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Defence



MINISTRY OF DEFENCE  
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*m/s mtg Thurs.*

MO 12/2/5

11th May 1979

Prime Minister

*Dear Brian.*

*This is in response to the queries you raised in your original CTB brig.   
 Paul  
24/5*

COMPREHENSIVE TEST BAN (CTB)

The Prime Minister may be interested to have the views of Ministry of Defence officials on the points made in your letter of 8th May to Martin Vile.

It has always been recognised that it is technically impossible to verify that the terms of a truly comprehensive test ban are not being evaded. There will always be a detection threshold below which any country could cheat without any real risk of being found out. The seismic monitoring system at present deployed by the Americans is proven to be capable of detecting, with at least 90% confidence, Soviet nuclear tests conducted underground in hard rock at yields in excess of 800 tons. Improvements planned for this system and the addition of National Seismic Stations (NSS) in the Soviet Union would, it is estimated, reduce this threshold to about 300 tons. The equivalent detection thresholds for explosions conducted in soft rock are 10 times higher, ie 8 kilotons and 3 kilotons respectively. They have to be increased yet further if underground explosions are carried out in a way which reduces the seismic signals, ie by decoupling using an underground cavity, or which masks the seismic signals ie by hiding the explosion signal in that from an earthquake occurring at roughly the same time and place. Taking these evasion possibilities into account, the broad estimate of Western verification capability is that it can give a

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high probability of detecting clandestine tests above a yield level of a few tens of kilotons.

Should a country decide to cheat, it would have to set an upper limit on the yield for a clandestine test taking into account its uncertainties about the verification capabilities of deployed detection systems and the safety factor required to be sure of escaping detection. With this in mind, if the Russians decided to cheat, it is assessed that they would not do so above a few kilotons, perhaps 10 kilotons at maximum, even with the use of evasion techniques; but naturally much depends upon the Russian assessment of the consequences of being found out.

It is a joint United States/United Kingdom technical assessment that it would be certainly possible to maintain the reliability and safety of the existing Western nuclear weapon stockpiles in the long term if underground nuclear testing up to a limit of 5 kilotons were permitted, and it is possible that 3 kilotons would be sufficient. The indications, based on our intelligence of Soviet nuclear warhead designs obtained from their pre-1963 atmospheric testing programme and, latterly, on intelligence about their nuclear delivery systems, are that a 5 kiloton test limit could be too low for their potential stockpile maintenance purposes. A limit of say between 15 and 30 kilotons might be required by them.

In the light of the above, the MOD view is that the West's deployed seismic detection capability, if augmented by 10 NSS in the Soviet Union, would be adequate for verifying a three-year CTB Treaty. But, for a Treaty of longer duration an increased verification capability would be required. MOD has also advised that a suspension of all testing for a three year period would not entail a significant risk to the viability of the UK's nuclear weapon stockpile.

The concept of permitted experiments is based on the essential consideration that, during a CTB, the skilled

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manpower in the Defence nuclear programme must be kept competent not only for stockpile maintenance reasons but also to permit a resumption of warhead development and production if and when the ban ceased. One route for this purpose is through a programme of very low nuclear yield experiments. In addition there is a requirement for civil nuclear experiments in aid of power generation research. In particular, there is a defence and a civil interest in laser fusion research. Nuclear experiments up to 100 lb yield would provide the freedom that is required in this context and technically there would be no advantage in increasing the yield to 500 lb or even to several tons. There are some Americans who suggest that work directly useful for stockpile maintenance might be carried out at 300 ton yields, but, as stated in paragraph 4, confidence in Western stockpile maintenance could at present only be assured with tests up to 3 to 5 kilotons. If testing at these levels were allowed, then the test ban would clearly be not a comprehensive but a threshold test ban.

From a purely technical point of view, MOD would prefer a threshold Treaty at the 3 to 5 kiloton level. Under such a Treaty, it would be possible to conduct a programme of nuclear tests aimed at investigating how the problems of stockpile maintenance could be solved with a reducing threshold. But for wider reasons it was decided to seek a comprehensive Treaty but one with a strictly limited duration because of potential stockpile problems. In the light of the assessment in paragraph 4, MOD would not seek a threshold of 10 or more kilotons because this might be to the advantage of the Russians. A threshold Treaty at 3 to 5 kilotons could, moreover, be adequately verified without the need for NSS.

The Americans intend to institute a so-called "Safeguards Programme" during the currency of a CTB. The aim of this programme will be to maintain the whole range of US nuclear weapon expertise, including the ability to resume underground nuclear testing immediately a test ban lapses.

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MOD envisages a similar programme for the UK nuclear establishments and has had informal exchanges with the Americans on the types of "safeguards" that would be required. Technical opinions in the US and UK run along very similar lines and the Americans have shown considerable interest in adopting a joint approach to the common problem. Of special interest to the UK would be a co-operative agreement which would allow us access to American facilities for permitted nuclear experiments during a test ban.

An additional important question is the degree to which a CTB on the present lines would restrict our options for a new strategic nuclear deterrent to succeed Polaris/Chevaline. A definitive answer must await decisions on the type of successor system, if any, required. But the candidate which would pose us the most difficult problem is the warhead for a MIRV-d submarine launched missile. In this case, the choice for UK production would lie between copying an appropriate US design, a design depending on a device scheduled for testing in mid-1980, and a design based on a device already tested. It would not be possible to buy a US-manufactured warhead because this is prohibited by US law. The feasibility of copying a US design cannot be assessed until the design details are released to us by the US; but there would be problems in duplicating the advanced fabrication techniques already used in the US for their warheads and confidence in the UK production route could be low if it were not proven by nuclear testing.

For warhead designs based on UK devices, we would rely upon results already obtained from nuclear testing and those from tests which are scheduled. The aim of the two most recent UK tests and that scheduled for August 1979 is to provide information on very small and hard warhead designs suitable for MIRV-d systems but with a nuclear yield lower than that desired. A further successful test in mid-1980 should enable a full yield requirement for a successor system warhead to be met. Of course, if a CTB entered into

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force in say 1981 and lasted for no more than three years, then a new area of possibilities opens up in that nuclear testing for a successor system could resume in 1985. Even so, the window into which tests could be fixed and still meet a requirement to replace Polaris/Chevaline at the end of its operational life in the early 1990s would be narrow, but might be met.

I am sending copies of this letter to George Walden (Foreign and Commonwealth Office) and Martin Vile (Cabinet Office).

*Yours sincerely,*

*Roger L. L. Facer*

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