

Ref: A09972

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PRIME MINISTER

Comprehensive Test Ban

In my minute to you of 4th May (copy attached) I mentioned the existence of a Nuclear Advisory Panel under Lord Penney. Its other members are -

Lord Zuckerman  
Sir Sam Curran  
Sir Sam Edwards  
Sir Hans Kornberg

2. Two key questions referred to them concerned (a) the maintenance of nuclear weapon stockpile reliability and (b) the possibility of failure in verifying compliance with a CTB treaty. After spending a weekend at the Atomic Weapons Research Establishment at Aldermaston at the beginning of this month, the Panel have now submitted to me the attached replies, which you will wish to see. They will be relevant to a discussion of CTB issues in your restricted group of senior Ministers on Nuclear Defence Policy (MISC 7) which will be needed before the Recess, and may take place at 11.15 on 25th July.

3. You will see that the reply to the second question says (in its first paragraph) that a decoupled cavity explosion would be equated to "an even larger yield" than 10 kilotons. I understand that it could, at least in theory, be much larger.

4. I am sending copies of this minute and its attachments to the Foreign and Commonwealth Secretary and the Secretary of State for Defence.

*On our work  
New work  
etc*

*John*  
(John Hunt)

13th July, 1979

*B/F 24.7.79  
for meeting*

*Prime Minister*

*John  
13/7*

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Comprehensive Test Ban

You will of course know that since July 1977 the United Kingdom has participated in negotiations with the United States and the Soviet Union for a multilateral comprehensive test ban treaty. Much of the treaty has already been agreed tripartitely, but there are a few outstanding and important issues still to be settled, including especially problems relating to verification.

2. I attach a note describing the current state of play in the negotiations and indicating the problems which remain to be resolved. It has been prepared by a small group of officials under Cabinet Office chairmanship and is for information only. Further submissions will be made as and when decisions are required by Ministers.

3. It is convenient to mention one related point at this stage. Difficult scientific and technical questions arise over e.g. stockpile reliability and safety in the absence of testing (see paragraph 7 of the attached note); and we have felt the need for some independent source of advice in addition to that provided by the experts in the Ministry of Defence. Accordingly a small panel of eminent outside scientists was established a few months ago under the chairmanship of Lord Penney to advise on such nuclear weapons matters as might be referred to it.

4. Copies of the attached note are being given to the incoming Foreign and Commonwealth Secretary and the Secretary of State for Defence: but it will not have any wider circulation until you decide whether you wish sensitive matters of this kind to be handled in the Defence Committee or in a smaller group. I will let you have a separate submission on this when your main appointments have been made.

JOHN HUNT

JOHN HUNT

4th May 1979.



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QUESTION REFERRED TO PANEL

Against the background of present Western (not only British) warhead technology, what ageing faults are likely to arise in a stockpile of nuclear weapons over successive three year periods?

Which of these faults would be expected to be amenable to rectification without subsequent nuclear testing of whole weapon operation?

Which might require subsequent nuclear testing to re-establish confidence in reliability of whole weapon operation?

PANEL'S RESPONSE

The mechanical properties of the materials used in a nuclear warhead are likely to change with age but it is virtually certain that any faults thus arising, within a period of three years, could be remedied by AWRE without recourse to nuclear weapon testing. There is no reason to suppose that this position will change in subsequent three year periods, so long as the component materials are available to reproduce the original designs and thus to reconstruct the weapon to the original specification.

However, there are components of the warhead whose performance depends critically on both their chemical stabilities and their precise spatial relationship. It is conceivable that circumstances may arise, through for example alterations in the availability or purity of the materials used, when AWRE would not have their present degree of confidence in their ability to reproduce exactly the original design specifications. Under such circumstances, the Panel accepts that AWRE must then advise HM Government that a nuclear test is desirable.

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QUESTION REFERRED TO PANEL

What scope does the Panel see for possible evasion of compliance with a comprehensive test ban treaty (CTBT) under current limits of detection and verification?

What minimum threshold level of verification does the Panel consider would ensure that any Party testing below that level would not acquire a unilateral advantage of military significance?

PANEL'S RESPONSE

The present United States Atomic Energy Detection System (AEDS) has a proven detection threshold at seismic magnitude 3.9. A seismic magnitude of 3.9 is equivalent to an explosion having a yield of about one kiloton if fired in hard rock (like granite), or an explosion having a yield of ten kilotons if fired in soft rock (like dry alluvium). It would be equated to an even larger yield if the explosion took place in a cavity which decoupled the seismic signals. At or above seismic magnitude 3.9 there are, on average, 60 events per annum in the Soviet Union which the AEDS is unable to classify as either earthquakes or explosions.

Improvements for the present AEDS, planned for operation by 1983, together with ten national seismic stations (NSS) in the Soviet Union yet to be agreed under the proposed CTBT and at sites to be chosen by the USA, will enable most, if not all, of these 60 events to be classified as either earthquakes or explosions. But, at the same time, this enhanced seismic system will detect many smaller events down to seismic magnitude 3.6 (about  $\frac{1}{2}$  kiloton in hard rock) which cannot be identified.

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There is no doubt that successful clandestine testing at yields of three to five kilotons could give the weapon design authorities of a potential violator greater confidence in their ability to design kiloton weapons and greater flexibility in the design of high yield weapons. The question therefore is whether the overall 'improved' seismic detection system will be completely reliable in detecting and identifying a test of yield level three to five kilotons.

A violator might make an explosion of yield three to five kilotons and escape detection and identification by making use of a cavity in, for example, a salt dome. Such cavities can be produced by either 'solution' mining or by a high yield explosion. The Panel was informed that the Soviet Union has created some cavities in salt domes in the Caspian area, which is a seismically active zone. They were also informed that these cavities were made by high yield explosions and have subsequently been used for smaller nuclear tests. The Panel noted that there are other salt desposits in aseismic areas in the Soviet Union, and also in the USA and in UK (Yorkshire).

Another possible method of concealing a small explosion would be to make it coincide with a nearby earthquake. Its seismic signals would then be buried in the 'noise' of the natural earthquake. This procedure would pose serious technical problems for the violator.

Given the information about salt domes, described above, the Panel felt that, even with the proposed enhanced seismic system, the possibility of carrying out an undetected nuclear explosion with yield up to 5 kilotons in an underground cavity has to be recognised.

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Additionally, the Panel recognised the political difficulty that could arise from making an accusation against a possible violator, unless that accusation was based on seismic information which was of sufficient quality and certainty to sustain the accusation.

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