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Preliminary Study of Problems Connected with the Elimination of Rockets as Nuclear Delivery Vehicles

Introduction

1. Both the Soviet Union and the United States of America envisage, in their proposals for general and complete disarmament, the elimination of rockets capable of delivering nuclear weapons, except for certain designated rockets which would be retained for the peaceful exploration of space. According to the Russian proposals military rockets wouldbe entirely eliminated in Stage I. According to the American proposals reduction would be progressive and would not be completed until Stage III.

2. Furthermore the Russian draft Treaty provides that in Stage I the manufacture of all such rockets shall be completely discontinued, workshops and special machine tools shall be destroyed, and all proving grounds shall be demolished. According to the American proposals production should be limited to an agreed allowance during the beginning of Stage I and should be halted by the beginning of Stage II. On the other hand both the Russian and the American proposals envisage the continued manufacture and testing of appropriate rockets for the peaceful exploration of space, under some form of control or supervision by the International Disarmament Organization.

3. In considering the possible implementation of these proposals, the following problems arise:-

(a) Whether in all cases it is possible to distinguish unambiguously between military rockets and rockets intended for the peaceful exploration of space.

(b) How the control or supervision of the manufacture and testing of space rockets is to be exercised.

(c) How the destruction of military rockets, their means of production and proving grounds is to be verified, and what the chances are of undetected evasion.

(d) Whether there is any means of ensuring that further developments in space technology will not be used to conceal or threaten any aggressive intentions by countries engaged in space research.

4. The purpose of this paper is to examine these problems briefly, and to suggest points for further consideration.

The Problem of Differentiation

5. One of the main difficulties with which we have to contend, in attempting to eliminate rockets as nuclear delivery vehicles, is that there is no fool-proof means of differentiating between the type of rocket used to project a weapon on to its target and the type of rocket used as a booster to launch a payload into space. This is not so much a matter of terminology, as of technical fact. The rockets used to launch every space-shot so far carried out, were originally designed as ballistic missiles. Future rockets, designed to meet the requirements of a legitimate space programme, could just as readily be used to deliver a weapon, or to threaten to do so, - provided such weapons were already available or could be produced at short notice.

6. The significance lies not in the rocket but in the use to which it is put. If intended as a nuclear delivery vehicle, the rocket has to carry a weapon in the form of a warhead. To eliminate "military rockets" capable of carrying nuclear weapons, while leaving "civil rockets" uncontrolled, would afford insufficient security unless (and this is another point requiring examination at a later stage) the elimination or control of all nuclear warheads could be guaranteed.

Control of Production

7. Although it is envisaged that the International Disarmament Organization should exercise some form of control or supervision over the manufacture of space rockets, both draft Treaties now before the Conference leave open the question of how this is to be done. As we suggest later in this paper, one way might be to internationalize the whole of space research. But if this is not done, and if the manufacturing industries are left in national hands, then for effective control resident inspectors would have to be maintained at the main assembly plants and proving grounds. Further back in the production process a sufficient measures of supervision might be exercised by checking the records of

the principal sub-contractors and by periodic visits to the component manufacturers, for which teams of travelling inspectors would be required on a geographical basis.

8. There is very little past experience on which to base even an approximate estimate of the number of inspectors that would be required. Clearly this number would be influenced by the size, complexity and distribution of the industry - which, in themselves are factors that are difficult to assess. However, bearing in mind the effort so far expended on space developments and the magnitude of the space projects that have already been announced, it seems probable that a very considerable industry will be required to support the programmes that are envisaged for the next 10 to 15 years.

9. Experience of a very limited form of factory inspection under the Factory Acts in the United Kingdom suggests that the number of inspectors required, world-wide, for the control or supervision of production by the International Disarmament Organization is likely to be large - in the region of a few thousands rather than of hundreds.

Verification of Destruction and Chances of Evasion

10. Apart from monitoring the production and testing of space rockets, the International Disarmament Organization will need to take additional measures to provide:-

(a) Verification that the rockets, production facilities and bases scheduled for destruction are in fact destroyed.

(b) A reasonable degree of assurance against the possibility of hidden stockpiles, concealed launching sites and clandestine production.

