pledged in the NPT that they would work in good faith toward total nuclear disarmament. Simultaneously, however, the nuclear weapon states have continued to rely on nuclear deterrence for security, and they have said that disarmament is a long-term rather than a near-term goal.

At the NPT Review and Extension Conference of 1995, the United States and others agreed to negotiate a CTBT, touting it as a step toward total nuclear disarmament. Now, however, NPT parties are in the process of discovering that the CTBT does not constitute a step toward disarmament that they had thought it was. This is because nuclear weapon states are not by any means abandoning nuclear deterrence but are instead taking steps to assure that their stockpiles will remain safe and reliable and, therefore, usable despite the testing ban. The U.S. Stockpile Stewardship Program is designed to defeat nuclear erosion. Thus, the goal set for the CTBT by many nations is effectively undermined by a successful Stockpile Stewardship Program.

It is the dependence of the nuclear weapon states on nuclear deterrence, despite the NPT commitment to disarmament, that is the source of greatest danger to the non-proliferation treaty, and this conflict will persist regardless of whether the CTBT is ratified by the United States or not.

Goal No. 3, establishing an international norm, I will also gloss over fairly briefly because I view it as pretty inconsequential. History is replete with examples when norms and even legally binding treaties, which are a much stronger constraint, have failed to inhibit nations. For example, the Biological Weapons Convention set up an international norm against biological weapons production, possession, use, but we have two examples today of nations that we know are pursuing and have in their hands biological weapons. One is Iraq; the other is Russia. And we don't know how many others. So international norms come and go without much effect.

Let's turn to goal No. 3. The administration has declared that the CTBT is effectively verifiable. Let me define what I mean by effective verification, and I think it is a generally accepted definition. It means "high confidence that militarily significant cheating will be detected in a timely manner." In the case of the CTBT, of course, this would mean that you are highly confident that you will be able to detect within hours or a few days of the event any nuclear testing which will provide the test with significant, militarily significant information.

Now, there are two questions that we need to answer in looking at the CTBT. First is: What yield nuclear test give you, or gives the tester, militarily significant information? The second question is: Can the CTBT verification system detect to that level?

Now, I have taken the conservative approach and said that the basic cutoff point of militarily useful testing is 500 tons, and I selected that number because of the attachment that you will see in my testimony. This colorful table was put together in 1995 by the three nuclear weapons laboratories for presentation to the administration to explain why our nuclear weapons designers would like to be able to continue testing at a level of 500 tons under the CTBT. So we assume for the sake of argument that a very low number, 500 tons—or it could, of course, be 10 kilotons or some other higher number, but let's assume 500 tons is militarily useful.

The International Monitoring System of the CTBT is expected to provide the ability to detect, locate, and identify non-evasive testing of 1 kiloton or greater. Thus, it is clear that the monitoring system will not be able to detect 500 tons or more, up to a kiloton.

However—and this is a very important point—a Nation may conduct nuclear tests evasively which would allow several kilotons to be tested with little or no risk of detection. One method by which this might be done is decoupling—that is, detonation of the device in a cavity that can reduce the signal by as much as a factor of 70. This means, for example, that a kiloton explosion would be made to look seismically like a 14-ton explosion fully coupled. A 10-kiloton explosion would look only like a 0.14-kiloton explosion.

Let me give an example, an interesting one. The United States conducted two nuclear tests in the Tatum salt dome located at Chilton, Mississippi. Sterling, the test conducted on December 3, 1966, had a yield of 380 tons, but the apparent seismic yield was only 5.3 tons. Thus, you can see that the salt dome decoupling effect made the test look much, much smaller.

Now, in his testimony, John Holum said that decoupling was a sophisticated measure, that it would be difficult for countries to achieve. That is patently untrue. I would like to quote from a document that I got recently from an unclassified intelligence community report. It says, "The decoupling scenario is credible for many countries for at least two reasons: First, the worldwide mining and petroleum literature indicates that construction of large cavities in both hard rock and salt is feasible, with costs that would be relatively small compared to those required for the production of materials for a nuclear device; second, literature and symposia indicate that containment of particulate and gaseous debris is feasible in both salt and hard rock."

So I would suggest to you that decoupling is not a terribly big challenge and that it is quite a feasible scenario.

However, let's assume that the country is unable to get a large cavity and is not able to decouple its device. What could it do? Well, I would suggest that one of the easiest things to do would be to put the device that it wanted to test on a barge, send it out to the ocean, let the detonation occur, and wait for the International Monitoring System and the *New York Times* and *CNN* to tell them what the yield was. That test would be very difficult to attribute, and perhaps impossible.

So the bottom line is this comprehensive test ban is not effectively verifiable, and militarily significant testing can take place with very little or no risk of detection.

Let's turn now to goal No. 4, which is constraining nuclear modernization. I would agree with administration officials that say that the CTBT will constrain the United States and others from being able to modernize their nuclear weapons. But I would see this as a bad thing, not a good thing. Let me give you some examples of three instances in which we would need possibly to modernize our nuclear forces.

In one case, we might need to increase safety measures for our nuclear weapons. We cannot say what new technologies will be discovered in the future that would greatly enhance the safety of our nuclear weapons. It is like saying in 1949 we didn't know that airbags would come along in the 1990's for automobiles. Well, that technology was unknown then. The same kind of thing happens. Technology marches. You find out later that there is a new discovery that you could apply to an old problem of safety, and you need to be able to test to implement that.

Second, modernization may be needed for new requirements. We say that we don't have any current new requirements that would make us need a new device design or testing. But that might change. There may be emerging threats. For example, Desert Storm taught us that we need to be able to strike deeply buried targets such as hardened underground bunkers, and so we modified the B–61–11 bomb. There may be future instances in which we would need to have a new or redesigned bomb.

There may be emerging defensive technologies. There may be a quantum leap somewhere in which Russia or some other Nation may develop a technology that would render our weapons obsolete overnight, and we would need to be able to adjust our deterrent to meet that counter-force challenge.

We would also need to adjust new delivery systems. Years ago we didn't anticipate the global positioning system—the satellite system that enables pinpoint accuracy, and that has revolutionized delivery systems. Well, what if there is a new discovery in the future that would enable us to have a more streamlined, lightweight, effective delivery system. If that is the case, we may need a new warhead to go with it. So we should not preclude U.S. ability to test should we need to change our nuclear arsenal.

I would like to raise here another consideration which is not mentioned by the administration and I think is terribly important, and that is that the CTBT may actually promote nuclear proliferation. Nuclear testing has demonstrated to our allies, as well as to potential adversaries, that we have a strong commitment to our allies and that our nuclear deterrence is strong. Any decline in that confidence that we have or in our commitment to nuclear deterrence could signal to other nations that are now under our nuclear umbrella that we are not serious. And I would suggest to you that sophisticated nations—Japan, Germany, Italy, who knows which countries—would revisit whether or not they might need their own nuclear option in the future.

So the punchline is the CTBT will not meaningfully accomplish the five nonproliferation goals set out for it. It won't stop nations

from designing and deploying nuclear weapons. It will not save the NPT. It will not detect militarily significant cheating. And the international norm that it would create is essentially not meaningful.

Thus, the potential benefits of the CTBT to nuclear nonproliferation is meager. On the other hand, the CTBT will have a profound impact on the ability of the United States to assure that its nuclear weapons continue to be safe, reliable, and effective. Ratifying the CTBT will foreclose the ability of the United States to modernize its nuclear forces because U.S. compliance will be certain. So the limited political benefits of the CTBT are vastly outweighed by the costs to national security.

I would like to take one moment to correct what I view are some omissions or errors in fact of statements that have been made here today. I will be very brief.

One is that it was stated that we have had no need for nuclear testing since the 1992—since the moratorium began in 1992. Sig Hecker, the former Director of Los Alamos National Laboratory, said in writing last fall that indeed there have been instances since 1992 that, had we not had a moratorium in effect, the U.S. technical community would have advised a nuclear test. That is the first point.

The second is Senator Glenn pointed out that computers today are "able to replace testing." Laboratory directors have said that computers will not replace testing. Virtual reality cannot replace reality. More importantly, the head of the advanced supercomputer program at Lawrence Livermore has said that the success of the initiative is uncertain and we won't know for quite some time whether or not the computer systems will perform as planned.

Finally, it was noted that—a question was asked whether or not other nations had honored moratoria in the past. The answer is no, they have not. Not only did the Soviet Union break out of the moratorium, leaving us flat-footed in the 1958 to 1961 time, but also, as former Secretary of Defense Perry testified before Congress in January of 1996, the current moratorium may have been broken by Russia. No further public details were given on that so I can't go beyond that, but it appears that there was suspicious activity then.

There are other factual difficulties, but I will stop now and turn to questions. Thank you.

Senator COCHRAN. Thank you very much, Dr. Bailey and Mr. Keeny.

If NPT signatory nations like Iran, North Korea, or Iraq are intent on acquiring nuclear weapons, in what way would the Comprehensive Test Ban Treaty make the acquisition more difficult? Mr. Keeny.

Mr. KEENY. As has been pointed out before, if the CTBT were in effect and they signed it, they would be forced back into developing weapons without testing, which, as we have recognized, is certainly a possibility. If they don't sign it, if they don't ratify it and become a party, they certainly have the legal right to test. But if the test ban has become really an international norm, it puts tremendous pressure on them. And as an example of that, it is interesting that in the past several countries that have pursued nuclear weapons, with the exception of India's test in 1974, Pakistan and Israel and

South Africa did not conduct nuclear tests even though they legally would have been permitted to do so. Presumably, they felt for their own particular political reasons considerable pressure from the even more informal norm that this would be ill advised for them to do it.

Senator COCHRAN. Dr. Bailey.

Ms. BAILEY. Senator, there is already an international norm against development of nuclear weapons. There is even a treaty. The Nuclear Non-Proliferation Treaty already accomplishes that. Iran and Iraq are both signatories. Iraq broke the treaty, and Iran is suspected to be doing it.

The CTBT doesn't do anything that the NPT doesn't do, and there is no technical barrier that the CTBT presents.

Senator COCHRAN. Do you think there is any legitimate reason for a declared nuclear power to develop more advanced nuclear weapons?

Mr. Keeny.

Mr. KEENY. No, I don't, and presumably that is a decision that the military and the laboratories have agreed to, that our present arsenal meets our present nuclear requirements. There are no major new ideas pressing to be explored, and it was interesting when the congressional legislation led to a moratorium on testing, the question came up whether there were some tests that had to be pursued. They had great difficulty pulling together a handful of tests that should be given consideration.

We have a very mature nuclear stockpile, and no clear demands to change it, to elaborate on it, while we have a real interest in not seeing the other nuclear weapon states, for example, China, moving to catch up or possibly introducing new ideas that might destabilize a very satisfactory deterrent posture in which we find ourselves now in the post-Cold War environment.

So I fail to see any pressing need on our part, and I am encouraged that the other nuclear weapon states were willing to go along with the test ban, suggesting that they, too, are satisfied with their general nuclear posture.

Senator COCHRAN. Thank you.

Dr. Bailey.

