

TESTIMONY OF

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ON THE

VERIFICATION AND COMPLIANCE

OF NUCLEAR TESTING TREATIES

BEFORE THE

COMMITTEE ON FOREIGN RELATIONS

OF THE

UNITED STATES SENATE

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Mr. Chairman,

## PURPOSE OF THE TESTIMONY

Thank you very much for the opportunity to testify on the verification and compliance of the Threshold Test Ban Treaty (TTBT). My remarks today will focus on (1) the compliance decision, and (2) the compliance-judgement process. From January to December 1987, I was the technical lead for the State Department on the TTBT Interagency Work Program. I have since returned to my permanent position as Professor of Physics at the California State Polytechnic University; this testimony is written in my individual capacity. Policy decisions always involve difficult tradeoffs between dissimilar objects, which is why we have elections to pick leaders with visions of the future. On the other hand, a compliance decision is judicial in nature and it involves different issues. As in the courts, we have to ask:

- (1) What did the law or the treaty say?
- (2) What is the evidence?
- (3) Is the same standard of evidence applied to both sides in a consistent manner?
- (4) Who decides that evidence is inadmissible, and that standards are consistent?
- (5) Does the treaty partner have an advocate, or at least a position paper, which will present his side, no matter how unpopular?

In my testimony, I will indicate that the compliance process in the Executive Branch has not always been a judicial process since the third, fourth and fifth criteria have been violated. When one examines the Soviet noncompliance charges against the U.S., the same questions can be asked of the Soviet process for determining compliance charges. My intent today, is not to belabor the errors of the past, but rather -- how can we do better in the future. It is my belief that the process for compliance decisions must be treated differently than the normal process for policy decisions. If arms control is to have a future, we must develop more judicial, internal procedures to enhance the fairness of the compliance process. In my testimony I will offer some suggestions to improve the compliance process that could be considered by the next Administration (which has the responsibility to carry out the compliance process), the next Congress, and by the Soviet Union.

## I. COMPLIANCE WITH THE TTBT

**SUMMARY STATEMENT ON COMPLIANCE:** I would like to underscore the important conclusion of the recent Office of Technology Assessment (OTA) report, Seismic Verification of Nuclear Testing Treaties. While at the State Department, I examined the relevant data from all the interagency working groups, involving both seismic and other data. In particular, I carried out a thorough statistical analysis of the seismic data, taking into account the random and systematic errors and using the accepted U.S. government value for the bias factor. I agree with the Defense Intelligence Agency (DIA) report of 1985 (which is cited in the OTA report) and other internal studies that the seismic data sets are the most meaningful for the present consideration of the past Soviet compliance with the TTBT. In the future, when the calibrations of the test sites are completed, the systematic errors in the seismic data will be reduced, and at that time the data should be reexamined. Since all the measured yields of the largest Soviet tests fall within statistical uncertainties of the measurements centered at 150 kt, it appears that the Soviets are complying with the limit of 150 kilotons. If one applies the same standard of evidence to the testing programs of both the U.S. and the U.S.S.R., one can state that both

sides are complying to the TTBT within the accuracy of the measurements. Because of the statistical uncertainties, one can not rule out that a very few Soviet or American tests may have exceeded the 150 kt level by only a small amount, but when one considers the distribution of tests this does not constitute a violation. Thus, it is incorrect to state, as it does in the President's report to the Congress on Soviet noncompliance, that the Soviet nuclear tests are a "likely violation." Furthermore, virtually all of the technical people analyzing these data in the other agencies reached the same conclusions. Therefore, I agree with the OTA report on this issue which states that:

"All of the estimates of Soviet and U.S. tests are within the 90 percent confidence level that one would expect if the yields were 150 kt or less. Extensive statistical studies have examined the distribution of estimated yields of explosions at Soviet test sites. These studies have concluded that the Soviets are observing a yield limit consistent with compliance with the 150 kt limit of the Threshold Test Ban Treaty." (page 17)

**MORE DETAILS:** Because of the classified nature of the data, there will be a lack of numerical specificity in my testimony. In this particular compliance case, this is unfortunate because there is no military significance in the slightly more accurate, classified seismic magnitude values, and the agreed U.S. government value for the bias factor. In other words, this discussion would be enhanced if we could lay the data out on the table and discuss it. There are two main errors that one must consider when analyzing the data, random errors which give a fluctuating value of measurement about a central value, and systematic errors, such as a zero set on a scale. Publicly, the U.S. government has stated that the present seismic technology is within a factor of about two ( $F=2$ ). This means that 95% of the explosions at exactly 150 kilotons (kt) would measure between  $2 \times 150$  ( $2F$ ), or 300 kt, and  $150/2$  ( $F/2$ ), or 75 kt. Alternatively, this means that 1 event in 40 would appear above 300 kt if  $F=2$ . The OTA report states that all of the Soviet and U.S. tests are within (or below) the  $F=2$  criteria. I agree, and so does everyone else in the "process" that the events are considerably below the  $150 \times 2 = 300$  kiloton limit. Thus, if one is to claim noncompliance, one must assert one of the following:

**ERRORS IN THE BIAS FACTOR.** The relative difference between the seismic signals from the Nevada and Semipalatinsk test sites is call the bias factor. The bias factor has not yet been directly measured by the United States Government. At this time, interagency task forces have examined the indirect determinations of the bias factor, and given their interpretation of the data, which was ultimately accepted by the Executive Branch process<sup>1</sup>. More direct measurements of the bias factor could ultimately come from further Joint Verification Experiments. By ignoring the systematic error in the bias factor, one can make the old (uncalibrated, no  $L_g$  data) seismic data appear to be much more accurate than it really is by considerably reducing the apparent  $F$  factor. By avoiding the systematic error, one in effect pushes some of the events beyond the upper limit ( $2F$ ) because  $F$  is smaller. Some have incorrectly argued that the error on the bias factor, as adopted by the Executive Branch, is a political decision, and that the political process, by definition, does not make an error in its judgements. But we all know, that both scientific measurements and political decisions have errors, and we must take them into account. To ignore the systematic error in the bias, at this time without calibration, is to make a very large error in one's analysis.

**NONSEISMIC DATA ON SOVIET TESTS:** If the argument for noncompliance cannot rest on the seismic data (as indicated above), then it must depend on other, nonseismic data. The OTA report references a letter<sup>2</sup> from Dr. Roger Batzel, Director of the Lawrence-Livermore National Laboratory to Senator Pell, Chairman of the Senate Committee on Foreign Relations (February 23, 1987):

"We have considered the non-seismic evidence as well as the seismic evidence. Our conclusion, like that of the DIA panel which also reviewed all the data, is that the seismic evidence is currently the most reliable basis for estimating the yields of Soviet underground nuclear explosions. We continue to attempt to reconcile the available data. However, we believe that the interpretation of the past Soviet test program which is the most consistent with the best available data is that: The Soviets appear to have obeyed a testing limit. The limit is consistent with compliance with the provisions of the TTBT. The uncertainties of the yield estimation process are such that we cannot rule out the possibility that a few of the tests could have exceeded the threshold. These uncertainties are, in part, the source of the differences in the assessments of the extent of Soviet compliance with the TTBT. On-site hydrodynamic yield measurements would help to reduce the uncertainties and improve confidence in the results of the compliance evaluation process."

From what I know about the data, the Livermore and OTA conclusions are correct. I have done independent calculations on the compliance and calibration data. I have participated in the groups that analyzed the non-seismic data. I have spent a considerable amount of time with scientists, at the working level, on all of these technical issues. From my work and these discussions, I find a great unanimity among the scientists on the conclusions on compliance by OTA and LLNL. On the other hand, I take a great exception to the Executive Branch testimony<sup>3</sup> before the House Foreign Affairs Committee on June 28, 1988 that "Furthermore, the totality of evidence strengthens the previous finding of likely TTBT violation." This statement implies that the nonseismic data were good enough to prove the case, which is in disagreement with the DIA and other reports.

**REPORT TO CONGRESS ON SOVIET NONCOMPLIANCE WITH ARMS CONTROL AGREEMENTS.** The most recent report<sup>4</sup> to the Congress on the Soviet noncompliance on the TTBT stated that:

"While, in view of ambiguities in the pattern of Soviet testing and in view of verification uncertainties, the available evidence is ambiguous and we have been unable to reach a definitive conclusion, this evidence indicates, that Soviet nuclear-testing activities for a number of tests constitute a likely violation of legal obligations under the TTBT." (emphasis added)

According to Webster's Dictionary, a "likely" event is one which is "probably destined to happen or be." Thus a likely event must be much more probable than a "not-likely event." The concluding charge of "likely violation" in this sentence does not logically follow from the preamble portions of the sentence. One can only conclude that the Executive Branch must have been split over the issue, and that the National Security Council attempted to patch the disagreement together.

**WHY HAS THE EXECUTIVE BRANCH MAINTAINED THE CHARGE OF "LIKELY VIOLATION?"** The original charge of noncompliance on the TTBT was released to the Congress on January 23, 1984. According to Duffy<sup>1</sup>, "In January 1986, Director of Central Intelligence William Casey reportedly changed the CIA procedures for estimating the yields of large Soviet tests to conform to the recommendations of review panels." In other words, the value of the bias factor was increased, and the case of "noncompliance" was severely weakened. In December 1985 President Reagan signed National Security Decision Directive 202, requesting a review of how the methodological changes would affect the past U.S. charges of Soviet violations." In my view, some members of the Executive Branch felt that they were locked-in to continue the charge of "likely violation" because of the great inertia of history. In 1984, the U.S. made the charge of noncompliance on a number of issues, such as TTBT and the Krasnoyarsk radar. In 1986, the charge of noncompliance with the TTBT was greatly

weakened by the change of the bias factor, but, of course, the Krasnoyarsk radar continues to be a violation, no one disputes that. (The military significance of Krasnoyarsk at this time is essentially nil, but it still is a violation until it is torn down.) Many observers think that the compliance process can be used as a tool to send the Soviets a message that we are, in general, unhappy with their behavior, and that to backtrack on the TTBT compliance issue would be to send the wrong message. There may be some truth in this argument, but the broader question is "should one use any means to obtain one's ends, and will it be counterproductive?" Most of us would be discouraged if the justice system of our country was used to accomplish goals beyond the original allegations. In my testimony I maintain that the "compliance-judgement process" must be held to the same general standards on which our country's judicial system is based. My conclusion is that the "likely violation" charge would not be made now, except for the momentum of the past noncompliance charge.

