

**Testimony Before the Senate Armed Services Committee
On Stockpile Stewardship and the Comprehensive Test Ban Treaty
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Thank you for this invitation to appear before you once again. I last had this privilege little more than three months ago, on June 23, when I testified on the findings of the Special Investigative Panel (the Rudman Panel) of the President's Foreign Intelligence Advisory Board on the security problems at the Department of Energy. We recommended creation of a semi-autonomous agency and I am pleased that this has now come to a reality. I hope its implementation will meet the country's need to establish appropriate security at our DOE weapons laboratories while at the same time preserving the outstanding science they are doing, as we emphasized in our report.

Turning to today's topic, Stockpile Stewardship and the Comprehensive Test Ban Treaty (CTBT), I want to make two points:

1. With your bipartisan support, the country is pursuing a well-designed program of stockpile stewardship to maintain a safe and reliable nuclear deterrent without nuclear explosive testing. There is no technical need for underground nuclear testing by the U.S.

2. This treaty can be effectively verified. With the full power of its international monitoring system and protocols for on-site inspection, we will be able to monitor nuclear explosive testing that might undercut our own security in time to take prompt and effective counteraction.

Stockpile Stewardship is not a new creation. The careful management, or stewardship, of the United States nuclear arsenal_its evaluation, surveillance, and maintenance_has been going on for forty years. This program, led and implemented by outstanding scientists at the weapons labs, has given this country a nuclear deterrent that today is reliable and safe. We have a good statistical basis for high confidence in our deterrent.

Following the end of the Cold War at the beginning of this decade, President George Bush terminated the requirement to develop new and improved weapon designs for deployment, either at the upper or lower end of destructive yield. In 1992 he initiated a moratorium on underground tests that has since been extended by President Clinton who signed the Comprehensive Test Ban Treaty in September 1996. This new circumstance of developing no new weapons designsfor deployment, and performing no underground nuclear yield-producing explosions, puts a stronger burden of proof on the DOE's stewardship program. In response, DOE and the weapons labs, starting in 1994, have developed a more sophisticated and extensive program. It is being implemented today with strong and critically important support of Congress and the White House. With sustained steady support by the government and the American public in the years ahead, this program will, in the absence of nuclear yield testing:

1. Make it possible for the country to maintain confidence in the performance, reliability and safety of our nuclear arsenal.
2. Enable the nuclear weapons complex to respond appropriately and in a timely fashion, if needed, to protect U.S. security under changed circumstances. Such change may be

the result of strategic developments that call for the U.S. to develop new designs for warheads to meet new military requirements, or the result of unanticipated technical developments in the future.

3. Ensure that the Nation preserves the core intellectual and technical competencies to manage this program.

Simply put, this program will deepen our scientific understanding of the nuclear weapons, of what goes on during the explosion process, and of the signatures and effects of their aging. It will tell us what is required to refurbish or remanufacture warheads as needed. It will, most importantly, enable us to hear whatever warning bells may ring, signaling evidence of deterioration due to aging, no matter how unanticipated, and enable us to make the necessary fixes in a timely fashion.

These are strong claims that I have made, so I will take a moment to tell you on what basis I am making them. I am a scientist, and my conclusion that the stewardship program is meeting US national security requirements under the CTBT is based on many years of familiarity with the labs' programs, and especially on my extensive personal involvement and leadership in more than a dozen official technical studies over the past decade. These studies analyzed our nuclear arsenal and programs in detail. Some of you may remember one in particular: the comprehensive review on nuclear weapons safety that I did for this Committee and the House Armed Services Committee in 1990 at your request. It was the first comprehensive study of the safety of our arsenal and came to the conclusion that the enduring arsenal does meet the official and rigorous safety standards of the U.S. The question of the CTBT came up in the hearings when I presented the

report to the Congress. My response then was that, if and when the CTBT became an essential

component of advancing the non-proliferation agenda through the NPT, it would have to be seriously considered, and that I thought that developing an effective, verifiable non-proliferation regime would add more to U.S. national security than would the marginal improvements that one might still make in the modern U.S. weapons in our enduring stockpile. Today, I believe we have come to the point that the CTBT has become essential to the future of the non-proliferation regime. I refer to Article VI of the NPT and the debate at the U.N. in 1995 at the time of its extension into the indefinite future.

But let me return to the technical grounds to further amplify my confidence in the stewardship program and its potential for maintaining U.S. national security under a CTBT. I want to make my first point, that today, with no requirement to develop new nuclear devices for deployment, the U.S. has no technical need for underground nuclear explosive testing. The coin of the realm in science and technology is not opinions or general allegations; it is data. What data does the U.S. need to provide any clues that our nuclear warheads are deteriorating to the extent that will cause them to fail to meet their required military characteristics? Any scientist will welcome more quality data, but the question is, what data is necessary. Can the U.S. base confidence in the current stockpile_not designing new warheads_from the diagnostic data being gained from the enhanced surveillance program, the stockpile life extension program, and the remanufacturing program, using the new facilities including the frontier computation facilities with their advanced simulation capabilities? Or is there a need for additional data than can come only from underground nuclear yield producing explosions? The detailed analyses that I

have been involved in, or led, with expert colleagues, including several of our leading weapons

designers, lead me to conclude quite strongly that, underground nuclear explosions have little to contribute, and nothing essential, relative to what we are presently learning from the stewardship program.