Ms. BAILEY. Absolutely, we need to maintain the flexibility to have nuclear weapons designs. There may be new threats, for example, chemical, or biological. What if we need to have a nuclear weapon that would detonate and burn up the biological agent in a particular bunker? We can't do that conventionally. We can do it with nuclear. What if we need a small tailor-made nuclear weapon to do that? We may discover new safety measures. We would need to do new designs then.

Additionally, new technologies by Russia or China, in terms of defending against our nuclear arsenal, our nuclear deterrent, could cause us to have to re-tailor our arsenal. We need to maintain the flexibility to do that.

Senator COCHRAN. Thank you.

Senator Stevens.

Senator STEVENS. Mr. Keeny, do you think our nuclear deterrent is credible if we do ratify this treaty?

Mr. KEENY. I think there is no question about it. We have an overwhelming nuclear deterrent, and with the new policy enunciated that we are focusing on a nuclear deterrent posture as opposed to a protracted war-fighting posture, numerically and qualitatively our stockpile is an overwhelming deterrent, and it clearly would continue to be so at a much lower level. There is no reason to think it could be any stronger if you modified the stockpile in any way whatsoever.

Senator STEVENS. Well, then, let's turn it over. Do you think it is credible if we maintain the full complement of our testing staff and maintain at 100 percent of capability our testing facilities? Do you think it is credible for us to say we are not going to test?

Mr. KEENY. I understand——

Senator STEVENS. You know that the budget before us now says we are going to keep everything we have got. All the testing facilities will be maintained at 100 percent. All the staff will be kept at 100 percent. All of the readiness to test will be kept at 100 percent. But we will also have over here a whole new group that will perform all of the functions that have been outlined for a country that doesn't test.

Now, is that credible, too?

Mr. KEENY. Well, it may not be necessary, but it is certainly credible in the eyes of the rest of the world. I think that you must have a stewardship program of some sort, the ability to keep track of the status of existing weapons and to, as necessary refabricate components in the weapons or the entire weapon.

I think the present Stewardship Program is extremely generous and is an insurance policy of extremely generous proportions. I think no one should have any concerns that with this amount of effort we are in a position to maintain the reliability and safety of the stockpile and would be in a position to very quickly accelerate our efforts if the regime does break down.

So I would say, I think, the activity could be successfully done on a more modest level, but if the Congress is prepared to fund the program at this level and it gives additional reinsurance, I would certainly support it.

I think other countries will do it on a much less ambitious level. Apparently, the Russian approach to stockpile reliability is based more on periodic refabrication of the weapons. We, by our science-based Stewardship Program, will monitor them extremely close and will be in a position to make minor modifications more frequently, and presumably have to do a complete refabrication on a much longer time scale.

Clearly, a lot of the funding of this program is based in maintaining the laboratories to have an interesting and detailed program to attract and maintain competent people in the business, and this is a legitimate insurance policy. How much you are prepared to expend on this is a national security decision that should take into account your other security requirements.

Ms. BAILEY. Senator, may I comment on the question?

Senator STEVENS. Yes.

Ms. BAILEY. The Nevada test site cannot be maintained in ready condition absent some level of nuclear testing. Lawrence Livermore Laboratory Director Bruce Tarter has already said that we are 2

years away from being able to conduct a nuclear test right now. You can't keep the good people, the skill levels up and so forth, absent some kind of testing.

So even with Safeguard F, for example, when the national security might determine that we needed to have a test, we would still be 2 years away from a test. Your question, which is a good one is: Does the maintenance of a test site not signal our ability to have a strong deterrent? The answer is no because we won't be able to keep that test site ready to go.

Senator STEVENS. Well, I don't think it would be maintained either, but the beginning part of the program indicates that we would keep both up—at a cost, I might add, of something like 20 C–17's a year. The duplication and cost would build us 20 C–17s.

I have some real questions about this treaty now that I didn't have before when I have seen the quantification of what it is going to cost to maintain this dual track in this program, and that is why I came over here today. I seriously question this program now.

Ms. BAILEY. The big fear of people at my laboratory, the designers particularly, is that what we will get is the worst of both worlds; that is, that the stockpile stewardship—the lukewarm advocacy of it by arms control advocates will completely fade once the CTBT is ratified, if it is ratified, and then we won't have either testing or a Stockpile Stewardship Program.

Senator STEVENS. Well, I just feel that successive Congresses will edge and cut both sides of this program. Neither one of them will be creditable after a series of years, and that will mean we will be forced to rebuild our conventional systems at a much higher rate to maintain our credibility as a superpower. I really think this needs to be rethought, and I hope that you will continue the hearings, Senator.

Senator COCHRAN. Thank you very much, Senator Stevens.

Let me ask a question, Mr. Keeny, about the alternatives that might be available, feasible, to a ban on testing.

First of all, what is the harm of testing? Is there any measurable realistic harm to the environment or the health and safety of American citizens for a low-level testing program to ensure reliability of weapons?

Mr. KEENY. Well, the harm is international politics. I would say that unless one is extremely careless or incompetent, there is little danger to the health and safety of the American people from underground testing, properly conducted.

The danger of this is that we are going to persuade the rest of the world we are interested in preventing them from having nuclear capabilities, but we have no intention ourselves to in any way constrain our own programs. And not only will we insist on indefinite continuation of nuclear armaments, but we will insist on continuing to improve and make them, at least in the eyes of the rest of the world, more dangerous to international security. And I think this is a problem we have in dealing with the international community.

We would like to be in a position that we can get maximum support from the international community when situations such as Iraq or North Korea or whatever happens next come along that they will support sanctions, they will support our leadership role

in assuring there will not be further nuclear proliferation, because that could be dangerous to the health of our friends and allies abroad and eventually to ourselves as well.

That is the argument for the comprehensive test ban. One can imagine that if the whole regime collapses and testing becomes much more general and goes above ground and we have atmospheric testing, that would endanger the American citizens' health and well-being. But I think that is unlikely, or at least for the foreseeable future. So this should be looked on in terms of our broader international objectives to prevent the proliferation of nuclear weapons to other countries that we consider rogue countries or simply to countries—if the regime breaks down and many countries become nuclear-capable, it would be a very, very frightening world.

I remember in my earlier days in this issue wise men generally were saying in the 1960's that there were going to be scores or many dozens of nuclear weapon states by the end of the 1970's, which is now a long time ago. They were wrong. And we were very fortunate. But I think if we found most of the industrialized states developing nuclear capabilities, which they could very easily, or many other countries developing more modest but capabilities that might be used, it would just be an extremely dangerous world. And if conflicts emerged, as they almost certainly will in the future, you have an increasing probability that there would actually be use of nuclear weapons and could well be in situations into which the United States would be drawn. And that would be very dangerous to the health of American citizens, in the military and otherwise.

Senator COCHRAN. Dr. Bailey, what is the alternative to the Comprehensive Test Ban Treaty and the Non-Proliferation Treaty, both of which have had Republican and Democratic administrations alike support in one form or another and rely upon more and more as a way to ensure a norm of behavior that is consistent with the goal and hope that Mr. Keeny has expressed? What is the alternative?

Ms. BAILEY. Let's take each treaty separately, if you don't mind.

The Nuclear Non-Proliferation Treaty is adhered to by states because they see it in their security interest to do so. They want to prevent nuclear proliferation in their regions and so forth. It is not because they are afraid of U.S. nuclear weapons or the declared nuclear weapons states. So I think that there isn't an alternative. States will continue to support the NPT because it is in their security interest to do so.

Now, what is the alternative to the comprehensive test ban? I would suggest that we go back and reconsider what previous presidents, all presidents prior to President Clinton considered, and that is, a limitation in the Comprehensive Test Ban Treaty that would allow us to conduct some level of nuclear tests to keep our deterrent strong.

Clinton was the first one that came out with zero yield, so the treaty is very different today than the one that we have been talking about for 40 years. I think that we will continue to need some level of nuclear testing not only if we choose to support stockpile stewardship, we need to be able to calibrate the stockpile stewardship; or if we choose to do rebuilds, we need to be able to prove the processes by which we will do the nuclear rebuilds. So testing

is integral there. So the alternative, if you really want a CTBT, is to revisit it, go back and make it what previous presidents were doing, that is, a time-limited treat with some level of testing that will allow us to keep our deterrent strong.

Senator COCHRAN. Mr. Keeny, what is your reaction to that?

Mr. KEENY. Well, I would like to say a word about the statements that have been made a number of times here about previous presidents. I think it is simply not correct. When Eisenhower initiated the treaty on the discontinuance of nuclear weapons, it was for a comprehensive test ban. That was his intention, and that was what the formulation was.

Now, it is true that the agreement was not reached. One never got to the point of defining what is a nuclear explosion. But the thinking about it was in terms of a de minimis definition initially. As problems developed, various other formulations were considered, one to deal differently with underground testing. At that time there had only been a single underground test, the Rainier test. So it was a new phenomenon. And then subsequently there was thought given to various types of threshold test bans. But both Eisenhower and Kennedy had addressed the proposition of a comprehensive test ban. But, of course, there was never an agreement reached and certainly nothing signed.

Under President Carter, the pursuit was of a comprehensive test ban, although there, again, the negotiation, although it went quite far in some regards, never came to a question of the definition of nuclear explosion. There was never an agreed U.S. position, and there was nothing agreed to with the Soviet Union.

So I think one should be very careful in saying this is a unique approach that was never conceived of. I do think it is true that when Clinton made a formal statement of having a zero yield, without specifically defining it, he went a step further than had been achieved in the previous negotiations. But I think you misread the objectives of Eisenhower, Kennedy, and Carter when you suggest that really the notion there was to continue testing at a level such that it would have any relevance to deterrence.

Another point is on the testing that took place during the moratorium. Actually, I was indirectly involved because my boss, George Kistikowsky, who was Eisenhower's second science adviser, was a key person in the decision as to whether to go ahead with these very small yield tests and concluded this would be a reasonable thing to do. They were limited to a few pounds of yield, and it related to some very specific safety problems that existed at the time.

But you must remember, these were unilateral moratorium that each side interpreted as they saw fit, and it was interesting how strict Eisenhower was in constraining any testing that was to be allowed under the moratorium.

Senator COCHRAN. Thank you very much for that information and that perspective. That is very helpful.

Dr. Bailey, are there any other comments or observations that you would like to make?

Ms. BAILEY. I would like to observe that that is not technically accurate. First of all, previous presidents called in the directors of national laboratories when this Comprehensive Test Ban Treaty was being considered, and they heard briefings and previous Presi-

dents decided that the United States did need to maintain some level, some yield of testing. President Clinton was the first president that did not call in the laboratory directors and personally hear the briefing. Instead, it was done at the Secretary of Energy level. The briefings that took place about why we need testing were heard by Secretary O'Leary, and it was decided at that level, not at the presidential level.

It is very important to realize that in previous negotiations of the comprehensive test ban, it was assumed that there would be some level of testing to enable the United States to keep its deterrent strong, safe, and reliable. And that is just a fact. It can be documented in history.

Mr. KEENY. Well, I just don't know how you can say something is just a fact. The kind of testing that some people were discussing had little to do with maintaining our deterrent. You know, the suggestion that was made so frequently that a country with 12,000 strategic nuclear weapons and highly sophisticated and competent delivery systems is going to lose its deterrent capability overnight because of some possible problem with certain weapons, simply shows no comprehension of what deterrence is about. To suggest that any of these developments would suddenly have left the United States impotent and obsolete is simply way off the mark.

