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REPORT OF THE USAF SCIENTIFIC ADVISORY BOARD WEAPONS PANEL ON THE EFFECTS OF A COMPREHENSIVE TEST BAN

APRIL 1978

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SCIENTIFIC ADVISORY BOARD
UNITED STATES AIR FORCE

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ATOMIC ENERGY ACT 1954

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THE JOINT CHIEFS OF STAFF
WASHINGTON, D.C. 20301

THE JOINT STAFF

13 September 1978

MEMORANDUM FOR MILITARY DIRECTOR USAF SCIENTIFIC BOARD

Subject: Report of the USAF Scientific Advisory Board Weapons Panel on the Effects of a Comprehensive Test Ban - April 1978

Subject report is of significant importance to this Deputy Directorate in dealing with the Joint Chiefs of Staff input to the negotiations. Request this office be provided a copy of the April 1978 report and be put on distribution for future publications on this subject.

Edward F. Welch
EDWARD F. WELCH, JR.
Rear Admiral, USN
Deputy Director for International Negotiations, J-5

78-6-250-014

ABSTRACT

The technical impact of a Comprehensive Test Ban on nuclear explosions is examined. The two key concerns that are identified are (a) the reliability of the nuclear stockpile and the weapons delivery systems, and (b) possible asymmetries seriously disadvantageous to the U.S., particularly if verification of the Comprehensive Test Ban is uncertain. These and other concerns are discussed and specific recommendations are offered.

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TASK ON COMPREHENSIVE TEST BAN

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Maj Thaddeus H. Sandford (Exec. Secy.)
HQ USAF (NB)

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78-0-22-5-917

I. ([redacted]) EXECUTIVE SUMMARY (U)

([redacted]) The Scientific Advisory Board Weapons Panel met on 21-22 March 1978 to review future Air Force needs for nuclear tests in view of ongoing CTB negotiations. Members of the Panel included: Drs. C. McDonald, W. McMillan, H. Smith, and E. Teller; Lieutenant General G. Kent (Ret.); Maj Gen J. Brickel; and Maj T. Sandford. The views of the Panel are as follows:

- The Panel took as preeminent the requirement to maintain credibility of the U.S. strategic nuclear deterrent. In the context of a possible CTB, two primary concerns stand out:

  (a) reliability of the nuclear stockpile and the weapons delivery systems;

  [redacted]

JS 3.3(b)(8)

- The Panel firmly believes some U.S. nuclear testing is needed to evaluate future suspected problems with weapons in stockpile and to confirm solutions.

JS 3.3(b)(6),(8)

[redacted]

DOE Section 6.2(a)

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JS 3.3(b)(6),(8)

- Other Panel concerns include:

  - Weapons effects tests are essential to assure reliability of total weapons systems designs.

  - New systems design opportunities may be foreclosed for tactical, strategic needs in the future.

    -- May have need for design improvements for better weapon safety, security, and survivability,

JS 3.3(b)(6),(8)

DOE Section 6.2(a)

[redacted]

  - Maintaining high competence in Nuclear Design Laboratories over extended time is uncertain without testing. The Labs are vital, since the ultimate confidence in the reliability of the stockpile is not based on statistical data, but on confidence in laboratory people.

- To minimize impact on USAF deterrent posture, it would be imperative to delay any CTB effectivity date until critical preparations have been accomplished. The most critical preparations include the following: DOE Section 6.2(a)

  - [redacted]

  - Special design emphasis directed toward achieving confidence in stockpile items and maintaining a viable and reproducible rebuild capability.

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II. (U) INTRODUCTION (U)

(U) The Weapons Panel of the USAF Scientific Advisory Board met on 21-22 March 1978 under the charter* to "...examine the technical issues pertaining to a Comprehensive Test Ban (CTB) on nuclear explosions and assess the impact on the nuclear weapons stockpile as relates to USAF systems."** The Panel had the benefit of extensive background briefings by

(a) VADM Robert R. Monroe, USN, Director, Defense Nuclear Agency.

(b) Maj Gen Edward Giller, USAF (Ret), U.S. Delegate to the on-going Nuclear Test Ban negotiations in Geneva.

(c) Maj Gen Jasper A. Welch, USAF, Assistant Chief of Staff, Studies and Analysis.

