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POSSIBLE MODIFICATIONS IN THE PRESENT U.S. POSITION AT THE GENEVA CONFERENCE ON THE DISCONTINUANCE OF NUCLEAR TESTS

Alternatives Which Need to be Considered as a Result of Test Results Obtained in October on Underground Nuclear Tests

New Data and Implications

The new seismic data resulting from the Hardtack II series of tests (October 1958) alter the quantitative conclusions relating to underground tests reached by the "Geneva Conference of Experts." While the qualitative basis for seeking the initial technical agreements and for continuing in the present Geneva negotiations appear to be unchanged, detection and identification will be more difficult than had been expected.

The new observations are the following:

1. The maximum amplitude of the seismic signal is approximately 60% of that expected, based on the Rainier data.

2. The "First Motion" of the seismic signal, relative to the seismic signal, is smaller than anticipated (at distances greater than 2,000 KM).

3. The new data are more reliable, being based on observation at more stations and greater distances.

As a result of the new data:

1. The range of detection is decreased for explosions of a given yield.

2. Identification of earthquakes by the method of "First Motion" is less reliable than previously estimated. This result implies a requirement for a considerably larger number of inspections.

Alternatives to be Considered

Since there is clear agreement among informed scientists that significant modifications are necessary in that section of the report of the Geneva Conference of Experts which deals with underground tests, it is important to examine the possible modifications in U.S. policy which these changes in the estimated capabilities of the system will necessitate. The alternatives presented below are all based on the premises that the United States will continue to be firm in insisting on the necessity of proper controls of any test agreement and that we will continue to seek agreement with the Soviets on some form of test discontinuance or limitation.

Alternative No. 1 - Continue all tests in the atmosphere. The AEC has stated this position in the following way:

"(1) to adhere rigidly to the principle that control of any test cessation agreement is essential and that only those tests which are detectable and identifiable are to be prohibited by treaty. Under no conditions shall the relaxation of the requirements of the control system antecede policy changes regarding the scope of the tests being suspended.

"(2) Negotiate as a first step, beginning at the appropriate time after the resumption of negotiations, a treaty for the cessation of atmospheric tests.

"(3) To postpone for later negotiation a treaty applying to underground and outer space tests after further investigation of the technical problems involved in their detection. The U.S. should be willing to discuss these problems to the extent desired by Russia during current negotiations.

"(4) To propose meanwhile international cooperation (with the Control Commission if established) in this investigation to the extent of conducting for the Commission necessary experiments and in making available to the Commission or other appropriate authority the results of national nuclear experiments whose results bear upon the detection and identification problems at issue.

"(5) To preserve the right to develop non-military applications of nuclear explosives."

This position would initially eliminate the problem of detecting underground tests (as well as tests at great distances from the earth) by permitting such tests. This would answer the worldwide concern about fallout hazard. However, unless subsequent phases were carried out, it would fail to accomplish the other objectives of a test suspension since by itself it would probably, in the long run, have little effect on weapon development and would not require a control system that would have any significant impact on the Soviet Bloc.

Alternative No. 2 - Modify "Geneva" System to Improve Capabilities

It would be possible to modify the "Geneva" System in a manner which would substantially improve the capabilities of the system. This might be accompliahed if one of more of the following steps were adopted:

1. Increase the number of seismographs at each control post in the Geneva System (e.g. An increase in seismographs from 10 to 100 might improve the signal to noise ratio for detection by a factor of 3).

2. Halve the seismic grid spacing by adding unmanned, seismic-only stations using the same number of seismographs as in the main control posts.

3. Augment the agreed-upon grid of manned control posts with a much closer spaced grid (e.g., 100-150KM) of small, unmanned seismographs which would telemeter information.

4. Increase the number of inspections.

5. Develop other presently promising techniques to identify earthquakes and to discriminate between explosions and earthquakes.

A carefully-engineered modification of the present system, including some combination of the above concepts, could restore or even better the effectiveness of the system proposed at Geneva.

Alternative No. 3 - More Effective Use of Inspection in "Geneva" System

It would be possible to provide at least some level of deterrence down to 1 KT or below with the present "Geneva" system by a more effective use of onsite inspections. This might be accomplished by employing some variation of one or more of the following procedures:

a) Establish a graduated, decreasing scale for the percentage of unidentified events which would be inspected on a random basis in different yield ranges (e.g., 100% over 20 KT; 25% 20-10 KT; 10% 10-5 KT; 2% 5-1 KT; 1/2% less than 1 KT.)

b) Establish weighted inspection procedure focused on the nuclear powers and possibly their principal allies (e.g., in areas outside the nuclear powers and possibly their principal allies reduce the percentage of events inspected by a factor of 4 and undertake no inspections on a routine basis below 5 KT).

c) Increase the number of inspections substantially over the number previously contemplated by simplifying the inspection procedure and only undertaking exhaustive examinations when an initial survey indicated the possibility of suspicious activity.

This position has the advantage of not requiring the reopening of any of the conclusions of the Geneva Conference of Experts; however, it clearly involves a greater risk that the Soviet Union might attempt clandestine tests than either Alternative No. 1 or No. 2. The extent to which such a system would in fact deter tests is a complex judgment which cannot be made on technical grounds alone.

Alternative No. 4 - Permit Underground Testing Below a "Threshold"

The present "Geneva" system as well as the modification of it suggested in Alternative No. 2 and No. 3 can clearly provide much more secure control of nuclear testing if underground tests are permitted below a "threshold" yield. This procedure would minimize the intangible factor of deterrence upon which a complete prohibition must ultimately rest. There is no unique "threshold" yield to associate with any of these systems. The level of the threshold might vary between 1 and 20 KT and would be set by the objects sought in negotiating an agreement and the amount of risk deemed "acceptable." A 20 KT threshold would involve relatively little risk of violation but also would permit substantial weapon development and would provide little basis for inspection. A 5 KT threshold would involve greater risk of violation, assuming it was not subject to 100 percent inspection; however, it would permit less weapon development, probably would exclude "n"th power tests, and would provide the basis for extensive inspection. A 1 KT threshold would involve substantially greater risk since clearly only a small fraction of events in 1 to 5 KT range could be inspected; however, such a threshold would permit

only limited weapon development in areas probably primarily of interest to U.S., would almost certainly exclude "n"th power tests, and would provide the basis for very extensive inspection.

Alternative No. 5 - No Restrictions on Nuclear Tests

A policy decision to avoid any agreement which would prohibit nuclear testing in any form would permit unrestricted weapon development and would accomplish none of the objectives of a test suspension. It would avoid the risk, considered substantial by some, that underground testing will in fact prove inadequate both for large yields and for diagnostic measurements at all yields.