I think when Eisenhower was pursuing the nuclear test ban, it was with the intention of stopping the development of nuclear weapons, which he saw as a threat to the survival of the United States and to the international community.

I think a person it would be very useful for you to talk to would be General Andy Goodpastor, who, as you know, was Eisenhower's——

Senator COCHRAN. We have had him before the Subcommittee.

Mr. KEENY [continuing]. Personal military aide and very close to him personally. And I think he would say that at the beginning Eisenhower thought nuclear weapons were just another much more powerful and dangerous type of weapon, military armament, but that with the rapid escalation during his term and the introduction of thermonuclear weapons and the sort of open-ended expansion that seemed available, he was deeply seized with the danger of the situation and really sought very sincerely at that early date to try to stop the development of further nuclear weapons, and saw the one handle on it at that time seemed to be through testing, because everyone felt that with increasingly high-yield weapons, the tests were indispensable to continue this progress.

But I would strongly suggest that you talk with General Andy Goodpastor, because I think he is one of the few people who is still around who can reflect what Eisenhower's actual concerns about these matters were.

Now, I think it is true the laboratory directors always in the past have basically opposed a test ban, and I think most of them would be frank to say so. Their job was to make nuclear weapons, and they wanted—they had ideas and they wanted to continue to improve them.

Senator COCHRAN. Do you suppose that the generosity of this Stockpile Stewardship Program may be the price that we pay for

the support of the laboratory directors now for the Comprehensive Test Ban Treaty?

Mr. KEENY. Well, I wouldn't want to put it that way. I think a more generous——

Senator COCHRAN. I didn't put it that way, either. I asked the question.

Mr. KEENY. Well, I think it did, but I think it is the price for their support. But to put it in a little more generous terms, I think it met their concerns about this narrow question of stockpile reliability and safety. I think it is unfair to say they just did it because they wanted to maintain a large and expensive establishment. I think the program did buy their support in that it answered the question that they were seized with: How can I, as a responsible manager of the scientific program, say these weapons are reliable and safe unless I have a lot of tools at my disposal? And having received them, I think they are clearly satisfied, and I think this is the first time that there has been clear support of all of the laboratory directors for the test ban. And it reflects on the one hand the Stewardship Program, but it also reflects an honest man's assessment of the fact that we have a very mature stockpile, we have a very secure deterrent, and we are not faced with an opponent of uncertain dimensions, as the Soviet Union was at the height of the Cold War.

So I acknowledge that the laboratory directors have done a responsible and honest appraisal of the situation and have decided that their responsibilities can be met without continuing an aggressive development program.

Senator COCHRAN. Thank you.

Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman. I apologize, and I apologize to our witnesses today that I had to be in and out so much. I have been out more than in, I guess today. But I had some other things I couldn't avoid, so I am sorry I wasn't here.

I have been impressed with the fact of what you just mentioned that the heads of our three major labs involved with this, Lawrence Livermore and Sandia and Los Alamos, all who are certainly highly technically competent people, favor this as long as the safeguard—or so long as the program is underway, the safeguard program to make sure that everything is still in working order if we happen to need it.

We also have the statements by four of the former Joint Chiefs of Staff—Shalikashvili, Powell, Crowe, and Jones—and they certainly are people who look at the technical background of this thing and are very happy with it. So I just think that this is the way we ought to go, and I am sorry I wasn't here for all the discussion previously, but I just wanted to make sure that my views were brought forward on that.

I noted in particular the statement by Dr. Tarter at Lawrence Livermore, and his statement was that, "We have maintained the nuclear weapons stockpile without nuclear testing since 1992 when the United States entered into a nuclear test moratorium. President Clinton has since signed a comprehensive nuclear test ban treaty aimed at ending nuclear explosive testing on a worldwide basis. Three important factors have enabled us to meet the chal-

lenge to date: First, the weapons intended for the enduring stockpile all have good pedigrees; they went into the stockpile with blue-chip credentials. To date, we have seen no signs of catastrophic aging; however, vigilance is required because nuclear weapons age in very dynamic, not necessarily predictable ways. Both the difficult task of assessing an ever older stockpile and the new challenge of certifying refurbished weapons increase the complexity of stockpile stewardship as time passes." That is his first point.

Second, "we have been able to meet the challenge because of the expertise residing in the technical staff, hands-on nuclear design, engineering, and test experience accumulated through the development of weapons now in the stockpile, but that experience base is also aging. So we are taking important steps to archive that experience and make prudent use of it while we have it. That includes working with the next generation of scientists and engineers to tend to the current needs of the stockpile and lay the foundation for the long-term program for stockpile stewardship."

Third point: "We have worked closely with Assistant Secretary Vic Reese and others in defense programs to design the overall program and provide the technical basis for its ambitious goals. We achieved what capabilities the program needs by when and worked throughout the 1990's to achieve, enabling scientific and engineering advances. Steady technical progress on a number of fronts moves us closer to the long-term goals of the Stockpile Stewardship Program."

So the points he makes—and certainly there is no one more experienced in nuclear matters than the Lawrence Laboratory out there, and the head, the director of it, Dr. Tarter. So I think when we have that and the former Chairmen of the Joint Chiefs of Staff, I come down on the side that I think it is safe to go ahead with this. And I don't ask that as a question, obviously. It is more a statement than anything else, but I wanted to get my views on record.

Thank you, Mr. Chairman.

Senator COCHRAN. Thank you, Senator Glenn.

Dr. Bailey, we were talking about the twin programs of maintaining a testing capability at the same time we have the Stockpile Stewardship Program and the attendant costs that that is going to require us, as Appropriations Committee members, and others to deal with. Senator Stevens made a very compelling statement about the seriousness of that as a dilemma.

What is your reaction to the situation in terms of trying to design a program for maintaining the deterrent that we have to have in view of the facts that we find existing around the world in terms of nuclear threats that threaten our security interest? Are we getting into a position where we are overreacting to the threat or to the possible deterioration of our deterrent by spending these huge sums of money? I don't know whether you have looked into the program that is outlined, but it is a very costly program at the laboratories. And I didn't realize that, as Senator Stevens said, we were also going to be maintaining the same kind of capability of testing and having the people in place and all of that, facilities, as if there were no test ban in effect.

Is all of that necessary?

Ms. BAILEY. The laboratory directors agreed with the statement that Senator Glenn has set out on the basis that there would be a Stockpile Stewardship Program and equally, if not more important, that there would be Safeguard F—that is, the national security clause escape clause that would allow us to conduct a nuclear test if we needed to.

They said at the same time that this would not be as good, technically, as nuclear weapons testing. It would never give you the kind of confidence in the reliability and safety of your weapons that testing would, but that we could make do with it. It would be sufficient, in other words.

If you take away either of those two points, either the Stockpile Stewardship or the ability to test in an emergency, I think that you would lose the laboratory directors' support. You would have an unacceptable level of erosion in our confidence in the stockpile.

Now, if your question is do we need to have confidence in the stockpile, I would say yes, for two basic reasons. We still face a capability in Russia and emerging in China that is extremely powerful. So while intent matters a great deal, capability matters even more. And as we have heard today, Russia is actually increasing its reliance on nuclear deterrence and increasing, I would add, its nuclear weapons capabilities. And I can go into that if you wish.

The other part of it is that there are proliferant nations developing or having already acquired weapons of mass destruction against which our nuclear deterrent may be the only effective response.

So, yes, we still need the deterrent because the threats are there. The directors of the technical laboratories have said we either need to test or, at a bare minimum, we need to have the escape testing clause coupled with the Stockpile Stewardship Program.

Now, having said all that, my personal view is that stopping testing is a political imperative. It is not something that is technically driven. If we need to test in order to prove stockpile stewardship or to maintain our deterrent, it seems to me that we need to do a good scrub on the costs versus benefits of that political imperative. And if it is going to be extremely costly in terms of our deterrent and in terms of finances, is it really worth the political gain that you would get by satisfying the worldwide clamor for us to cease testing? The nonproliferation goals that the administration has set out for this treaty cannot and will not be accomplished.

And I think that is the key. We need to keep our eye on the key. And the key is that you can't meet the nonproliferation goals of this treaty.

Senator COCHRAN. Well, I think this has been a very helpful and certainly informative hearing. I have learned a lot, and I know that the others who have had an opportunity to come hear the testimony and the questions and answers have learned a great deal as well. While it is not a requirement of non-government witnesses to respond to questions that are submitted after a hearing, I have been told that there may be Senators on the Subcommittee that would like to have the opportunity to submit questions to this panel. And if you have the opportunity to receive those questions, I hope you could respond if you can. We can't require you to, but

that has been a request I have received, and I submit that to you for your consideration.

This concludes the hearing. We appreciate so much the participation of our outstanding witnesses who have testified today. We will continue to review the implications for nonproliferation with respect to the Comprehensive Test Ban Treaty and other issues in this Subcommittee during the balance of the year. For the time being, though, the hearing will be in recess.

[Whereupon, at 4:24 p.m., the Subcommittee was adjourned.]

APPENDIX

TESTIMONY OF ACDA DIRECTOR AND
ACTING UNDER SECRETARY OF STATE JOHN HOLUM

Before the Senate Committee on Governmental Affairs
International Security, Proliferation & Federal Services Subcommittee

March 18, 1998

Good afternoon Mr. Chairman and members of the Subcommittee. I am pleased to join you to discuss the national security benefits of the Comprehensive Nuclear Test-Ban Treaty (CTBT). I am equally pleased that your Committee is holding hearings on this historic Treaty now pending in the Senate. Your first hearing last October helped focus on the issues. I trust this hearing will further the process of rendering Senate advice and consent.

As you know, the President has called on the Senate to provide its advice and consent this year. As soon as the Senate has approved NATO expansion, it should act expeditiously to consider and approve the CTBT. These agreements, individually and together, will ensure that the next century brings us a safer and more secure world. But continued U.S. leadership is required. Just as the United States led the successful effort to negotiate the CTBT among the 61 members of the Conference on Disarmament and was the first state to sign the Treaty, we should be among the initial states to ratify it as well.

The CTBT overwhelmingly serves our national interest. Let me describe how it does so.

First, by constraining the development of more advanced nuclear weapons by the declared nuclear powers, the CTBT essentially eliminates the possibility of a renewed arms competition such as characterized the Cold War. Without the ability to conduct nuclear explosive tests, none of the weapon states will be able to develop, with high confidence, new, more advanced weapons. For prudent military planners, this means that advanced new types of nuclear weapons will be precluded.

With all five declared nuclear weapon states effectively frozen at current levels of weapons development, a 50-year spiral of escalation will be ended. The United States is currently in a position to reap maximum benefits from such a freeze. Prompted by Congressional legislation, the U.S. has effectively left the testing business -- the last U.S. nuclear test explosion was in 1992. We have no plans and no military requirements to test. All the more reason, then, to hold others to the same standard we already observe.

The CTBT and the strategic nuclear arms reduction process are mutually

reinforcing. The test ban provides confidence that neither side is making significant qualitative improvements in its arsenal, thus fostering a stable environment for further reductions. The CTBT will not eliminate a single nuclear weapon. But it will enhance the START process and help us further reduce the roles and risks of nuclear weapons.