Also, the Panel had available the following recent, pertinent documents:

(d) Secretary of Defense, Dr. Harold Brown, Memorandum for the Assistant to the President for National Security Affairs, dated 3 Mar 78.

(e) White House Office of Science and Technology Policy (OST&P) CTB Review Panel; Comments on Seismic Monitoring, Stockpile Reliability, and Permitted Experiments under a CTB (undated).

(f) Letter of Dr. Harold M. Agnew, Director, Los Alamos Scientific Laboratory (and member of the OST CTB Review Panel) to Dr. Frank Press, President's Science Advisor, 17 Mar 78, commenting on the OST CTB Draft Report (Item (e) above).

(U) *The full task statement is reproduced in Appendix B.

(U) **At the request of Chairman McDonald, the preliminary Panel Point Paper (essentially the same as the foregoing Executive Digest) was discussed on 24 March 1978 with General David C. Jones, USAF Chief of Staff, together with General L. Allen, USAF Vice Chief of Staff and Lt Gen W. Y. Smith (USAF), Assistant to the Chairman, JCS, by Dr. W. G. McMillan and Maj Gen J. R. Brickel.

78-S-290-020

III. ([redacted]) DISCUSSION (U)

A. (U) The Governing National Policy: Maintain Deterrence (U)

(U) In the Department of Defense Annual Report for Fiscal Year 1979, Dr. Harold Brown, Secretary of Defense, clearly summarizes US defense policy* in these words:

> "...we strive to maintain the nuclear and conventional forces necessary to deter, or if necessary frustrate, possible Soviet military actions in areas of the world that are vital to us."

It is equally clear that at both the strategic and tactical levels, deterrence depends critically upon the availability, survivability, reliability and credibility of the US nuclear arsenal, together with our national will to maintain these capabilities as long as necessary.

B. (U) Historical Role of Nuclear Testing (U)

(U) Nuclear tests have, of course, played a central role in developing and continually updating US nuclear forces to meet the evolving threat. While these tests have been mainly concerned with the development and proof of the nuclear weapons themselves--bombs, missile warheads, mines, etc.--there are many other objectives that have motivated the US nuclear test program. While the relative urgency of these objectives changes with time, requirements and past accomplishments, the following test objectives are listed in an approximate order of priority as perceived during the dynamic evolution of the US nuclear stockpile:

(1) Strategic weapons development, including testing to

- explore and extend basic technology, both experimental and theoretical, needed for weapons design

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(U) *Harold Brown, US Secretary of Defense, Department of Defense Annual Report, Fiscal Year 1979, 2 February 1978, p. 4.

- improve yield-to-weight ratios
- reduce requirements for special nuclear materials (SNM)
- verify prototype designs
- proof stockpile designs
- assure safety requirements
- monitor stockpile reliability and lifetime

(2) Tactical weapons development, with testing (in addition to those reasons given under (1)) to

- achieve weights, yields and effects compatible with tactical battlefield delivery systems and requirements
- develop special effects
- reduce and control collateral effects

(3) Nuclear weapons effects testing to

- improve understanding of weapons effects on targets
- improve basic understanding of phenomenology
- discover, identify and eliminate vulnerabilities, not only of nuclear components but also of total weapons systems
- assure survivability of critical systems in a hostile nuclear environment

(4) Nuclear devices for peaceful applications, with testing for

- environmental effects
- efficacy in various PLOWSHARE applications
- device technology development for various political constraints

(U) It turns out that in pursuing the above objectives, we have maintained the viability of the U.S. nuclear stockpile principally through the continual introduction of new weapons designs (predicated on nuclear testing) and the retirement of older weapons, rather than by designing toward longevity and maintainability. But with the prospect of a CTB, new weapons development and retirement of the older designs will be severely constrained.

(U) Because the very survival of the United States may hinge on the U.S. nuclear deterrent, this paper focuses on the testing requirements essential to maintain the reliability and credibility of that deterrent. The other reasons for nuclear testing mentioned above, while perhaps not currently accepted as being of such critical importance, nevertheless support the need for some testing. Nuclear weapons effects tests have played a critical role in the past and could become important again--for example, in disclosing unforeseen vulnerabilities of the M-X basing. One need only recall the consternation concerning survivability of the strategic nuclear deterrent which accompanied the "discovery" of the electromagnetic pulse (EMP), internal EMP (SGEMP), hot X rays, etc. in the 1960s.*