**HOW MUCH VERIFICATION IS ENOUGH? A SENSITIVITY ANALYSIS OF THE THREAT TO NATIONAL SECURITY DUE TO A BREAKOUT FROM THE TTBT:** Five years ago, I published<sup>5</sup> a variational calculation on the survivability of U.S. strategic forces if the Soviets improved their weapons in a variety of ways. These calculations were based on the unclassified data sets from the International Institute for Strategic Studies in London. My results showed that the survival of U.S. forces was much less sensitive to increases in the yield parameter than to improvements in the accuracy (CEP) and reliability. Many other authors have obtained similar results. While in the Executive Branch, I carried out similar calculations using the real data on computerized exchange models. These results confirmed the above conclusion that variations in yield were much, much less important than variations in accuracy or reliability. The policy process should examine these kinds of effects when considering verification technologies.

## **II. THE COMPLIANCE-JUDGEMENT PROCESS**

**HOW CAN THE INTERAGENCY COMPLIANCE PROCESS BE IMPROVED? A PROPOSAL FOR THE U.S. AND THE SOVIETS.** The last part of my testimony is not based on science, but rather, it is intended as a provocative suggestion in order to have us focus on the improvement of the compliance process. In my view the compliance process would be improved if the Executive Branch adopted more judicial procedures for the compliance process. As one examines the Soviet charges of U.S. noncompliance, it rapidly becomes clear that many of their charges can be dismissed without seeing the data. For example, the deployment of Pershing Two missiles was not a violation of SALT, and so forth. Thus, my suggestions (rather than criticisms) are relevant to both sides, and, in my view, one shouldn't belabor the fact of which side was more illogical. Let us admit that we both can improve, and leave it at that. Within this spirit, I offer the following three possible rules of conduct for compliance deliberations in the United States and in the Soviet Union in order to carry out the criteria 3 to 5, listed in the first paragraph of this testimony:

-- The same standard of evidence shall apply when considering (1) U.S. charges of Soviet noncompliance and (2) U.S. compliance with the same treaties. We should encourage the Soviets also to apply the same standards for the two situations that they face.

-- The interagency group as a whole shall rule on the validity of the standards of evidence used, with disagreements directly appealable to the National Security Council.

-- The treaty partner, which is not in attendance to present its views, shall be represented by either an interagency paper representing their views, or preferably by an experienced advocate, appointed by the President or his designate. It is the responsibility of the advocate, or position paper to argue against unreasonable positions and ask hard questions of the other agencies. This process could encourage the Executive Branch to ask their treaty partners additional questions which might, or might not, clarify the situation. We should encourage the Secretary General to appoint an "American Advocate" to the Soviet internal compliance proceedings.

**CAN THESE RULES BE IMPLEMENTED?** No matter which party controls the Executive Branch, it is unlikely that the Executive Branch will want to consider formalizing their compliance-judgement process for fear of infringement by the Congress on their national security process. It is very unlikely that the Congress can dictate the details of the classified, national-security process. However, the Congress could require the Executive Branch to study these rules of fairness, consider other improved procedures, and examine the possibility of their implementation. Without some action along these lines some of the problems will continue, such as:

- (1) In the past, two different standards have been used, on at least two occasions, which required a higher standard from the Soviets, than from the U.S. A judicial process demands the same standard.
- (2) Because the 6 agencies in the compliance process don't wish to be viewed as too favorable toward the Soviets, it becomes somewhat difficult to combat unreasonableness and ask the hard questions.
- (3) When there are many issues at the interagency process, defending due process for the Soviets becomes expendable.

Thank you very much, Mr. Chairman, I will gladly answer questions you have.

#### REFERENCES

1. G. Duffy, Compliance and the Future of Arms Control, Ballinger Pub., Cambridge, MA, 1988, pages 54-58.
2. R. E. Batzel, Director of Lawrence Livermore National Laboratory, to Claiborne Pell, Chairman of the U.S. Senate Committee on Foreign Relations, February 23, 1987.
3. W. F. Burns, Director of the Arms Control and Disarmament Agency, testimony before Subcommittee on Arms Control, International Security and Science of the House Foreign Affairs Committee, June 28, 1988.
4. R.B. Barker, Assistant to the Secretary of Defense for Atomic Energy, testimony before the Subcommittee on Arms Control, International Security and Science of the House Foreign Affairs Committee, June 28, 1988.
5. D. Hafemeister, "Breakout from Arms Control Treaties: A Sensitivity Analysis of the Threat to National Security," Chapter 6 in Arms Control Verification, K. Tsipis, D. Hafemeister, and P. Janeway, eds., Pergamon-Brassey, Washington, DC, 1986.