Second, the CTBT also is a nonproliferation treaty. It will erect a further barrier to the development of nuclear weapons by states hostile to our interests and others. Even if a non-nuclear weapon state were able to assemble sufficient nuclear material to produce a simple fission weapon, the CTBT would force it to place confidence in an untested design (which military leaders might find unacceptable), and it would constrain the development of nuclear weapons beyond simple fission designs. Without access to testing data, a would-be proliferator cannot develop with any degree of confidence a compact boosted weapon. Design of a two-stage thermonuclear weapon is even more complicated, and confident development even more dependent on test data.

Some observers point out that the bomb used in Hiroshima was never tested. True enough, but we had to dig a hole under a B-29 to load it aboard. It would be a challenging task for an emerging nuclear weapon state, likely requiring nuclear explosive tests, to design nuclear weapons in the sizes, shapes and weights most dangerous to us -- compact weapons deliverable in long-range airplanes and missiles, or very small, low-yield, nuclear weapons to be used as terrorist devices or in regional conflicts.

Third, quite apart from the sheer technical obstacles to nuclear weapon development posed by a CTBT, the existence of the Treaty will strengthen international nonproliferation standards and the Nuclear Non-Proliferation Treaty regime, and give the U.S. a stronger hand to lead the global nonproliferation effort.

The nuclear weapon states' commitment to conclude a CTBT in 1996 was instrumental in achieving the indefinite and unconditional extension of the NPT in 1995. This was to be expected. The non-nuclear weapon states have always seen a ban on nuclear testing as an essential step by the nuclear weapon states to fulfill their part of the NPT bargain in exchange for a commitment from the others to forego nuclear weapons.

Largely due to U.S. initiatives, agreement on the CTBT text was reached on schedule, and the Treaty has now been signed by 150 countries, including the five nuclear-weapon states. The next step is ratification by the U.S. and the other nuclear weapon states, and concerted efforts to bring the Treaty into force.

Ratification is also critical to our ability to effectively enforce the NPT regime, which is no easy task. The NPT, now with nearly universal membership at

185 states, has established a global norm of nonproliferation which discourages most states from even considering nuclear weapon programs. The CTBT will reinforce this global norm against weapons development, and hold the existing programs of other states in check.

However, as recent history demonstrates, not all states feel bound hy norms or Treaty obligations. Even states that appear to be complying with the legal obligations of the NPT may go quite far in pursuit of nuclear weapon capabilities without clearly violating it. Thus, a challenge for the U.S. is to insist on strict compliance by the non-nuclear weapon states with both the letter and the spirit of the NPT obligation to forego nuclear weapons. That requires a united world, with the means to isolate and sanction those who do not respect the law. It requires a strong global political commitment to the NPT, so countries will be prepared to negotiate new agreements with the International Atomic Energy Agency incorporating the strong new safeguards we finally achieved last year.

Think about the potential proliferation consequences of an extended delay in U.S. ratification, accompanied, as would probably be the case, by such a delay in ratification by Russia and China. It could be seen as a repudiation of the political commitment made at the time of the NPT Extension Conference and during the course of CTBT negotiations. It could send the message that the weapon states are unwilling to ever break with their Cold War reliance on nuclear arms -- exactly the wrong signal to send. Under these circumstances, we would have significantly harmed U.S. efforts to persuade the international community to join us in insisting on strict compliance with the NPT and to use the "strengthened review process" agreed to at the 1995 NPT Review Conference to advance our nonproliferation goals.

The fourth reason to ratify the CTBT is that it is effectively verifiable. The U.S. successfully fought for tough verification provisions in the negotiations and would not have signed the Treaty if it were not effectively verifiable. What do we mean by this term?

Let me begin with what it does not mean: effective verification does not mean that the U.S. has a guarantee that it would be able to detect and attribute all tests worldwide, under all circumstances, should violations occur. Effective verification involves political judgments as well as technical ones; it involves determinations of acceptable levels of uncertainty. To make a judgment about what is acceptable, we need to weigh the benefits of the treaty compared to the likelihood of violations and the potential costs to the U.S.

Thus, our judgment that the Treaty is effectively verifiable reflects the belief that U.S. nuclear deterrence would not be undermined by nuclear testing that the United States might fail to detect. It further reflects our belief that the Treaty will

effectively deter violations in light of the significant possibility of detection in combination with the high political costs if a violation is detected. Moreover, the Treaty's verification regime, along with our national intelligence means and diplomatic efforts, will limit an evader's options and provide us with the means to take prompt and effective counter action should we suspect a violation has occurred. In sum, we believe that the benefits of the Treaty to U.S. national security clearly outweigh the potential costs and likelihood of undetected violations.

We would be concerned about the possibility of any violation, even a test with a nuclear yield of a few pounds. Quite apart from the potential military significance of such a test, it would have serious political consequences and, moreover, could provide us important information about another states' weapons program. With or without a CTBT, monitoring the nuclear-related activities of the nuclear powers and potential proliferators will continue to be a high priority job of the intelligence community. This brings me to a fifth reason to ratify the Treaty: it will improve our nuclear test monitoring capabilities.

The CTBT augments the current national technical means for monitoring worldwide nuclear testing with additional tools and data not previously available to the United States. It is a net plus. The CTBT establishes global networks of four different types of sensors -- seismic, hydroacoustic, radionuclide and infrasound -- that can detect explosions in different physical environments. These networks, comprising 321 monitoring stations, are called the International Monitoring System (IMS). Data will be coming in continuously from the IMS. Some of this data will be recorded at stations in sensitive parts of the world to which we would not otherwise have access. Consider, for example, that the IMS includes 31 monitoring stations in Russia, 11 in China and 17 in the Middle East.

The CTBT permits any party to request an on-site inspection to clarify whether or not a violation has occurred, and allows for the use of a range of technologies during that inspection to gather any facts which might assist in identifying a possible violation. With the assent of the CTBT decision-making body, the Executive Council, the U.S. would thus be able to ensure that ambiguous evidence is further investigated. The Treaty further provides for consultation and clarification of ambiguous situations and confidence building measures that will enhance our confidence in our monitoring capabilities. The Treaty also provides the legal basis and an international forum with which to promote and enforce a global end to nuclear testing.

We had a demonstration of some of these capabilities last summer. In the Kara Sea, near a former Soviet nuclear testing facility where there had been ongoing activity, seismic sensors detected an event. This raised red flags about a potential tests in the area and we began collecting and analyzing data. The event,

with a seismic signal equivalent to about one-tenth of one kiloton, was detected by several IMS stations in Russia, Norway, Sweden and Finland. Our intelligence community could confidently locate the event in the Kara Sea even though a major seismic station in the region was out of commission.

After analysis, we were satisfied that there was no nuclear explosion, based solely on remote sensing and study. If the Treaty were in force we could, of course, choose to use its on-site inspection regime or consultation and clarification procedures if there are similar incidents.

Sixth, the CTBT will allow us to maintain a safe and reliable nuclear deterrent.

As a condition of U.S. support for a zero-yield CTBT in the summer of 1995, President Clinton announced safeguards which collectively recognize and protect the continued important contribution of nuclear weapons to U.S. national security. The first safeguard mandated the conduct of a Stockpile Stewardship program -- for which there must be sustained bipartisan support from Congress -- to ensure a high level of confidence in the safety and reliability of our nuclear weapons stockpile.

Such a program to maintain our nuclear deterrent under a CTBT was established in 1993 by the Department of Energy in close collaboration with the Strategic Command and the Joint Staff at the Department of Defense. The program builds on DOE's longstanding, rigorous program of stockpile surveillance and component testing with more sophisticated laboratory experimentation and advanced computations. Its point of departure is a rich database from over 1,000 past nuclear weapon tests that characterize the operation of our weapons and will serve as a benchmark for analyzing the operation of our weapons in the future.

The program has earned the confidence of our military leaders, independent weapon scientists and the Directors of the three nuclear weapon laboratories. During a February visit to Los Alamos National Laboratory, President Clinton was joined by the laboratory Directors -- Dr. Browne of Los Alamos, Dr. Robinson of Sandia and Dr. Tarter of Lawrence Livermore. The Directors affirmed that [they] "are confident that the Stockpile Stewardship program will enable us to maintain America's nuclear deterrent without nuclear testing."

If, in the unlikely event doubts about our ability to maintain the arsenal under a CTBT arise at some point in the future, the Treaty provides for withdrawal from the Treaty if a party decides that its supreme interests are jeopardized. President Clinton has decided (and stated as one of the Safeguards that condition U.S. support for the Treaty) that the safety and reliability of our nuclear weapons is a supreme national interest.

To implement this condition, the President established a certification process requiring the weapon design laboratories and the Department of Defense to review annually all nuclear weapon types. The Secretaries of Energy and Defense, based on the independent advice of the laboratory Directors, the Nuclear Weapons Council, and the Commander-in-Chief of Strategic Command, are required to report annually to the President whether the U.S. nuclear weapons stockpile is, to a high degree of confidence, safe and reliable. If our nuclear deterrent cannot be so certified, the President, in consultation with the Congress, has made it clear that he would be prepared to withdraw from the Treaty under the "supreme interests" clause in order to conduct whatever testing might be required.

I am pleased to report that the Administration forwarded to the Congress February 12 the second annual certification from the Secretaries of Defense and Energy that the nuclear stockpile remains safe and reliable, confirming that the U.S. will enter the CTBT regime with a proven, well-tested arsenal.

In addition to the two safeguards referred to above, U.S. adherence to the CTBT is conditioned on four other safeguard related to our stockpile stewardship program and Treaty monitoring. Together these six safeguards include:

A. A Science Based Stockpile Stewardship program to insure a high level of confidence in the safety and reliability of nuclear weapons in the active stockpile, including the conduct of a broad range of effective and continuing experimental programs.

B. Modern nuclear laboratory facilities and program in theoretical and exploratory nuclear technology which will attract, retain, and ensure the continued application of our human scientific resources to those programs on which continued progress in nuclear technology depends.

C. Maintenance of the basic capability to resume nuclear test activities prohibited by the CTBT should the United States cease to be bound to adhere to this treaty.

D. A comprehensive research and development program to improve our treaty monitoring capabilities and operations.

E. Continuing development of a broad range of intelligence gathering and analytical capabilities and operations to ensure accurate and comprehensive information on worldwide nuclear arsenals, nuclear weapons development programs, and related nuclear programs.

F. The understanding that if the President of the United States is informed by the Secretary of Defense and the Secretary of Energy (DOE) -- advised by

the Nuclear Weapons Council, the Directors of the DOE's nuclear weapons laboratories and the Commander of the U.S. Strategic Command -- that a high level of confidence in the safety or reliability of a nuclear weapon type which the two Secretaries consider to be critical to our nuclear deterrent could no longer be certified, the President, in consultation with Congress, would be prepared to withdraw from the CTBT under the standard "supreme national interests" clause in order to conduct whatever testing might be required.

Some may ask, why should we act now to ratify? The condition for the Treaty's entry into force is ratification by 44 identified countries -- members of the Conference on Disarmament possessing nuclear power or nuclear research reactors. Of the 44, North Korea, India and Pakistan have not even signed, although Islamabad voted to adopt the Treaty at the United Nations General Assembly.