C. (U) The Central Issues (U)

(U) Against this background, there appears to be little disagreement across the full spectrum of opinion--from CTB opponents to advocates--that in the current international climate, highest national priority must be assigned to maintaining the credibility of the U.S. nuclear deterrent. Nor can there be any serious doubt that this credibility rests upon maintaining a high level of reliability and confidence in the performance of weapons in the U.S. nuclear

*Technical Aspects of Nuclear Test Ban Proposals, (U) Report of the Ad Hoc Panel to the Joint Chiefs of Staff through the Chief of Staff, U.S. Air Force, AFRDC 332-66, January 1966 (TOP SECRET).

stockpile. The primary issues arise over three aspects of the role of testing in meeting this requirement.

(1) Why is any testing required simply to maintain reliability of weapons already stockpiled?

(2) Insofar as testing is needed or desirable for U.S. stockpile maintenance, doesn't this also apply to the Soviet stockpile?

(3) Would not a CTB have an equal and symmetrical effect on both the USSR and U.S. nuclear capability?

[redacted] (U) To anticipate the conclusions which emerge from the detailed arguments of the sections which follow, the essence of the Panel's answers to these questions are as follows:

(1) [redacted]

DOE Section 6.2(a)

(2) The Soviets could have similar stockpile problems, but their greater payloads would have constrained their design much less than the smaller payloads.

(3) No! Unless carefully designed, a CTB could imperil the U.S. strategic nuclear deterrent without degrading significantly the Soviet capability.

(U) Since the reasons behind these answers appear not widely known, or at least not fully appreciated, the Panel feels obliged to spell out the underlying logic.

D. ([redacted] Priorities and Trade-Offs in Weapons Development (U)

[redacted] As with any systems development, the product that emerges from the U.S. nuclear weapons design laboratories is sensitively dependent upon the imposed objectives, requirements, and constraints, together with their prioritization and relative weighting in trade-off compromises. A typical list of requirements would involve at least the following considerations:

1. Mating to Delivery Vehicle

   Weight & volume
   Size & shape
   Center-of-mass
   Moment of inertia

2. Performance

   Yield-to-weight ratio
   Yield selectability
   Fission vs fusion yield
   Reliability
   Special effects

3. Safety & Security

   Fuze safety & redundancy
   One-point nuclear safety
   Fail-safe features
   Security of control

4. Survivability/Hardening

   High g-levels
   Blast & shock
   Radiation environment
   Fraternal explosions

5. Field Handling

   Security
   Transportability
   Collateral effects
   Battlefield requirements

6. Design & Development

   Underground vs atmospheric tests
   Development time
   Number of tests required
   Test yields
   Development cost
   Conservative vs advanced technology

7. Manufacture/Production

   Safety
   Ease/simplicity
   Tolerances
   Low cost
   Minimal SNM

8. Stockpile Reliability & Maintenance

   Shelf life
   MTBF
   Ease of maintenance
   Storage conditions

(U) Clearly, many desirable characteristics are in competition--if not indeed incompatible--with others, and difficult choices must be made. For example, to reduce overall systems costs, the

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major U.S. strategic missile systems were designed around relatively small missiles having correspondingly small payloads. This decision was reinforced by the insistence of some prominent scientists that there are few targets suitable to yields in the megaton regime. The resulting U.S. limitations in payload weights and R/V geometry placed a great premium on maximum yield-to-weight ratios in order to maximize the weapon effectiveness. The nuclear design problems were greatly exacerbated when it was decided to subdivide the already limited payload into numerous multiple individually targeted reentry vehicles (MIRVs).

DOE Section 6.2(a)

[redacted] Stockpile longevity was not prominent as a design requirement whereas higher performance was always in demand. A shelf life limited to only a few years in any event posed no particular problem under the dynamic stockpile conditions which have existed hitherto, in which the rapid evolution of delivery systems demanded an equally rapid evolution and stockpile replacement of nuclear weapons.

(U) Faced with a further extension of the test ban, the U.S., and the Air Force as Executive Agent for two of the three systems of the U.S. Strategic Triad, is now forced to reexamine the reliability and maintainability of its nuclear stockpile under possible test constraints. Our current stockpile was designed in a period when nuclear testing was available and the stockpile was automatically turned over before it degraded significantly. It would be remarkable if it were the one we would wish to have in perpetuity.*

(U) *We should expect that treaties of this nature will have a lifetime in excess of the agreed upon limit. This view was reinforced by the unilateral extension of the SALT I Interim Agreements.

