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By JK	NARS, Date	5/19/81
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REPORT

of the

AD HOC PANEL ON NUCLEAR TESTING

July 21, 1961

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- Hans A. Lethe
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D. AICBM SYSTEMS

The AICBM problem must be considered both from the point of view of increasing our AICBM defense capabilities and of reducing the vulnerability of our ICBM's to enemy AICBM action. Nuclear tests have a bearing on the AICBM problem in the following areas: AICBM warheads; kill mechanisms; and "blackout" effects on radars and communications.

1. AICBM Warheads.

The present U. S. Nike-Zeus AICBM system is not limited by warhead performance [redacted] providing the forthcoming Kwajalein tests verify the predictions on intercept accuracy. Thus, the potential increase in yield [redacted] in this weight class is not of great importance in determining the effectiveness of Nike-Zeus. The limitation to the usefulness of Nike-Zeus results from the unfavorable exchange ratios of the cost of Nike-Zeus vs. increased enemy ICBM traffic, especially if the enemy uses decoys or other penetration aids. Although the Nike-Zeus warhead costs about [redacted] this cost does not dominate the cost of the defense system due to the large radar and data processing requirements. There have been speculations whether one could increase [redacted] from an AICBM warhead and thus increase its effectiveness. Although improvements

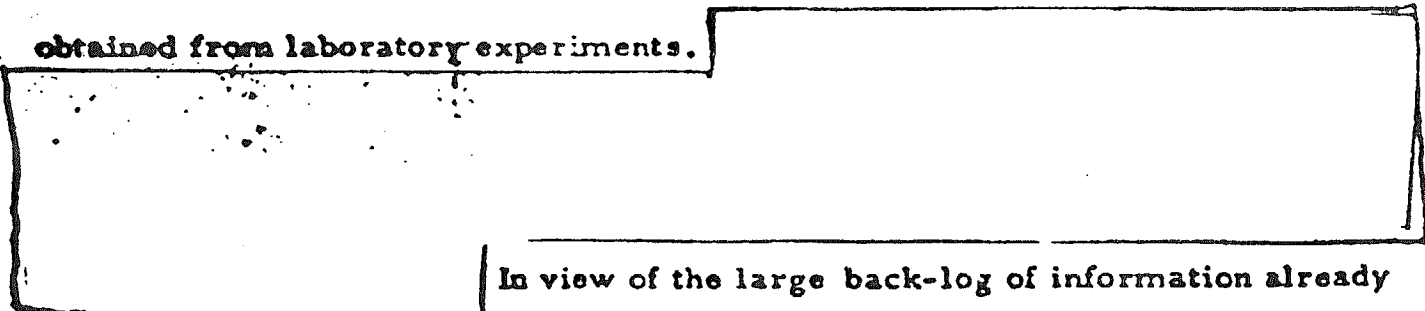
are possible, they are not believed to be of particular significance.



While the USSR would have adequate nuclear warheads for a Nike-Zeus type system, they have  higher cost than those of the U. S. in this weight class. The USSR could, therefore, achieve greater relative reductions than the U. S. in the cost of the nuclear component of its AICBM system by testing either under the Case II, unlimited testing, or Case III, clandestine Soviet testing.

## 2. Kill Mechanisms

ICBM warheads are vulnerable to several different effects from nuclear explosions: X-ray impulse; neutron melting of fissionable material; debris impact, radiation effects on electronics; and blast.\* The theory of these effects is well known; some experimental information is available to the U. S. from earlier nuclear tests, and more detailed information can and is being obtained from laboratory experiments.



In view of the large back-log of information already available which has as yet not been applied to warhead design, nuclear effects

\*For an assessment of the present status, see Report of the Ad Hoc Panel on Warhead Vulnerability to the President's Science Advisory Committee, June 20, 1961.

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tests are not necessary during the next few years in order to undertake a program to reduce this known vulnerability of our ICBM warheads. However, the degree of reduction

Although the USSR might be less aware of some aspects of these effects

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the USSR should also either have or be able to obtain adequate information on these effects by calculations and in the laboratory for purposes of designing an AICBM system or reducing the vulnerability of its own weapons. Underground nuclear tests may be helpful to uncover unsuspected additional phenomena contributing to warhead vulnerability. In the longer run, over-all tests of the vulnerability of complete ICBM re-entry vehicles to nuclear explosions would remove some uncertainties; such tests would have to be carried out in the upper atmosphere and would be subject to uncertainties about detailed characteristics of enemy warheads.

There are a number of measures which could be undertaken to reduce the vulnerability of our nuclear warheads to these AICBM kill mechanisms.

However, this could also be accomplished by such measures as the following: 1) improved propulsion systems; 2) larger missiles; or 3) the utilization of existing lower weight warheads with smaller

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3. "Blackout" Effects

The detonation at high altitude of enemy ICBM's or defensive AICBM's would cause serious "blackout" effects on certain radars and communications systems. The U. S. probably has more information on this problem than the USSR.

*A* [REDACTED] Although the effects on some systems and equipment could be severe, the problem is well understood by the U. S. (and probably by the USSR). In principle, radar difficulties can be gotten around by going to higher frequencies and alternate modes of communications are available. While more information on this problem might be useful, it is not critical to the operation of the Nike-Zeus AICBM system and could not be obtained by underground testing.

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