If the Treaty is in our interests -- as I believe it is -- and especially if we are going to comply with it anyway, then we should work to bring it into force as soon as we can.

U.S. ratification will encourage further ratifications, just as U.S. ratification of the Chemical Weapons Convention facilitated ratification by Russia, China, Pakistan and Iran. The most effective means of moving reluctant states is to make them feel the sting of isolation on this issue and not to provide them with the "cover" of U.S. inaction. U.S. delays in ratification would compromise our efforts to encourage others. In particular, with regard to India and Pakistan, it is important that when the President travels to the subcontinent later this year he does so with U.S. ratification in hand.

In addition, if the CTBT has not entered into force by September 1999, that is, three years after it was opened for signature, the Treaty provides for an annual conference of countries that have ratified to consider how to facilitate early entry into force. The U.S. should be there. But, to participate, the U.S. must ratify.

Moreover, even before entry into force, our ratification and that of other key states will help to constrain non-signatories from conducting nuclear tests. The CTBT already has advanced the goal of ending nuclear weapon testing by promoting an international norm against testing. The five nuclear weapon states unilaterally declared moratoria on testing at different points during the past eight years in anticipation to or in response to the Treaty negotiations. The international community endorsed the Treaty after the conclusion of negotiations by a 158-3 vote in the United Nations General Assembly. In the 18 months since it was opened for signature, 150 states have signed.

If U.S. ratification is delayed for an extended period, the norm that we seek to advance could unravel. Moreover, we would run the risk that other nuclear weapon states -- which are currently observing self-imposed moratoria on test explosions -- could decide, in the absence of firm legal constraints, to declare they do not intend to ratify the Treaty and to resume testing.

Lastly, it is essential that the U.S. continue to demonstrate leadership with regard to the crucial treaties and regimes that strengthen our global nonproliferation effort, as it did during the CTBT negotiations. The U.S. needs to promote the CTBT's entry into force, not complicate it.

Mr. Chairman, I have endeavored to elaborate for the Committee the reasons the CTBT is in the national security interests of the United States. Its obvious benefits have led four former chairmen of the Joint Chiefs of Staff -- Generals John Shalikashvili, Colin Powell and David Jones, and Admiral William Crowe -- to endorse the Treaty. And, significantly, the Treaty enjoys overwhelming public support. A recent nationwide poll 10 showed 70 percent of the people, Republicans and Democrats alike, favor a treaty to prohibit further nuclear explosions worldwide.

At its very core, here is what the CTBT issue comes down to, what the Senate must consider when making its decision: the nuclear arms race is over; arsenals are shrinking; our dramatically fewer remaining weapons can be kept safe and reliable by other means; we don't need tests; proliferators do; the American people overwhelmingly want testing banned.

Mr. Chairman, this concludes my prepared remarks. I would be happy to take your questions now or for the record.

STATEMENT BEFORE THE SENATE SUBCOMMITTEE ON INTERNATIONAL SECURITY, PROLIFERATION, AND FEDERAL SERVICES
"THE COMPREHENSIVE TEST BAN TREATY AND NUCLEAR NON-PROLIFERATION"
WEDNESDAY, MARCH 18, 1998

SPURGEON M. KEENY, JR.
PRESIDENT AND EXECUTIVE DIRECTOR
THE ARMS CONTROL ASSOCIATION

Mr. Chairman and members of the Committee, I am honored to be here today at your invitation to present my views on the relationship between the Comprehensive Test Ban Treaty and nuclear non-proliferation. I particularly appreciate this opportunity to discuss with you an issue with which I have been involved throughout my professional career.

As it might be relevant to your questions, let me say a few words about my background relating to this issue. As a junior Air Force officer and subsequent civilian employee, I was in charge of the office that followed the Soviet nuclear weapons program in the Directorate of Intelligence, HQ USAF. I was involved in the analysis of the Soviet test in August 1949 that signaled the first instance of nuclear proliferation. Until the mid-1950's I represented the Air Force on the Joint Atomic Energy Intelligence Committee that prepared the national assessments of the Soviet nuclear threat. In 1958 as Technical Assistant to Dr. James Killian, President's Eisenhower's first Science Advisor, I staffed the advisory committees that led to Eisenhower's decision to pursue a comprehensive test ban and then served as the staff director for the U.S. delegation to the international Conference of Experts that concluded a test ban could be verified. In the fall of 1958, I was a member of the U.S. delegation to the first negotiations for a test ban. I followed these issues during the Kennedy and Johnson administrations as a Senior Staff Member of the NSC and as the technical assistant to the President's Science Advisor. In 1965, I was Staff Director for the special Committee on Nuclear Proliferation, chaired by Roswell Gilpatric, which advised President Johnson on nuclear non-proliferation issues. On the basis of this report, Johnson subsequently directed Secretary of State Dean Rusk to complete the NPT despite opposition from the State Department bureaucracy and several key allied governments. In the mid-70's, I was chairman of the study group that produced the report, "Nuclear Power Issues and Choices," which had a major influence on President Jimmy Carter's nuclear non-proliferation policy. As Deputy Director of the Arms Control and Disarmament Agency under President Carter, I backstopped in Washington the renewed

comprehensive test ban negotiations which, despite considerable progress, bogged down after Soviet intervention in Afghanistan. With this background, I am indeed pleased that the CTBT has at last been completed and is now before the Senate for its advice and consent.

Mr. Chairman, I would like to commend you and your committee for holding hearings on the impact of the CTBT on U.S. nuclear non-proliferation policy. This is the reason that this treaty is of such great importance to U.S. security. In your invitation to me to appear as a witness, you asked me to focus my remarks on five specific "Reasons for Ratification" from the White House Working Group on the CTBT. In my remarks I will explain why I agree with each of these reasons:

1. "The CTBT will constrain the development of more advanced nuclear weapons by the declared nuclear powers."

I believe the CTBT will severely constrain the development of more advanced weapons by the declared nuclear weapon states. In fact, as a practical matter, it will prevent such developments by these states. By such developments, I mean not only radical new concepts, such as nuclear explosion pumped x-ray laser weapons and pure fusion weapons, but also new designs for "classical" two-stage thermonuclear weapons with significantly different parameters. Even the very sophisticated research facilities and advanced supercomputers called for in the U.S. Stockpile Stewardship and Management Program (SSMP) will not permit the development, production and deployment of such advanced new weapons in which responsible officials would have confidence. Pursuit of new designs would appear to be even more problematic in the case of the other nuclear weapon states that will not share the luxury of the elaborate facilities available to the United States in the U.S. stewardship program.

Within the U.S. stewardship program one might make minor modifications in existing weapons designs to take into account changes in materials or manufacturing techniques which could be checked out by supercomputers and non-nuclear testing. However, to maintain a high level of confidence in the U.S. stockpile, such modifications would have to be closely controlled and held to an absolute minimum. And there is no reason to think many such changes would be deemed necessary even over a very extended period of time.

All of this is not to say that the CTBT can prevent scientists in the weapons laboratories from thinking about new designs which could be of interest in the unlikely event that the test ban regime collapsed. It is indeed difficult, however, to imagine the circumstances in which responsible

political, military or scientific leaders in any country would be interested in pursuing unproven designs in the absence of testing when a wide variety of highly reliable, proven weapons are already available in their arsenals.

2. "The CTBT will strengthen the NPT regime and the U.S. ability to lead the global nonproliferation effort."

I believe the CTBT will substantially strengthen the NPT regime. Failure of the United States to ratify the CTBT promptly will seriously undercut U.S. ability to carry out its critical role in leading the global non-proliferation effort.

The Nuclear Non-Proliferation Treaty (NPT), which constitutes the framework for the non-proliferation regime, is by its very nature discriminatory since it divided the world into nuclear weapon haves and have-nots--the five nuclear weapons states, the United States, Russia, Britain, France and China as opposed to the rest of the world. The treaty was based on the correct assumption that most countries are more concerned with preventing their neighbors and adversaries from acquiring nuclear weapons than with maintaining the option to acquire such weapons themselves or with requiring the existing nuclear weapon states to divest themselves of weapons as a precondition. Nevertheless, serious concern about the treaty's discriminatory nature was, and remains, very real. Article VI was included to obligate the nuclear weapon states "to pursue negotiations in good faith on effective measures relating to the nuclear arms race at an early date and to nuclear disarmament,..." From its entry into force, some 185 states have joined the NPT--all but five of which, the nuclear weapon states, thereby voluntarily gave up the nuclear weapons option in part based on the arms control assurances provided in Article VI.

When President Eisenhower initiated the first comprehensive test ban negotiations in 1958, he saw it as the best hope to constrain both the nuclear arms race with the Soviet Union (vertical proliferation) and the spread of nuclear weapons beyond the three countries that then possessed them (horizontal proliferation). President Kennedy shared these hopes and resumed the negotiations. Unfortunately, these early negotiations failed to produce agreement.

A decade later the NPT, which was successfully negotiated under President Johnson and ratified by President Nixon, provided a strong barrier to horizontal proliferation. The NPT also banned nuclear testing for all non-nuclear weapon parties to the treaty since they foreswore the development or acquisition of nuclear explosive devices.

In these circumstances, the non-nuclear weapon states that were parties to the treaty looked on the continued nuclear testing by the nuclear powers as a constant reminder of the discriminatory nature of the NPT. They looked on progress in achieving a global comprehensive test ban as the most visible demonstration of the willingness of the nuclear weapon states to end the nuclear arms race. In fact, the global cessation of nuclear testing has become the litmus test of the seriousness of the nuclear weapon states to meet their obligations under Article VI.

When the NPT came up for renewal at its 25th anniversary conference in 1995, there was considerable dissatisfaction with the record of the nuclear weapons states in fulfilling their obligations under Article VI, particularly with regard to the nuclear test ban. The Conference had to decide whether to extend the NPT indefinitely or for only a fixed period. While the majority of participants were willing to extend the treaty indefinitely, a significant minority favored a fixed period in order to maintain pressure on the nuclear weapon states to meet their Article VI obligations. In view of the significance of the decision, the Conference sought approval of indefinite extension by consensus rather than the simple majority required by the treaty. This consensus was achieved by the adoption of a resolution of Principles and Objectives which contained many commendable generalizations but one very specific objective--the completion by the Conference on Disarmament of a universal CTB Treaty no later than the end of 1996.

In a remarkable negotiation, the treatv was completed on schedule, in large part due to initiatives taken by President Clinton, and the CTBT was opened for signature on September 24, 1996. To date 149 states have signed the treaty, including the five nuclear weapon states, and nine countries--soon be joined by France and Britain--have ratified the treaty. However, many key countries, including Russia and China, will not move on ratification until the U.S. Senate acts.

3. "The CTBT will constrain 'rogue' states' nuclear weapons development and other states' nuclear capabilities."

I believe that the CTBT will constrain, but cannot in itself prevent, so-called "rogue" states and other states from obtaining a first generation nuclear weapons capability. When the CTBT enters into force with essentially worldwide support, including the five nuclear weapon states, an international legal norm against testing will be established. While this could not prevent testing by a "rogue" state, the act of testing would, by violating a universal norm, put that state at odds with the entire international community and make it a prime candidate for sanctions.