11. Verification of the destruction of rockets would be comparatively easy without resorting to inspection, as these could be fired down existing test ranges to an impact area in the Pacific where adequate instrumentation facilities could be provided to prove that rockets of the appropriate size had in fact been fired. Alternatively, rockets could be destroyed under supervision in a "destruction factory". These aspects are considered in detail in a separate paper. On the other hand illegal stockpiles, stored underground and suitably camouflaged before the disarmament process took effect, would be extremely difficult to detect - even if unrestricted facilities forinspection were permitted. There is no technical reason why certain types of rockets and their associated warheads could not be salted away for several years.

12. The destruction of production facilities and bases could be verified only by inspection. If launching sites for non-mobile rockets, such as underground silos, had been completed before disarmament and steps had been taken to render them inconspicuous, their continued concealment might be possible. But very considerable effort would have been expended in carrying out such an operation; the existence the existence of the sites would be known to many of the local population, and extreme security precautions would have to be taken to prevent compromising any such evasion plan. It might perhaps be easier to conceal mobile launching facilities such as tube launchers on merchant ships or barges, and launching ramps on railway flats or vehicle trailers; to ensure that they would not escape detection indefinitely, it would be necessary to bear these points in mind when defining the powers of inspection to be vested in the International Disarmament Organization.

13. As far as clandestine production is concerned, it might be comparatively easy to conceal, under cover ofother industrial processes, the illegal manufacture of many of the essential components comprising, for example, rocket motors and guidance systems. With regard to fuels, kerosine and the various oxydants required for liquid-propelled systems are used commercially and would be difficult to control; solid propellants can be readily produced in a variety of plants. However, the body of a rocket (whether liquid or solid-propelled), which requires high-tensile steel rolled to exacting standards, and very large heat treatment facilities, would be difficult to disguise as anything other than it was. Final assembly under clandestine conditions would also require unique facilities, which would be likely to betray themselves to the inspecting agency, always provided that appropriate powers were vested in it.

14. This analysis suggests that clandestine production subsequent to the implementation of a disarmament treaty could - given suitable inspection - be less of a danger than clandestine storage of previous production.

Safeguarding Peace in Space

15. Whatever precautions are taken against possible evasions of the disarmament agreements, one cannot at present discount the possibility that future developments in space technology may be used to conceal or threaten aggression. In this connexion some idea of the scale of the problem with which the International Disarmament Organization might be faced can be gleaned from what has already

been achieved up to mid-1962. Over 100 satellites have already been launched, of which 50 are at present in orbit. Outstanding among these, as an indication of potentiality, is the Russian Sputnik IV, weighing 10,000 lbs., with an estimated life of 2-3 years. Of the American satellites at present orbiting, ten weigh more than 2,000 lbs.; the largest, Midas II (5,000 lbs.) has an estimated life of 8-15 years. Bearing in mind the possibilities that already exist, it seems highly desirable that all space projects should be brought as soon as possible under some comprehensive organization for international collaboration.

16. The only alternative assurance against aggressive developments in space is the degree of supervision and inspection to be exercised by the International Disarmament Organization. This would require that satellites and spacecraft should be subject to inspection at all stages of design and production, and that control should be exercised at assembly points and launching sites to ensure that no illegal payloads were being launched into space. Such a commitment would involve a very large number of additional inspectors, the actual number depending on the magnitude of the space programme, the exact extent of which is virtually impossible to predict. This, obviously, is a less attractive solution than one based on international collaboration; but unless collaboration can be seen to be complete, inspection by the International Disarmament Organization will also be needed.

Points for Consideration

17. Summarizing the problems outlined above, we suggest the following questions for consideration:-

(a) Is there any means of differentiating between rockets used as boosters in a legitimate space programme and rockets intended as weapon carriers, in such a way that there is no residual risk that the resources of a space programme could be diverted into a nuclear delivery system?

(b) Since such a risk could be minimised by the control and inspection of production and proving grounds by the International Disarmament Organization, can an estimate be made of the number of inspectors required?

(c) The inspectors provided to meet the requirements at (b) above should also be capable of verifying the destruction of rockets, production facilities and bases scheduled for elimination under the disarmament agreement; but how many additional inspectors would be needed to guard

against the possibility of hidden stockpiles, concealed launching sites and clandestine production; and what powers of inspection must they be given?

(d) Is there any way of ensuring against the agressive misuse of future developments in space, apart from bringing all launchings under international control?

(e) To what extent would comprehensive international collaboration simplify the problems of verification?