(U) To determine the influence of these further test constraints on the balance of strategic nuclear forces, we must first explore the existing and potential asymmetries between the U.S. and USSR status and related options.

DOE Section 6.2(a)

E. ([redacted]) The Impact of Test Constraints (U)

[redacted]

JS 3.3(b)(6),(8)

(U) Experience has taught us that it is literally impossible to control materials and workmanship quality and standards, or even specifications and working drawings, over an extended period of time. Further, sound, virtually irresistible reasons will be advanced for "improvements" to exploit materials advances, new theoretical understanding (e.g.,3-dimensional hydrodynamic codes), etc.; and the old hands, with the wisdom of test experience to know that these changes must be rejected, will have retired. Thus, it is practically impossible to rebuild a warhead once it has been out of production for some period of time.

DOE Section 6.2(a) OSD Section 6.2 (a) JS 3.3(b)(6),(8)

[redacted]

(U) As the allowed upper yield limit is reduced, there is thus a progressive reduction in ability to test, maintain, and verify the reliability of the U.S. nuclear stockpile. Table I depicts an approximate schedule of that progressive reduction in ability.

[redacted] In assessing the possible impact of the testing constraints and possible oversight of important failure modes, it is important to recognize that the U.S. strategic nuclear stockpile is constituted

JS 3.3(b)(8)

[redacted]

DOE Section 6.2(a)

JS 3.3(b)(8)

of large numbers of weapons of relatively few types.*

[redacted]

DOE Section 6.2(a)

F. (U) The Basic U.S./USSR Asymmetries (U)

(U) In attempting to assess the impact of a CTB on the relative status of the U.S. vs USSR strategic nuclear forces, it is important to weigh the effects of several ineradicable asymmetries, most of which favor the Soviet Union:

- Large missile payloads
- Design conservatism
- Multiplicity of delivery systems types
- Unequivocal government control
- Secrecy of clandestine operations

JS 3.3(b)(6),(8)

[redacted]

OSD
Section 6.2 (a)

DOE Section 6.2(a)

This section addresses these asymmetries and their influence on the CTB issues.

(U) By contrast with the small, low-payload and highly-sophisticated delivery systems of the US, the Soviet Union has from the beginning concentrated upon very large payload systems. For example, even the new generation of "small" Soviet ICBMs have payloads several times that of the US MINUTEMAN III, and are themselves dwarfed by the Soviet SS-9 payload of 13,000 pounds.

(U) The low payload of MINUTEMAN dictated the use of advanced technology not only in the warhead but also in the guidance system. In particular, the missile designers were driven to the most sophisticated solid state electronics and one of the most advanced microminiaturized general-purpose computers. Only later were the extreme vulnerabilities to nuclear weapons effects of these advanced electronic systems discovered and corrected. The lesson here is one that has been brought home many times to weapons designers: It is humanly impossible to anticipate all of the possible failure modes of a complex system. To discover and eradicate these we must give nature full opportunity to exhibit them. This is what testing is all about.

(U) Thus, while the early US decisions to develop strategic missiles having relatively small payloads had the advantage of saving large deployment costs for slightly increased development costs, the resulting low payloads coupled with high-performance requirements severely limited the accommodation of such lower-priority features as stockpile longevity. By contrast, with the degree of design flexibility allowed by the large Soviet payloads, there would be little motivation not to emphasize design conservatism for stockpile weapons--low-risk technology well back from the leading edge, less ambitious yield-to-weight ratios, ruggedized construction, redundancy, etc.--in short, the same kind of design philosophy which we see in virtually all Soviet military systems.

(U) Another aspect of Soviet conservatism is evident in their multiplicity of missile types and large deployment numbers. The continual parade of missile types--the SS 7, 9, 11, 13, 16, 17, 18, 19, and still more under development, to mention only land-based systems--rather dwarfs the US MINUTEMAN I, II and III family. The significance of such diversity is that if any single strategic missile system should have to stand down--say, because of a belatedly-discovered warhead defect--the impact on the total strategic inventory would loom small for the USSR but large for the U.S.