Technically such a "rogue" state could develop a first generation nuclear weapon without testing. Such a weapon would probably be similar to the gun-type U-235 weapon that destroyed Hiroshima, which had not been tested, or the plutonium implosion weapon that was successfully tested at the Trinity site prior to use against Nagasaki, or the early U-235 implosion weapons tested by China. Such weapons are known to have been developed (and subsequently destroyed) by South Africa without tests, and presumably by Israel and Pakistan as well. India's program is based on a single test conducted in 1974.

While such a "rogue" state might make marginal improvements without testing to weaponize these initial devices, it would not be able to go very far in optimizing and miniaturizing fission weapons and would certainly not be able to develop thermonuclear weapons without extensive testing or access to detailed plans and direct technical assistance from a nuclear weapon state that had successfully developed and tested them. Although the undeclared nuclear weapon states, India, Israel and Pakistan, which presumably already have first generation weapons, are more experienced in the field, they would also not be able to develop thermonuclear weapons without testing or external assistance by a nuclear weapon state. If a state were a member of the NPT, such a program would of course be a violation of the NPT and would probably be revealed by the new, more intrusive IAEA inspection program, which can inspect suspicious sites. If not a member of the NPT, the "rogue" state's weapons development program could be greatly complicated but not indefinitely blocked by reduced access to external technical support.

4. "The CTBT will improve America's ability to detect and deter nuclear explosive testing."

Under the CTBT, the establishment of the International Monitoring System and mandated procedures for on-site inspections of suspicious events will significantly supplement the already impressive unilateral U.S. capabilities to detect and thereby deter nuclear testing.

The United States already has in place a very effective system of national technical means (NTM) with which it has successfully monitored nuclear testing world-wide since the first Soviet nuclear test in August 1949. I do not think that it is necessary or appropriate for me to elaborate on the various elements of this system with which I am sure you are familiar. I would point out, however, the U.S. system has been able to call upon the considerable capabilities of the several thousand world-wide unclassified seismic stations to supplement its classified system.

The International Monitoring System (IMS) when fully operational will have over 300

seismic, hydroacoustic, infrasound and radionuclide monitoring stations. The system is credited with having a world-wide detection capability down to about one kiloton, although I believe in geographic areas of special interest it will be considerably better than that. The IMS has the advantage that it will be an open international operation so that all parties to the treaty have access to the data and will not be solely dependent on U.S. conclusions which are often based on data that the United States is not prepared to share and which some parties may perceive as biased. Moreover, the treaty establishes specific procedures to allow on-site inspections of suspicious events. The prospect of on-site inspections should act as a powerful deterrent since they would have a good chance of identifying even very small tests and, if the country where the event occurred rejected or obstructed the inspection, that action would strongly suggest that the party in question was in fact trying to hide a clandestine test. In making the case for a suspicious event, the United States can also present information from its powerful classified NTM system that it would not be willing to share with the rest of the world on a routine basis.

The powerful synergistic effect of the U.S. NTM capabilities and the IMS is well illustrated by the earthquake in the vicinity of Novaya Zemlya on August 16 last year. U.S. photo reconnaissance satellites detected unusual activity at the Novaya Zemlya test site in August that in retrospect was probably associated with permitted subcritical experiments of the type the United States was conducting at the same time at the Nevada test site. Thus alerted, the intelligence community was understandably alarmed when a seismic event was reported whose initial location was so poorly defined that it might have occurred at the test site. As more seismic data became available it was apparent within days to both U.S. government and international seismologists that the event actually had occurred 130 kilometers from the test site beneath the floor of the Arctic Ocean. More careful examination revealed that the seismic signal was in fact consistent with an earthquake and indeed a very small characteristic aftershock was subsequently identified to have occurred a few hours after the main event. It was thus concluded that the earthquake was unrelated to the activity at the test site. If the CTBT had been in force and the event had been much closer to the test site, the United States would have been in a position to request an on-site inspection.

I think it is significant to note that even before the IMS became fully operational, elements of the system were able to locate accurately this event, which had a yield equivalent to about 100 tons of TNT, or one-tenth the advertised threshold of the system, as well as an aftershock that had an equivalent yield of about 10 tons of TNT or one-hundredth of the one kiloton threshold.

In judging the "effectiveness" of a detection system, it must be recognized that every system that depends upon technical measurements has a threshold below which signals are lost in the background noise. In the case of the CTBT, one can with high confidence detect tests down to one kiloton high explosive equivalent and probably with less confidence to a considerably lower level. But there will always be a range of yields above zero that cannot be detected.

Despite these technical limitations, the verification system can still be correctly defined as "effective" because tests below the threshold do not constitute a security risk to the United States. Clandestine testing below the threshold by the nuclear weapon states would not permit development of radically new or significantly improved nuclear weapons. In the case of non-nuclear weapon states, tests below the threshold would not contribute to the production of a first generation primitive weapon, which would either be tested at full yield or be produced without testing since little would be gained by testing such weapons at very low yields.

I should add that, in addition to detection by sensors recording the event itself, a potential clandestine tester would have to take into account the possibility that his actions would be revealed by human sources or by a failure in communications security. Such sources of information, although unquantifiable, would have a further deterrent effect on low yield clandestine testing.

5. "CTBT ratification by the United States and others will constrain non-signatories from conducting nuclear tests."

I believe that prompt ratification of the CTB is critical to U.S. efforts to maintain an effective leadership role in maintaining and strengthening the nuclear non-proliferation regime, which is the principal constraint on testing by non-nuclear weapon states.

It has been suggested that the Senate does not have to hurry in considering the CTBT since India, one of the 44 countries that must ratify the treaty for it to enter into force, has stated emphatically that it will not ever sign the treaty. The urgency in U.S. action derives not only because our leadership role will probably stimulate a wave of ratifications, including Russia and China, but also because it will give the United States a seat at a special Conference that can be called after September 24, 1999 (three years after the treaty was opened for signature) at the request of a majority of the states that have deposited their instruments of ratification to decide what measures can be taken to accelerate the ratification process and facilitate early entry into force of the treaty. If Indian participation does not appear to be forthcoming, the conference can recommend a number of ways

to bring the treaty into force provisionally. If the United States fails to ratify the treaty before September 24, 1999, it will only be able to participate in the conference as an observer, without a vote or voice in these efforts to bring into force a treaty in which it has played such a central role over the years.

In the year 2000, there will be a major NPT Review Conference. The main focus of attention at the Conference will be on the extent the nuclear weapon states have met their obligations under Article VI and implemented the Principles and Objectives Resolution that accompanied the indefinite extension of the NPT. If the United States has ratified the CTBT and the treaty is moving toward entry into force, the United States will be in a very strong position to press the Conference to support other efforts to strengthen the non-proliferation regime with respect to potential proliferators. But if the treaty has been rejected or is still before the U.S. Senate, the United States will be strongly attacked at the NPT Review Conference as the barrier to an effective non-proliferation regime and will lose much of the leadership role it has achieved over the years. Some have even suggested that U.S. failure to act on the CTBT could persuade some non-aligned countries to withdraw from the NPT, which would seriously undermine efforts to achieve global support for U.S. nuclear non-proliferation policy.

In summary, I believe the Comprehensive Test Ban Treaty is an extremely important component of the U.S. strategy to establish a permanent global non-proliferation regime. I urge the Senate to act promptly to give its advice and consent to the treaty in order to reinforce the leadership role of the United States in extending and strengthening the non-proliferation regime. Thank you.

Statement

By

Dr. Kathleen C. Bailey

Before the

United States Senate
Committee on Governmental Affairs

Subcommittee on International Security,
Proliferation, and Federal Services

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Introduction

Mr. Chairman, Members of the Committee, I am very pleased to appear before you today to address the relationship between nuclear nonproliferation and the Comprehensive Test Ban Treaty (CTBT). The views I express today are my own and not necessarily those of any institution.

For most of the last 22 years, I have been working on issues related to nuclear nonproliferation and arms control. In 1976, I was the first social scientist to be hired at Lawrence Livermore Laboratory, where I worked closely with nuclear weapons scientists and engineers analyzing nuclear proliferation intelligence. Subsequently, in Washington, I served as Deputy Assistant Secretary for Intelligence & Research in the Department of State and, later, was Assistant Director for nonproliferation at the Arms Control and Disarmament Agency. I served as the US Government's principal policy official responsible for implementation of the Nuclear Nonproliferation Treaty (NPT) and, as one of my duties, headed our nation's delegations to the preparatory meetings for the 1990 review of the NPT. In 1992, I returned to Lawrence Livermore, where I have focused on measures to limit proliferation, and have authored several books and many articles on the topics of nonproliferation and arms control.

Table 1: Administration's Goals for CTBT

- Constrain nuclear weapons development by non-nuclear-weapons states
- "Save" the Nuclear Non-Proliferation Treaty (NPT)
- Improve ability to detect nuclear testing
- Establish an international norm against nuclear testing
- Constrain development of advanced nuclear weapons by nuclear weapons states

Proponents for the CTBT have said that it will achieve five nonproliferation goals (see Table 1) and will enable America to maintain a safe and reliable nuclear deterrent. Four of the five goals relate to horizontal nuclear nonproliferation—the spread of weapons to additional countries. The fifth goal is to restrict vertical proliferation—improvement of the nuclear weapons capabilities of America and other nuclear weapons states.

The conclusion of my testimony is that the CTBT fails the cost/benefit test. It will not accomplish the nonproliferation goals as claimed, and therefore will have little benefit. At the same time, the treaty will seriously degrade the US nuclear deterrent, and thus the CTBT will have high national security costs.

The "Proliferation Arguments"

The CTBT Will Not Meaningfully Constrain Nuclear Proliferation

Claims made about the value of a CTBT to nuclear nonproliferation have evolved. Whereas once treaty proponents argued that a CTBT would help *prevent* or *severely restrict* nuclear proliferation, they now say that the treaty will *constrain* nuclear weapons development. In fact, however, the CTBT will not meaningfully constrain nations that seek to acquire a workable nuclear weapons design.

A state that wants to produce a nuclear weapon can do so, given adequate time and resources, without nuclear testing. It is well known that some single-stage fission designs are relatively simple, and nations would not need to test them to have sufficiently high confidence that they will work. Gun-type weapons, using enriched uranium, would not necessitate testing. For example, the bomb dropped on Hiroshima was a design that had never been tested, and South Africa indigenously built six gun-type nuclear weapons without testing.

Furthermore, the CTBT would not confine new proliferators to simple designs. Today, non-boosted, implosion-type weapons may also be designed with high confidence, without testing. The level of complexity of the nuclear design possible without testing is dependent on the technological sophistication of the nation concerned.

Nuclear weapons testing is not essential now for proliferating nations, as it once was, because information related to nuclear weapons is now widespread. The technological hurdles faced by US weapon designers in the 1940s are long gone. Universities teach courses in physics, engineering, metallurgy, and chemistry that can provide a sound basis for a nuclear weapons program. The information superhighway enables researchers in remote locations to access thousands of relevant articles and reports, as well as to seek assistance from experts who, prior to the invention of the Internet, were inaccessible. Advanced computers, although not a prerequisite, are readily available and make weapons design easier. The state of knowledge has also advanced with regard to materials, which makes it easier for a nation to design lighter, less bulky weapons than those built at the outset of the US nuclear weapons program. When combined, these variables make feasible for a nation to design with high confidence a nuclear weapon that, in the not-so-distant past, would have considered relatively sophisticated.

