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**EFFECT OF A TEST MORATORIUM ON THE  
SOVIET WEAPONS DEVELOPMENT PROGRAM**

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*Submitted by the*

**DIRECTOR OF CENTRAL INTELLIGENCE**

*The following intelligence organizations participated in the preparation of this estimate: The Central Intelligence Agency and the intelligence organizations of the Departments of State, the Army, the Navy, the Air Force, the Joint Staff, and the Atomic Energy Commission.*

*Concurred in by the*

**INTELLIGENCE ADVISORY COMMITTEE**

*on 13 November 1956. Concurring were the Special Assistant, Intelligence, Department of State, the Assistant Chief of Staff, Intelligence, Department of the Army, the Director of Naval Intelligence, the Director of Intelligence, USAF, the Deputy Director for Intelligence, The Joint Staff, and the Atomic Energy Commission Representative to the IAC. The Assistant Director, Federal Bureau of Investigation, abstained, the subject being outside of the jurisdiction of his Agency.*

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JOINT ATOMIC ENERGY INTELLIGENCE COMMITTEE

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This estimate was prepared and agreed upon by the Joint Atomic Energy Intelligence Committee, which is composed of representatives of the Department of State, Army, Navy, Air Force, the Atomic Energy Commission, the Joint Staff and the Central Intelligence Agency. The FBI abstained, the subject being outside of its jurisdiction.

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THE PROBLEM

To assess the impact of effective total or limited nuclear test moratoriums on the Soviet nuclear weapon development program.

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CAUTION

For the limited purpose of this estimate, we have assumed that any moratorium entered into WILL be effective and we have NOT examined the very important question whether a Soviet violation of such moratorium could be discovered and proven. We have NOT considered the possibility that the USSR would advance its nuclear weapons program by intelligence operations against the US and UK developments during a period of a nuclear test moratorium.

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The reader's attention is called to the limited scope of this estimate. It deals only with the effects of two types of test limitations on the Soviet nuclear weapon development program. It does not address itself to the other aspects of the overall problem of a test moratorium, or to the problems raised by entirely different types of test moratoriums. While the estimate presents reasonable conclusions which are applicable to the consideration of types of moratoriums based on either a total prohibition of tests or limitation of test yields, the estimate is not intended to be, and should not be, used as a reference for consideration of other possible types of moratoriums, such as a limitation on the number of tests, or on the amount of fission products produced.

- 1 -

[ ~~TOP SECRET~~ ]

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1. Introduction

a. In estimating the impact of test moratoriums on the Soviet nuclear weapons development program, we have considered moratoriums of the two following types:

- (1) A total moratorium on all nuclear weapons tests, regardless of the type of weapon or the yield.
- (2) A limited moratorium prohibiting tests of weapons yielding greater than 100 kilotons, regardless of whether such yields are achieved by fission reactions alone, or in combination with thermonuclear reactions.

Consideration of these two types of moratorium encompasses most of the weapon development problems which will be faced by the Soviets in evaluating the many proposals which could be offered.

b. A third type of proposal which has received widespread attention, both in the US and abroad, -- "a moratorium on the testing of 'hydrogen/thermonuclear bombs'" -- has not been considered specifically in this estimate because of the difficulty of devising an acceptable definition of the term "hydrogen/thermonuclear bomb." Since it is recognized that the popular definition is synonymous with a high-yield weapon, this proposal has, in principle, been considered under 1 a. (2).

c. Since August, 1949, a total of 26 Soviet tests, including devices using both fission and thermonuclear reactions have been detected. These tests have achieved yields ranging from a few kilotons to about

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two megatons TNT equivalent. Based upon the evidence from these tests and the conclusions derived therefrom, we have endeavored to estimate the impact of two selected test moratoriums on the future Soviet nuclear weapons development program. We have assumed that during the period of a moratorium the Soviet Union would continue its weapons development activities on a high priority basis in order to be in the strongest possible position upon termination of the moratorium either by mutual agreement or unilateral action.

2. Effects of Total or Limited Moratorium on Soviet Development of Low-Yield Weapons (Less than 100 KT)

Approximately one-third of the Soviet nuclear weapons tests detected have involved the detonation of a device or weapon yielding less than 20 KT. We have estimated in NIE 11-2-56 that the current Soviet nuclear weapons stockpile includes low-yield (less than 100 KT) weapons,

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a. Total Moratorium

(1) Under a total ban of nuclear weapons tests, existing small-dimension, low-yield weapons could probably be improved in efficiency and in yield, and the diameter might be somewhat reduced.