(U) Turning to the maintenance of active weapons development laboratories and the corps of experts needed to cope with any stockpile problems that arise, again the totalitarian Soviet system would have much less difficulty than the U.S. A case in point is the congressional requirement to "maintain a readiness to test in the atmosphere," which our JCS insisted upon as one of four safeguards to the LTB treaty: This requirement was funded only for the first few years, and has since quietly faded into oblivion. The Panel fully expects the most knowledgeable and imaginative weapons scientists to turn their attention to more valued pursuits as soon as U.S. leaders, through their words and actions, imply that nuclear weapons are no longer important to the U.S. By contrast, of course, the Soviet leaders can enforce their will and determination not only in matters of government policy but even as to specifying who will work on what.

(U) The Soviets also have an exploitable advantage in their absolute control of the news media and the access to information. In particular, they can (and do) conduct nuclear tests clandestinely and without any public announcement or discussion.

(U) Finally, there is an asymmetry propagated in some circles of the US that our science in general, and weaponry in particular, is highly sophisticated and well-advanced over that of the Soviets. We see no reason to think that the Soviets are any better or worse than the US in nuclear weapons technology. It is certainly true that our ability to assess this statement with any accuracy ended with the ban on atmospheric testing in 1963, <u>15 years</u> ago.

(U) The relevance of these asymmetries to a CTB lies first in the sensitivity of stockpile problems to design philosophy and constraints; second, in the ability to correct stockpile deficiencies as they are discovered; and, third, in the need and availability of tests in maintaining and assuring stockpile reliability.

(U) There is strong reason to worry that the frequent and diverse problems that have shown up historically in US stockpile weapons--of which many have required testing to eradicate, or to ensure that they have been eradicated--have not totally exhausted our design oversights or even plain blunders. Moreover, comparison of the Soviet design philosophy and their freedom from the inhibiting constraints of low-payload delivery vehicles make it appear highly likely that the Soviet stockpile has been designed with much greater attention and priority to long shelf-life.

(U) In these considerations, the inescapable question arises: But surely the Soviet designers have also made some important oversights; aren't they in the same boat?

(U) While certainly agreeing that Soviet designers are no better than ours, they nevertheless are not in the same boat. Again, the underlying logic requires a careful exposition and comparison of the actual constraints on testing which a CTB would impose upon the U.S. and the USSR, to which we now turn.

G. [redacted] Nuclear Test Detectability (U)

(U) Under a prospective reduction of the permissible yield (currently < 150 KT) allowed for underground nuclear tests, the question of uniform compliance with treaty limitations becomes increasingly important. The issue here revolves around another asymmetry; namely, the necessary openness and public transparency of U.S. testing, contrasted with the secretiveness and impenetrability of the Soviet test program. In short, the technical capability for the USSR to conduct clandestine tests provide a consequent asymmetric disadvantage to the U.S.

(U) We have previously explored the question of the need for nuclear testing by the U.S. to assure the reliability of our stockpile. We now concern ourselves with the question of what level of yield could be so tested in the Soviet Union as to fall below the threshold of detection/identification by US national means under various circumstances.

(U) The tests which produce for a given yield the least-detectable signatures outside the Soviet border are those conducted underground (or in deep space). It has been well established by an extensive experimental and theoretical program in the US that the magnitude of the long-range seismic signal produced by an underground explosion can be reduced from the closely-coupled-in-hard-rock value by a factor of at least 10 (in the seismically-estimated yield) simply by adroit selection of the natural medium in which the explosion is carried out.

JS 3.3(b)(2) OSD Section 6.2 (a)

[redacted]

DOE 1.4(g)

DOE 1.4(g)

DOE 1.4(g)

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JS 3.3(b)(2) DOE 1.4(g)

[redacted]

(U) Still another method of concealment is to test in a seismically active region, allowing a genuine earthquake to trigger the explosion, thus submerging the signal in the earthquake event. Although recent U.S. advances in seismic technology, particularly the development of seismic arrays, have greatly improved the detection sensitivity toward seismic disturbances, the numbers of natural earthquake events increase rapidly at these lower seismic intensities so that the extraction and identification of signals submerged in the natural noise background is a problem still largely unsolved.

H. ([redacted]) Minimum Test Requirements (U) DOE 1.4(g) + Section 6.2(a)

[redacted]

JS 3.3(b)(6)

[redacted]

JS 3.3(b)(2),(6),(8)

(U) The Panel thus urges that in arriving at an acceptable yield limit, the Air Force stand fast on two principles:

(1) U.S. tests must be permitted up to yields adequate to assure maintenance of U.S. stockpile reliability; and

(2) U.S. tests must be permitted to the maximum yields which the Soviets might test under conditions which would defeat detection/identification by U.S. national means.