Critics may argue that new proliferators would want to test a design—just as the United States usually does—before stockpiling it. However, there are important differences between proliferators' needs, perspectives, and targeting requirements, and those of the United States and Russia. During the Cold War, both sides focused on targeting one another's military sites. A premier objective

has been pinpoint strikes against small targets such as silos, rather than cities. This dictated high-performance delivery systems, which, in turn, required tight parameters on the allowable weight, size, shape, safety measures, and yield. In the case of the United States, these requirements contributed to the US reliance on highly complex designs. Additionally, US and USSR interest in the battlefield effects of their warheads was high, and both have had high standards for reliability.

By comparison, proliferators are likely to target cities, not silos. Their delivery vehicles may be ships, barges, trucks, or Scud-type missiles. Proliferators may not care whether the yield they obtain is exact, may not have tight restrictions imposed by advanced delivery systems or safety standards, are unlikely to have highly complex designs, and may not care about battlefield effects. Furthermore, proliferators may have an entirely different standard for reliability. In other words, it is quite feasible for a nation to develop a device that will work, as long as it does not matter if the yield is exactly known and there are no exacting specifications which must be met. Such differences in requirements may help explain why Pakistan, and perhaps others, have concluded that nuclear testing is not a prerequisite to building a nuclear arsenal.

In summary, the CTBT will not create a significant obstacle to nuclear proliferation. The need for nuclear testing increases in proportion to the complexity of and requirements for the nuclear warhead design. However, it is quite feasible for a nation to design, build, and stockpile nuclear weapons without nuclear testing.

The Non-Proliferation Treaty Is At Risk, Regardless of a CTBT

Robert Bell, Special Assistant to the President for National Security Affairs, makes two points about the linkage between the CTBT and the future of the Nuclear Non-Proliferation Treaty (NPT), both of which imply that the CTBT will be necessary to assure the survival of the NPT. The first statement is that the CTBT and NPT are complementary and, "One without the other isn't going to be viable." Second, Bell says that the NPT will be at risk when the NPT is next reviewed in 2000 if the United States has not ratified the CTBT.

It is an exaggeration to say that the NPT is not viable without the CTBT. The NPT has been valued by its parties since it came into force in 1970 as a means of increasing their security. Absence of a CTBT has not negated, nor will it negate, that value.

Bell is correct, however, in saying that nonratification of the CTBT could contribute to the NPT's political woes. What is missing from his assessment is the fact that CTBT passage will not save the NPT from those problems. For at least

three reasons, discussed below, the NPT will be at increasing risk regardless of whether the United States ratifies the CTBT.

Demand for Timetable for Zero May Unravel the NPT

A contradiction exists which has long been a sore point with many NPT parties and is now building to a crisis which threatens to unravel the NPT. The United States and the other nuclear weapons states pledged in Article VI of the NPT that they would work in good faith toward total nuclear disarmament. Simultaneously they have continued to rely on their nuclear deterrents for security and have said that disarmament is a long-term rather than near-term goal.

Prior to the NPT Review and Extension Conference of 1995, several nations insisted that the nuclear weapons states abandon nuclear deterrence and negotiate a timetable by which zero nuclear weapons would be reached. They used the decision on extension of the NPT as a bargaining tool. Because the nuclear weapons states would not agree either to zero or a timetable, the NPT Conference was very nearly a failure. However, a last-minute compromise was reached which included a commitment to achieve a CTBT and a structural change for future NPT review conferences. Both decisions help set the stage for continuing troubles for the NPT.

The CTBT will be controversial among many NPT parties, who are in the process of discovering that it does not constitute the step toward disarmament that they had thought it was. The CTBT was touted as a disarmament measure because the United States and others said it would help halt "vertical proliferation"—defined as the modernization and enhancement of the capabilities of the declared nuclear weapons states. The view of most NPT parties has been that the United States and other weapons states would be unable to test, resulting in erosion of confidence in reliability and, ultimately, degradation of the usability of the nuclear weapons. This would set the stage for the United States and others to abandon nuclear deterrence and go to zero nuclear weapons.

The objective for the CTBT, from the perspective of many NPT parties, will not be met because the United States and other weapons states are not abandoning nuclear deterrence, but are taking steps to assure that their stockpiles will remain safe and reliable—and therefore usable—despite the testing ban. The US stockpile stewardship program (SSP) is designed to enhance understanding of the physics of nuclear weapons, to assure the ability to remanufacture warheads, to maintain the ability to test if needed, and to certify credibly the safety and reliability of US nuclear weapons. Thus, "nuclear erosion," the goal set for a CTBT by many nations around the world, is effectively undermined by a successful SSP. As a result, many nations and non-governmental groups already

have declared that the CTBT does little or nothing to fulfill the NPT Article VI obligation to abandon nuclear deterrence and move toward zero.

Another part of the compromise reached at the 1995 NPT conference established an enhanced review process for the NPT. This process locks in treaty review conferences every five years, as well as preparatory meetings in the three years preceding the review conferences *to evaluate progress toward meeting the objectives*—which refers primarily to the objective of total disarmament as contained in the NPT's Article VI. Whereas it was previously possible for the United States and other weapons states to say that nuclear disarmament was a goal whose achievement was at a time unknown in the future, there now is expectation that concrete steps be defined and fulfilled. We can therefore expect that each NPT review will be acrimonious and that the risk to the NPT will grow.

Dissatisfaction with US Technology Transfer Restrictions Is Growing

There also has been a long-standing unhappiness among many parties that the United States and other nuclear suppliers are not fulfilling the NPT's Article IV requirements to provide technology for peaceful uses. That dissatisfaction is growing significantly due to the US pressures to stop civil nuclear exports to Iran and other countries, particularly from Russia and China. Although Iran is a party to the treaty and has volunteered to allow visits to its nuclear sites to bolster its claim that there are no illicit activities, the United States is leading a campaign to prevent suppliers from selling nuclear technology to Iran. US officials openly voice suspicions that Iran is working on nuclear weapons, but has not convinced the international community that these claims are based on fact. The US actions are made more disturbing to many NPT parties by the US-led effort to provide nuclear technology and aid to North Korea, which remains in noncompliance with the treaty. It appears to many nations that the United States has rewarded a nation that cheated on the NPT and is punishing one that is seemingly in compliance.

Erosion of NPT's Contribution to Security

Violations of the NPT by North Korea and Iraq, as well as Iran's unconfirmed activities, have contributed to the third major problem that plagues the NPT—erosion of the NPT's security value. The fact that nations can design nuclear weapons and build weapons production facilities without timely detection, and that the international community does not deal effectively with such cheating when it is found, degrades the value of the NPT. The NPT has long been marketed as a means of helping assure security of nations, but these violations and lack of response belie that assurance.

The value of the NPT to its parties' security is further eroded by a phenomenon unrelated to nuclear proliferation—the spread of chemical and biological

weapons (CBW). Increasingly, nations are recognizing that their perceived adversaries are turning to CBW because they are technologically much easier, less expensive, and less observable than nuclear weapons. While NPT parties remain concerned about some nations' nuclear activities, nuclear proliferation is not as prominent a security concern as it once was.

In summary, the NPT is a troubled treaty, regardless of whether the CTBT is ratified or not. Some nations will attempt to hold the NPT hostage to demands for total disarmament on a timetable and/or freer nuclear technology transfers. Willingness to abandon the NPT will increase as nations come to view the NPT as unable to contribute meaningfully to their security. The United States should not ratify the CTBT, and thus compromise the safety and reliability of its own nuclear arsenal, in a futile attempt to ameliorate the NPT's problems.

The "International Norm" Argument is Meaningless

CTBT proponents contend that the test ban will constrain even those who are not party to the agreement from conducting nuclear tests because an international norm will have been created. History is replete, however, with examples when norms—and even legally binding treaties, which are a stronger constraint—fail to inhibit nations. Usually this occurs when a nation views breaking the norm or the treaty to be in its security interests.

The NPT norm against the pursuit of nuclear weapons has been broken repeatedly, both by the treaty's parties and by non-parties. The norm was established when the treaty went into effect in 1970. The list of states which broke or are thought to have broken the norm include: Argentina, Brazil, India, Iran, Iraq, Israel, North Korea, Pakistan, South Africa, South Korea, and Taiwan.

Another example of the failure of an international norm is provided by the history of non-adherence of some parties to the Biological and Toxin Weapons Convention (BTWC), which outlawed the possession of biological weapons. Iraq had signed but not acceded to the BTWC, but proceeded secretly to produce massive quantities of biological agents. The Soviet Union, and later Russia, violated not only the norm, but the treaty. As a party to the BTWC, Russia was obligated not to produce biological or toxin agents, yet there is convincing evidence provided by defectors that Russia continued to do so. Given the non-verifiability of the BTWC, one could argue that the propensity of nations to respect a norm is directly proportional to the probability that violations would be detected. In the case of the CTBT, the lack of verifiability is a serious drawback.

Downsides of the CTBT

The CTBT Is Unverifiable

In his letter of transmittal to the Senate, President Clinton states that the CTBT is effectively verifiable. The is correct only if you define verifiability by weak standards. Let me discuss the definition of "effective verification" and give you the facts that support my conclusion that the CTBT is neither effectively nor meaningfully verifiable.

When I served in the Reagan and Bush Administrations, "effective verification" was accepted to mean "high confidence that militarily significant cheating will be detected in a timely manner." In the case of the CTBT, this would mean that you are highly confident that you will be able to detect, within hours or a few days of the event, any nuclear testing which will provide the tester with militarily significant weapons information. There are at least two key questions that therefore must be addressed: What yield nuclear test can provide militarily significant information? and, Can the CTBT verification system detect to that level?

Experts will disagree on the usefulness of different yields to different testers, but I think they will all concur that less-than-full yield testing can be enormously important, and militarily significant. For example, many in our own nuclear weapons design community wanted to retain the ability to test at some level. Attached is a table, agreed to by all three US weapons laboratories, which makes the point that testing at 500 tons is a very useful testing level, although not sufficient to gain full confidence in all aspects of an existing weapon's performance or to develop sophisticated new nuclear weapons

The lowest possible yield to accomplish new designs as well as safety and reliability depends upon warhead requirements, but most designs could be adequately tested at yields between one and 10 kilotons. 500 tons would be sufficient for reliability testing, but a higher yield would be needed to certify any new design that was a major departure from already-tested designs. Therefore, it is reasonable to assume that 10 kiloton tests would be militarily significant, and tests down to a level of 500 tons may also be.

The International Monitoring System (IMS) of the CTBT is expected to provide the ability to detect, locate, and identify non-evasive nuclear testing of 1 kiloton or greater. However, a nation may conduct nuclear tests evasively, which would allow several kilotons to be tested with little or no risk of detection. One method by which this might be done is through energy decoupling—detonation of the device in a cavity—that can reduce the signal by as much as a factor of 70 are thought to be possible. Thus, a kiloton explosion could be made to look

seismically like a 14 ton explosion fully coupled. A 10 kt explosion could look like a .14 kt explosion.

