

D/9/1/08

To: Distribution

PEACEFUL NUCLEAR EXPLOSIONS

I attach a first shot at comments on the Arms Disarmament Research Unit paper of 6 November in the hope that we can let [redacted] have a final view by 24 November. AWRE could contribute a good deal to any development of the ideas in paragraph 47(b) and (c).



[redacted]
SSDM

17 November 1972

Distribution

- Director [redacted]
- CMF [redacted]
- CPA [redacted]
- SSCD [redacted]

* [redacted] draft issued in his absence by [redacted]

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PEACEFUL NUCLEAR EXPLOSIONS AND ARMS CONTROL -

COMMENTS ON THE DRAFT OF 6 NOVEMBER 1972 by [REDACTED]

1. Paragraph 3 to 10 appear to draw on the article "Engineering with Nuclear Explosives - Achievements Prospects" by [REDACTED] published in the November/December 1971 issue of J. Inst. Nuclear Engineers.

2. Paragraph 6, second sentence might be modified. The initial US programme was very much bound up with the Trans-Isthmian Canal project and was largely directed towards cratering explosions. Contained explosions only became prominent in their programme after 1965 and more particularly since 1970. The shift was ~~caused~~ caused partly by the entry into force of the PTBT.

3. The fourth sentence of paragraph 6 as written invites confusion on the term "clean" which is generally understood to mean producing comparatively few fission products (the explosive derives most of its energy from thermo-nuclear reactions). The sentence might read better as follows:

'For explosions where venting is expected the explosives are sophisticated and "clean" (most of the energy derived from thermo-nuclear reactions; few fission products released to the atmosphere). In many contained explosions it is important to avoid excess residual [REDACTED] and simple explosives are used which derive all their energy from fission. Apart from the development of these two main classes of

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of peaceful nuclear explosives there are, particularly for natural gas stimulation, sizeable research programmes aimed at developing methods of decontamination by chemical means and solving the problems of using slightly contaminated natural gas supplies'.

4. In paragraph 7 "cost" in the first sentence might be replaced by "difficulty". It is quite possible that large scale decontamination could be cheap once the necessary technology has been developed. The third and final sentence might be modified. Most of the 22 (say 25 or so) Flowshare projects have been concerned either with explosives development or with the physics of cratering. There have only been two projects designed to be anywhere near commercial, namely the gas stimulation projects Gasbuggy and Rulison and these were designed primarily to demonstrate feasibility of stimulation. A possible wording here is:

"The history of the United States Flowshare programme suggested that a long and extensive research and development programme is necessary before any particular PNE application such as gas stimulation can be demonstrated to be safe and commercially viable, if indeed adequate safety measures can be developed, although naturally the experience gained in any one successful application will be helpful in the development of new applications."

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5. In the first sentence of paragraph 8 for "PNEs" read "PNE applications".

6. In paragraph 14 it is important to distinguish between contained and uncontained explosions perhaps by the following wording:

"As for PNEs becoming a pollution issue, it seems, to judge from the experience of US and French atmospheric nuclear tests, that there would be widespread opposition to the large-scale use of PNEs for excavation purposes even if the projects were technically assessed safe".

7. In drafting paragraph 14 had consideration been given to the views of those who campaigned for the PTB? Surely there were two aims - reduction of pollution and slowing down the arms race. Whilst the first was largely achieved, the second has failed to materialise due to the large-scale development of underground nuclear weapon testing.

8. In paragraph 18 it is worth considering replacing the second word - "major" - by "possible", whilst the words "nuclear engineering" should be replaced by "excavation" in the second sentence. In considering the environmental hazards of excavation using nuclear explosives it is important that decisions be taken on a rational basis. If it can be demonstrated by detached reasoning to the satisfaction of the majority of people that the consequences have been carefully considered and that the risk from radioactivity does not outweigh the anticipated benefit then

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it would be dangerous to allow the PFBT as presently worded to stand in the way of suitable projects, lest similar irrational opposition to other activities such as the development of nuclear power or even of "conventional" power be encouraged. It seems desirable to make this point either as an addition to paragraph 18 or in conjunction with paragraph 21 and 22.

9. In discussing the quota arrangement referred to in paragraph 31 it should be remembered that, given success with gas stimulation, [REDACTED]

[REDACTED]

[REDACTED]

10. The thesis of paragraph 34 is not necessarily true. It is possible to imagine schemes under which PNE devices are drawn at random from an internationally inspected stock so that the supplying nation would not know in advance which particular device was to be used. (this possibility is implied by the discussion in paragraph 41). The problems raised in paragraph 34 are probably worth a paper on their own and it would be dangerous to draw firm conclusions in advance of detailed discussion of such a paper.

11. In relation to the discussion in paragraphs 38 to 41 it may well be that an international approach offers the best chance of getting PNE engineering

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recognised as a safe and economic proposition if that is the case (ie:it will help to overcome irrational objections).

12. In paragraph 41 line 8 the word "nuclear explosive" might be inserted before "research and development". A similar amendment in paragraph 47 (c) - insert "explosives" between "nuclear" and "research" would also increase clarity.

13. In paragraph 42 line 10 the word "substantial" might be inserted before "government". The same goes for paragraph 44 line 5 before "PNE programme".

15 November 1972