[redacted] From our brief considerations, the Panel concludes that both of these principles lead to about the same yield range, namely, some tens of kilotons.

JS 3.3(b)(6),(8)

[redacted]

DOE Section 6.2(a)

(U) The Panel emphasizes that, whatever treaty limits might be established, it is imperative that the U.S. not place further unilateral restrictions on the actual test yield allowed. A serious asymmetry disadvantage could occur if the U.S. were to require absolute assurance by the DOE Laboratories that no pre-shot underestimate of the yield could result in accidentally exceeding the treaty limit while the Soviets adopt a more flexible limit.

IV. ([redacted]) Conclusions (U)

([redacted] In view of the foregoing considerations, the Panel concludes that:

[redacted]

JS 3.3(b)(6),(8)

(4) [redacted]

(5)

(6)

(7)

(8)

(9)

OSD
Section 6.2 (a)

DOE Section 6.2(a)
18-0-250-038

 JS 3.3(b)(2),(6),(8)

DOE 1.4(g)

[redacted]

DOE 1.4(g)

(U) In addition to these conclusions, which are related to the issues of stockpile reliability, the Panel wishes to note that there are other important reasons to continue nuclear testing which have not been dealt with in this report. Among these are the following:

- We will predictably need new weapons designs which don't exist in the current stockpile. Examples include
  - a stockpile designed for longevity and "rebuildability"
  - change of criteria, e.g., one point nuclear safety, vulnerability issues, etc.
  - new weapon systems, e.g., the ALCM, earth penetrator, enhanced radiation weapons, etc.
  - new requirements for safety, survivability and security
  - control of collateral damage and special effects
  - conservation of Special Nuclear Materials

78-0-250-039

[redacted]

DOE 1.4(g)

JS 3.3(b)(2),(6),(8)

13 C-29-090

JS 3.3(b)(6),(8)

[redacted] The Panel thus recommends that the Air Force adopt the following position with respect to a possible extension of the LTB:

[redacted]

DOE Section 6.2(a)

DOE 1.4(g)

DOE 1.4(g)

JS 3.3(b)(6),(8)

[redacted]

(U) In addition to the above position posture, the Panel recommends that the Air Force pursue the following further steps:

(5) Sponsor a thorough review of the capability of US national means to detect/identify and quantify the yields of underground nuclear tests within the borders of the Soviet Union.

(6) Thoroughly explore the issues of USSR/U.S. asymmetries including a review of all available intelligence data pertaining to Soviet nuclear design and testing.

(7) Urge that the JCS communicate to the Department of Energy the military importance of placing

- special design emphasis directed toward achieving confidence in stockpile items and maintaining a viable and reproducible rebuild capability.

(U) The Panel is prepared to support the Air Force in these and such other CTB studies as the Air Force considers pertinent. In particular, we feel it is especially important to undertake, as soon as possible, the careful review of the current stockpile as discussed above.

F-0-256-

APPENDIX A

STATEMENT ON THE IMPLICATIONS OF A COMPREHENSIVE TEST BAN TREATY (U)

BY

DR. EDWARD TELLER

22 March 1978

78-[illegible]-20-043

([redacted]) The following are suggestions some of which may prove useful. No recommendations are included because recommendations would have to depend on developments which are as yet uncertain. Also the remarks are technical rather than political.

([redacted]) Maintaining the Stockpile

The stockpile was created under constraints which emphasized progress rather than a long guaranteed lifetime of the stockpile items. In part, this was due to a spirit of innovation. In greater part this came about because of the need to obtain maximum results from a limited budget. Thus we had to try to get both flexibility and effective-[redacted]

(U) Tactical Stockpile — JS 3.3(b)(6).(8)

Work on tactical explosives has not been emphasized. It is becoming clear that small defensive nuclear weapons with minimal colateral effects may be useful in the defense of NATO. Experience with such weapons is limited. A test ban may well freeze us in an inferior position.

(U) Technological Leadership of the U.S.