Let me give you an example. The United States conducted two nuclear tests in the Tatum salt dome located at Chilton, Mississippi. *Sterling*, the test conducted on December 3, 1966, had a yield of 380 tons, but the apparent seismic yield was only 5.3 tons, a reduction by a factor of 71.7.

It is clear that the IMS will not be able to detect nuclear testing below 1 kt and, if the test is evasively conducted, will not detect several kilotons. CTBT proponents say that supplemental data from US national technical means will fill the gap. This is not entirely accurate. The United States has stated that its objective is to have the capability "of identifying and attributing with high confidence evasively conducted nuclear explosions of about a few kilotons yield in broad areas of the globe." The US Intelligence Community acknowledges that this is a "complex task" that "will require a lot of work, time, and the necessary resources" to achieve. For the present, even with a fully functional IMS supplemented with data from US national technical means, it is possible that a militarily significant test could be evasively conducted without detection.

Another problem with detection and *identifying* low-yield events is the large number of signals in these ranges. At lower yields, the number of non-nuclear events of similar size increases (e.g., mining explosions and earthquakes on land, explosions for geophysical exploration, volcanoes at sea, meteorite impacts in the atmosphere). These non-nuclear events increase the total number of events to be processed by a verification system, and a small percentage of them generate signals similar to those expected from nuclear explosions. This increases the difficulty of identification.

In addition to its technical limitations, the IMS has other problems. A number of the countries in which the facilities are to be located will be unable or unwilling to pay for them, and may not have the technological wherewithal to properly manage them. Upkeep and protection of the facilities is also an issue, as is the actual location of some facilities. One difficulty, for example, is that some of the stations monitoring China will be within China. Hypothetically, if China wanted to test, it could assure that the station(s) would not be working during the time of the test. Another scenario is that a nation might test a nuclear weapon in the ocean, where identifying the origin of the device might be impossible. The perpetrator could then depend on the IMS to analyze the yield of its device and there would be no way to attribute the test.

In summary, the verification regime of the CTBT increases our capabilities to detect nuclear tests at yields higher than 1 kt non-evasively conducted, and up to 70 kt evasively conducted. This means that militarily significant testing can be

conducted with little or no risk of detection by either the IMS system or the supplemental capabilities of US technical means.

The CTBT Will Constrain Nuclear Modernization

The Clinton Administration asserts that a purpose of the CTBT is to prevent the United States and others from being able to modernize nuclear weapons. There is no question that the inability to test will limit the abilities of nuclear weapons states—assuming that they do not cheat under the CTBT—to modernize their nuclear forces. The directors of US and Russian nuclear weapons laboratories have stated that they would not choose to introduce new, modern, high yield-to-weight ratio warhead designs into their countries' stockpiles without nuclear testing. It is reasonable to expect that decision-makers in other nuclear weapons states would have similar views.

The important question to ask is whether constraining nuclear modernization is desirable. Some argue that constraint is a good outcome because it will undermine the confidence that nuclear weapons states have in their arsenals, making them less usable. However, there are also serious downsides, as outlined below.

Lack of Modernization Forecloses Safety Improvements

Think of the safety improvements for automobiles that have resulted from evolving technology over the past decade. Advances in materials science, electronics, and concept innovation have led to better crash-proofing, airbags, design principles, etc. These could not have been introduced without actual testing.

It would be foolish to assume that similar advances in technology will not produce measures which could make US and other nations' nuclear weapons safer. For example, it is possible that in the future, researchers will discover higher energy, insensitive explosives which will make it possible to make warheads safer, without compromising weight limitations. Because nuclear weapons are extraordinarily complex, testing would be required before such advances could be integrated into stockpile designs.

Modernization May Be Needed for New Requirements

The only claim by treaty proponents that rings true is that the CTBT will *constrain* —not prevent—modernization. Constraining modernization is risky, however, because it seriously degrades our ability to tailor the arsenal to emerging or as-yet-unknown threats, or to adapt it to changes in defensive technologies.

At present, the United States has no specific requirement for new nuclear weapons designs, but we cannot be certain that this always will be the case. Saddam Hussein and Desert Storm have taught us that we need to be able to strike and destroy deeply buried targets such as underground bunkers. Similarly, the proliferation of chemical and biological weapons worldwide raises the question of whether the current US stockpile, which was designed primarily to destroy Soviet nuclear weapons silos, is tailored for the missions of the future. For example, much has been made of the inability of the Patriot missile system to destroy incoming SCUD missiles during the Persian Gulf War. Fortunately, none of these warheads contained anthrax, ricin, or even a nuclear warhead. If they had, the casualties in Saudi Arabia and Israel could have been staggering. Patriot missiles tipped with low-yield nuclear warheads are capable of engaging and vaporizing any incoming Scud missile and rendering its lethal cargo useless.

Preserving the option of modernizing US nuclear weapons is important also in the context of emerging defensive technologies. In the future, adversaries may discover new means to render US warheads or delivery vehicles obsolete. Such a technological breakthrough could necessitate a complete overhaul of US warheads and delivery systems.

"Old" Weapon Designs Decline in Deliverability

Nuclear warheads are designed to be mated with specific delivery systems. Delivery systems—aircraft, boats, ships, etc.—age and must be replaced. Furthermore, as adversaries develop countermeasures, our systems must be improved. These newer systems have improved electronics, materials, performance criteria, and other attributes, all of which affect the optimal design of weapons they deliver. (It is, of course, possible to reverse the process and begin to design delivery vehicles to the parameters of existing weapons, but this has its own set of downsides and should be carefully considered.)

It is possible to make some changes to warhead design without testing. However, for nuclear weapons to continue to be deliverable by newer systems, it may be necessary to change the weight, size, and shape of the warhead. Without testing, the ability to significantly change the parameters of US nuclear warheads will be limited.

In summary, the CTBT will constrain nuclear weapons modernization, which may be a negative outcome. Any advantages of constraint must be weighed against the disadvantages of "freezing" our weapons technology. Evolution in technologies for safety, defenses, and delivery systems may render the now-modern US nuclear arsenal less-than-optimal.

The CTBT Erodes Confidence in the US Nuclear Stockpile

The United States continues to need a strong nuclear deterrent to respond to existing and emerging threats. Both Russia and China have significant nuclear arsenals, and perhaps undeclared chemical and biological arsenals as well. Meanwhile, chemical and biological weapons capabilities are proliferating, a threat against which our nuclear deterrent may be the only workable response. We should not inhibit our capabilities to keep that deterrent strong, safe, and reliable.

Nuclear testing has helped assure the reliability of US nuclear weapons. According to former Los Alamos National Laboratory Director Sig Hecker, confidence in the stockpile has decreased since testing ceased in 1992. Nevertheless, the decline in confidence is manageable because no new designs have been introduced, many experienced designers and engineers are still at hand, and there is an extensive test history related to the weapons in the stockpile. This will change, however, over time. Experts will retire and the weapons will age, possibly causing deterioration that could affect the workability of the weapons.

The weapons laboratories hope to assure the continuing confidence in reliability through the stockpile stewardship program (SSP). However, the SSP faces challenges which raise serious concerns, including:

- The SSP facilities will not be completed for some years, perhaps more than a decade. There is no certainty that the technologies of SSP will work as intended or that SSP will enable scientists to understand weapons physics well enough to replace the knowledge previously gained through testing.

- The funding for the program is promised, but the required $4.5 billion/year for 10 years must be annually agreed by Congress and defended in light of other pressing priorities. Already, there is a budding campaign in the House of Representatives against full funding which, if successful, could at best push completion of SSP too far into the future and, at worst, assure its failure.

- Support from the arms control community is lukewarm at best. Many advocates of CTBT say that they will have to reconsider their support for SSP in the future, after the CTBT is ratified.

- SSP managers may limit the types of experiments they are willing to do because of fear of adverse reaction from anti-nuclear activists. This could make the SSP less relevant to nuclear weapons design.

In summary, we still face threats for which we need a strong nuclear deterrent. That deterrent is eroded by the cessation of nuclear testing. SSP, the stopgap measure, faces serious challenges and may fail.

The CTBT May Promote Nuclear Proliferation

Nuclear testing not only enabled the United States to keep its nuclear weapons design skills at a high level, it demonstrated to allies and potential adversaries alike that the US arsenal is reliable and US commitment to nuclear deterrence was strong. Any decline in US confidence in or commitment to its nuclear deterrent will increase the likelihood of proliferation by nations currently under the US nuclear umbrella. Japan and South Korea worry about the plutonium that North Korea still possesses and about the fact that Pyongyang may have secret nuclear weapons and/or a clandestine nuclear weapons program. European nations may not trust Russia to disarm at the same pace as the United States, or to cease its nuclear testing at yields below detectability. Although nonproliferation commitments by all three advanced nations are strong, these may change if they perceive that they are threatened by nuclear weapons, but have little trust in the viability of the US nuclear deterrent.

Conclusion

For the sake of nuclear nonproliferation, we are considering ratification of the CTBT. Yet, the CTBT will not meaningfully accomplish the nonproliferation goals set out for it. Nations will be able to design and deploy nuclear weapons without testing. The NPT will be at risk regardless of whether the CTBT is ratified by the Senate. The CTBT will not be able to detect militarily significant cheating, even if supplemented by US national technical means. The objective of creating an international norm against testing is, as history has demonstrated with other arms control norms and agreements, not meaningful. Thus, the potential benefits of the CTBT to nuclear nonproliferation are meager.

On the other hand, the CTBT will have a profound impact on the ability of the United States to assure that its nuclear weapons continue to be as reliable, safe, and effective as can be. Ratifying the CTBT will foreclose the ability of the United States to modernize its nuclear forces because US compliance is certain. However, given that the CTBT is not effectively verifiable and that other nations have a history of noncompliance with arms control treaties, militarily significant cheating may occur—to the disadvantage of US security. Thus, the limited political benefits of the CTBT are not worth the high cost to our national security.

Confidence in the nuclear package depends on future requirements and capabilities

Nuclear Package Issue	Current Capability	2010 w/o SBSS	Successful 2010 SBSS	SBSS + HN	SBSS + 500T	Full
Non-nuclear Assessment	Minimum Certifiable	Low Confidence	Minimum Certifiable	Minimum Certifiable	Task Dependent	Task Dependent
Maintain/Assessment						
Rebuild/Aging	Low Confidence	Low Confidence	Minimum Certifiable	Minimum Certifiable	Task Dependent	Task Dependent
Stockpile Replacement	Low Confidence	Low Confidence	Low Confidence	Minimum Certifiable	Minimum Certifiable	Task Dependent
Current Safety Assessment	Minimum Certifiable	Low Confidence	Minimum Certifiable	Task Dependent	Task Dependent	Task Dependent
New Safety Assessment	Low Confidence	Low Confidence	Low Confidence	Task Dependent	Task Dependent	Task Dependent
New Design Type	Low Confidence	Low Confidence	Low Confidence	Low Confidence	Low Confidence	Low Confidence

Low Confidence
Task Dependent
Minimum Certifiable
Full Confidence