For example, a variety of dynamic and static tests, including the important subcritical experiments being pursued with very sophisticated equipment underground at the Nevada Test Site, are revealing detailed features of the crystal structure of plutonium and whether its aging affects its strength and integrity under the enormous pressures and temperatures during the implosion. In addition we are doing detailed forensics on each weapon type in the stockpile. In particular each year 11 copies of each type are removed from the stockpile and evaluated for changes. One of each set is destructively disassembled and inspected in every detail for signs of cracks or defects developing as the warhead ages due, for example, to the radiation environment created by the plutonium, or due to water vapor not being completely baked out in the assembly of the sealed pit. These are areas in which the data are now available and in which actionable findings so far have shown that the weapons are not noticeably aging.

We also have the ability now with the world's most powerful computers acquired by the Accelerated Strategic Computation Initiative (ASCI) to make detailed analyses and simulations using quantitative three-dimensional explosion codes. With these advanced codes and computers we can model imperfections due to cracks or voids that may develop in the structure and calculate to what extent they would degrade the performance of a warhead. Overall this is a very sophisticated and technically challenging program.

And with the two device labs, Livermore and Los Alamos, peer-reviewing each others work, there is no room for slack. It is the kind of scientific work that can attract the best scientists and engineers.

Furthermore it must provide what the directors of each laboratory must have to be able to stand up at the end of each year and say ``Mr. President, Mr. Chairman, we can certify today that our weapons meets their military requirements." They have done so successfully for the past three years.

Based upon what has been learned from this stockpile stewardship program, I, today have more confidence in the long-term credibility of our stockpile than was possible five years ago. The data being derived from our stockpile stewardship program is far more important for understanding our enduring nuclear arsenal and maintaining confidence in its performance than continued underground low yield testing. Most of the U.S. underground tests in the past were devoted to developing newer and more advanced warheads for which the U.S. presently has no stated military requirements. Very few were stockpile confidence tests. If I were giving a physics seminar I would be more specific on details here, but I believe you will appreciate it if I go no further than to say that I speak on the basis of detailed technical studies and reviews for the government. Many of the stewardship reports are public documents, but some crucial parts are properly classified.

Let me move to my second point. The CTBT can be effectively verified and will benefit U.S. security. First of all, given that we have the most advanced and sophisticated diagnostic, analytic, experimental and computation facilities, we are in a stronger position to maintain a deterrent under a test ban than other nations. Secondly, when it comes into force, the CTBT will improve America's ability to detect very low yield nuclear testing being done in violation of the provisions of the CTBT. In particular the Treaty will add a

significant number of seismic, hydroacoustic, radionuclide, and infrasound sensors that are part of the CTBT's International Monitoring System to supplement the existing system, including our national monitoring capabilities. Furthermore with the CTBT in force we will have the ability to request short notice, on-site inspection of suspicious events. Added together these will make it much more difficult for other nations to believe. that they can get away with very low-yield clandestine testing.

I consider cooperation with appropriate transparency and confidence building measures to be essential ingredients of a successful CTBT regime. I support every serious effort to achieve such cooperation with other weapon states_and Russia and China in particular. I know that there are serious. questions about what the Russians are doing at their test site in Novaya Zemlya. I am limited as to what I can say about this in an open hearing. I can say that I am aware of extensive work there as part of the Russian stewardship program, but I am not persuaded by the evidence that nuclear-yield producing testing has occurred in violation of the CTBT. Previous allegations that the Russians carried out nuclear yield producing tests at Novaya Zemlya in August 1997 were demonstrated to be false. Issues of our detection limits and of possible value to the Russian military of very low yield testing are not for discussion here but I can make two comments: We will be able to strengthen our ability to monitor and detect nuclear explosions when the CTBT's full international monitoring network and challenge on-site-inspection regime is in force. And secondly, I see no threat to U.S. security in what is going on at present at Novaya Zemlya. This is an issue that will require resolution in a satisfactory treaty regime for which improved information exchange and transparency with the Russians will be required.

The International Monitoring System of the CTBT will also greatly strengthen the ability to

monitor and interpret activities by rogue states seeking to develop a new weapon capability. The Treaty will of course not affect those who choose to ignore it and it will be up to the international community to deal with such states through sanctions and political pressure, aided by whatever added credibility and power of dissuasion that is gained from establishing a no-testing norm. However for those countries seeking to enter the nuclear club clandestinely the task will be made much more difficult and perilous.

I will conclude with a comment on the political value of a CTBT. I recall that 187 nations signed on to the NPT's indefinite extension following its fifth and final scheduled five year review in 1995, with the explicit understanding that the nuclear weapons states were committed to implementing Article VI of the Treaty calling for an end to all explosive testing. They are looking to the United States to lead the world in making good on this commitment. I view this as a powerful argument against simply continuing a moratorium without committing ourselves to the test ban.

I urge the Senate to ratify the CTBT. The U.S._with a strong and steady stewardship program has no need to test. The CTBT significantly strengthens our ability to monitor compliance with its added technical sensors and protocols for on-site inspection, and confidence building measures. Furthermore the Treaty has a series of strong safeguards, including the specific and explicitly emphasized requirement to withdraw with six months notification if there are strategic changes_on political or

technical grounds_that require such a step in order to protect our national security. But until such

a time, should it arise, the CTBT will enhance our security.