(2) Under a total moratorium, successful application to low-yield weapons of the principle of boosting would be difficult. In particular, it is probable that a dependable gas-boosted weapon could not be stockpiled without testing.

(3) It is highly improbable that air defense weapons could be optimized in the absence of nuclear tests. The Soviets, under the conditions of this moratorium, could not be certain of the most efficient use of their fissionable material stockpile. Since large numbers of this type of weapon must be stockpiled for adequate air defense systems, future Soviet air defense capabilities would probably be impaired, perhaps to a serious extent.

(4) We estimate that nuclear warheads, capable of delivery in bombs and missiles could, without nuclear tests, be adapted for use in artillery shells, depth-bombs, penetrating bombs, torpedoes, demolition charges and clandestine operations.

(5) Some experience in boosting and in development of low-yield weapons might be obtained from small tests (less than 10 KT) which might escape detection.

- 4 -

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- b. Moratorium on Tests of 100 KT Yield or Over. No effect.
3. Effects of Total or Limited Moratorium on Soviet Development of High-Yield Weapons (100 KT and Over).

The Soviet nuclear test program has included tests of two types of high-yield weapons: (a) weapons typified by tests JOE IV (300 KT) and JOE XVIII (200 KT), and (b) the weapons tested in JOE XIX (1.6 MT) and JOE XXIV (2 MT). [

] Soviet scientists have displayed a substantial degree of technical competence and apparent self confidence during the development and testing of high-yield weapons.

a. Total Moratorium

(1) General: With the detonation of JOE XIX and JOE XXIV, the Soviet nuclear weapons development program has reached the point where the fabrication and stockpiling of multi-megaton weapons can be accomplished by the extension of techniques which led to the development of these tested weapons. If the preliminary evaluation of JOE XXIV is confirmed, the yield of the 2 MT weapon could probable

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be increased to 10 MT, and even possibly higher, without further testing.

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this moratorium, these weapons with yields greater than 10 MT might be of questionable dependability and not of optimum size and weight.

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(2) High-Yield Missile Warheads: Under a total test prohibition, Soviet development of high-yield missile warheads would be impeded. Although some progress is possible, attainable warhead size and weight would force an upward revision of payload requirements of presently estimated missiles. However, if the missile accuracy could be materially improved, the ability to use lower-yield warheads would lessen the effect of a total moratorium.

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- 6 -

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b. Moratorium on Tests of 100 KT Yield and Over

(1) General: Under this nuclear test limitation, development of nuclear weapons in the yield range of 100 KT - 10 MT could proceed with considerable confidence by means of component and mock-up testing. Development of very high-yield weapons, (over 10 MT) could proceed with greater confidence than in the complete absence of tests, although even in this case, the reliability and yield of the weapons would be uncertain and the optimum size and weight could not be attained. [

(2) High-Yield Missile Warheads: [

] Even lighter warheads might be obtained with sacrifice in yield. The influence of this test limitation on the missile development program would be less than that experienced under a total prohibition but warhead design would still not be optimized.

4. Effects of Test Limitations on Soviet Weapons Effects Information.

At least two of the Soviet tests, JOE VIII (Totskoye) in 1954 and JOE XVII (underwater) in 1955, were accompanied by rather large scale weapons effects programs. The program undertaken in connection with

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JOE VIII was very extensive and probably resulted in acquisition of a large amount of effects data. This experience, together with other effects measurements which may have been conducted at development tests, and together with US published information, should furnish the Soviets with sufficient data on weapons effects and scaling laws for determining the effects of any yield weapon within acceptable but not necessarily desired accuracy, under almost all detonation conditions. However, under the 100 KT upper limit it is estimated that this knowledge would be refined to an extent that would allow more effective employment of weapons in any environment.

5. Impact of a Moratorium on the Soviet Nuclear Weapons Scientific Establishment.

Realization of the major developments discussed in paragraphs 2 and 3 will require the best efforts of a large number of highly skilled scientists. Because of the substantial material awards and recognition for Soviet scientists, and the type of economy and political control, we estimate that the best efforts of the necessary scientists will continue to be available to the weapons development program.

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