This leadership has tended to erode. As evidenced by information on Russian military research budget, our advantage continues to erode. A test ban will not freeze the present position. Indeed in our free country a test treaty will be strictly observed. The same is not true in Russia. Thus the ban will restrict programs more in the US than in the Soviet Union.

[redacted]

([redacted]) Verification — JS 3.3(b)(6)(8)

Small tests can be performed without giving an identifiable seismic signal. Nonseismic methods of verification are dubious. A limit of 10 kilotons would make sense in that the chances for verification of 10 kiloton explosions are considerably better.

[redacted] Secrecy Concerning Seismic Verification

Misleading optimistic statements have been circulated about seismic verification. Classified material contradicts these optimistic statements. Release of classified material is needed if it is to have an influence.

[redacted]

(U) Civil Defense

JS 3.3(b)(8)

A comprehensive test ban will favor the Russians to the point of making deterrence on our part unreliable. For this reason Civil Defense (on which the Russians are working vigorously) will become a necessity for the US. This is important because it is valid. It is also important because it would bring home to the decision-makers the danger of the comprehensive test ban.

(U) Two Laboratories

The competition between Los Alamos and Lawrence Livermore Laboratory is beneficial. In case of a comprehensive test ban the benefits will increase. In case changes in stockpile become necessary or valuable, two different designs from the two laboratories should be put into stockpile. The confidence of the Russians that neither of these designs will work will necessarily be reduced.

(U) Contained Nuclear Experiments

Any experiment performed in a survivable container should be permitted because it should be classed as an experiment rather than as a test. In connections with inertial fusion such experiments are unavoidable. The difference between these experiments and other confined experiments will be hard to define. It seems necessary to permit such experiments irrespective of size, frequency, or purpose. The only condition should be definitive confinement as opposed to limits on yield, number, or purpose. In case the Russians object, we should demand inspection of sites where we suspect that such experiments are going on inside Russia.

(U) Plowshare or Peaceful Nuclear Explosives

We should explore the possibility to permit and in fact encourage nuclear explosions for peaceful purposes. One possibility is to introduce full cooperation by the Russian and American teams, the cooperation extending to all phases of the operation: that is cooperation in the construction, placement, observation, and use of explosives. In the nonproliferation treaty negotiations, other countries demanded to obtain the benefits of Plowshare. The cooperation may be extended to other participating nations by establishing technical cooperation. We would obtain advantages of insight into nuclear explosive programs carried out abroad and we also could put the treaty on a basis that will appear equitable and conducive to peaceful cooperation.

APPENDIX B

(U) TASK STATEMENT & MEETING AGENDA

TASK STATEMENT

SUBJECT: Comprehensive Test Ban

OBJECTIVES: The USAF Scientific Advisory Board (SAB) will examine the technical issues pertaining to a Comprehensive Test Ban on nuclear explosions and assess the impact on the nuclear weapons stockpile as relates to USAF systems. Specifically, as a first order of business, the SAB is asked to form a small panel, principally from outside of DOE, to identify the key technical issues which should be examined and provide advice as to what, if any, more detailed review should be conducted by the panel. Such additional detailed review will be in the form of additional SAB CTB study tasks, to be approved.

The panel should provide a report by 31 March. Specific direction will be given subsequently if any further review is required.

GENERAL OFFICER PARTICIPANT: Major General James R. Brickel, Director of Concepts, Deputy Chief of Staff, Plans and Operations, HQ USAF

STEERING COMMITTEE APPROVAL: 1 March 1978

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AGENDA

Tuesday, 21 March

0900	Opening Remarks	Dr. Charles McDonald
0930	Thoughts on CTB	VADM Robert Monroe DNA
1030	Break	
1045	Panel Discussion	
1200	Lunch	
1300	Thoughts on CTB	Maj Gen Jasper Welch AF/SA
1400	Panel Discussion	
1645	Adjourn	
1700-1800	Reception in Air Force Mess #1, Room 4D859	

Wednesday, 22 March

0900	Executive Working Session	Dr. McDonald
1100	Thoughts on CTB	Maj Gen Edward Giller (Ret)
1300	Executive Working Session	
1530	Adjourn	

This meeting will concern matters listed in Section 552b(c) of Title 5, United States Code, specifically subparagraph (1), and accordingly will be closed to the public.

T H Sandford

THADDEUS H. SANDFORD
Major, USAF
Assistant Executive Secretary
USAF Scientific Advisory Board

20 March 1978

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