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E.O. 12958, Sec. 3.6

NW: 972006A  
By DM LTR Date 7/27/05

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November 5, 1957

AEC 952/20

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ATOMIC ENERGY COMMISSION

DEMONSTRATION SHOT FOR HARDTACK

Note by the Secretary

The Acting General Manager has requested that the attached report by the Director of Military Application be circulated for consideration by the Commission at the meeting scheduled for 2:45 p.m., Wednesday, November 6, 1957.

W. B. McCool

Secretary

REPOSITORY NARA/College Park  
COLLECTION RG 326 51-58 Secretary  
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FOLDER MRA 7 Hardtack, V2

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ATOMIC ENERGY COMMISSION

DEMONSTRATION SHOT FOR HARDTACK

Report to the Acting General Manager by the  
Director of Military Application

THE PROBLEM

1. To consider certain aspects of the contemplated U.N. observer program at HARDTACK which would affect the plan of observation to be offered the U.N.

BACKGROUND

2. At his press conference of July 3, 1957, the President stated in part, "I am going to invite any country in the world that wants to come and fire its rockets in the air and see just exactly how much radioactive fallout there is from those bombs..." Later the initial announcement on the HARDTACK series, dated September 15, 1957, stated in part, "A United Nations agency will be invited to designate an international group to observe one of the detonations involving limited fallout and studies are under way to determine the instrumentation which will facilitate their observation without making disclosures which would compromise restricted weapon information..." Still later at his initial appearance on September 19, 1957, before the U.N. General Assembly's current meeting, Mr. Dulles stated, "We shall invite the United Nations to send observers to one of our next tests so that they can see how these tests are conducted."

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3. It should be noted that the above-quoted statements have been successively less promising as to whether or not the degree of observation permitted would satisfy the observers that a particular shot was "clean".

4. It has appeared to the Division of Military Application that the United States is irrevocably committed to the inviting of U.N. observers to observe one shot. Also, the commitment has implied that (within security requirements) the degree of observation would be such that an unbiased observer would be convinced that the shot was "clean". Therefore DMA, with Laboratory representatives and the Commander, JTF-7, has investigated various means of observation to determine how these two objectives could be realized. As a result of our deliberations it appears that in order to convince an observer of weapon cleanliness, it is necessary that he be given or be allowed to obtain information from which he could calculate, with some degree of accuracy, fission to fusion ratio. Some compromise of design information could result from revealing this information. Each of the methods analyzed could permit this possibility to some degree, unless certain measures, such as those described in paragraph 7 below, are taken to prevent the disclosure of additional important information. The methods investigated included the following:

a. To fire two shots of comparable yield (one "clean" and one conventional) allowing observers after each shot to monitor with simple counters the intensity of residual fallout on the Atoll's islands. This method, though extremely simple, could lead to very unsatisfactory results. The land masses are small and the close-in fallout unpredictable. We could well get hot spots which would give contradictory and unconvincing evidence.

b. To measure for two comparable medium yield shots (one "clean" and one conventional) the gamma radiation close to the fireball during the period 5 to 10 seconds after the burst. During this period, the fission debris fragments cause most of the gamma radiation. Through such measurement, one could secure a basis to judge comparative "cleanliness". This method would require the establishment of instrumentation which might, or

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might not, be believed by the observers. It would require, also, two medium yield shots whose yield and behavior are fairly certain. Even if the shots function satisfactorily and the readings gave true evidence as to relative activity, it is not certain that this would be convincing to observers. They could always suspect, or claim to suspect, that we had tampered with the instrumentation or readings.

c. To fire through the clouds of two comparable yield shots (one "clean" and one conventional) a series of rockets which would telemeter back gamma intensity readings which, by comparison, would indicate relatively that the activity in one cloud was far less than in the other. This solution again requires two reliable shots of comparable yield. It requires extremely elaborate and costly instrumentation. It is capable of being assailed (like the approach of b. above) as subject to tampering.

d. To allow the observers to witness one "clean" shot of assured behavior - to determine by simple instrumentation (such as bhangmeter) the total yield and to determine by limited radiochemistry the fission yield. This appears to be the most convincing method of proving a shot "clean". It is relatively straight-forward (though not simple) and would require the shortest attendance at the site by the observers. However, unless the shot were doctored, it would reveal significant information relative to our weapons design. This possibility is discussed further below.

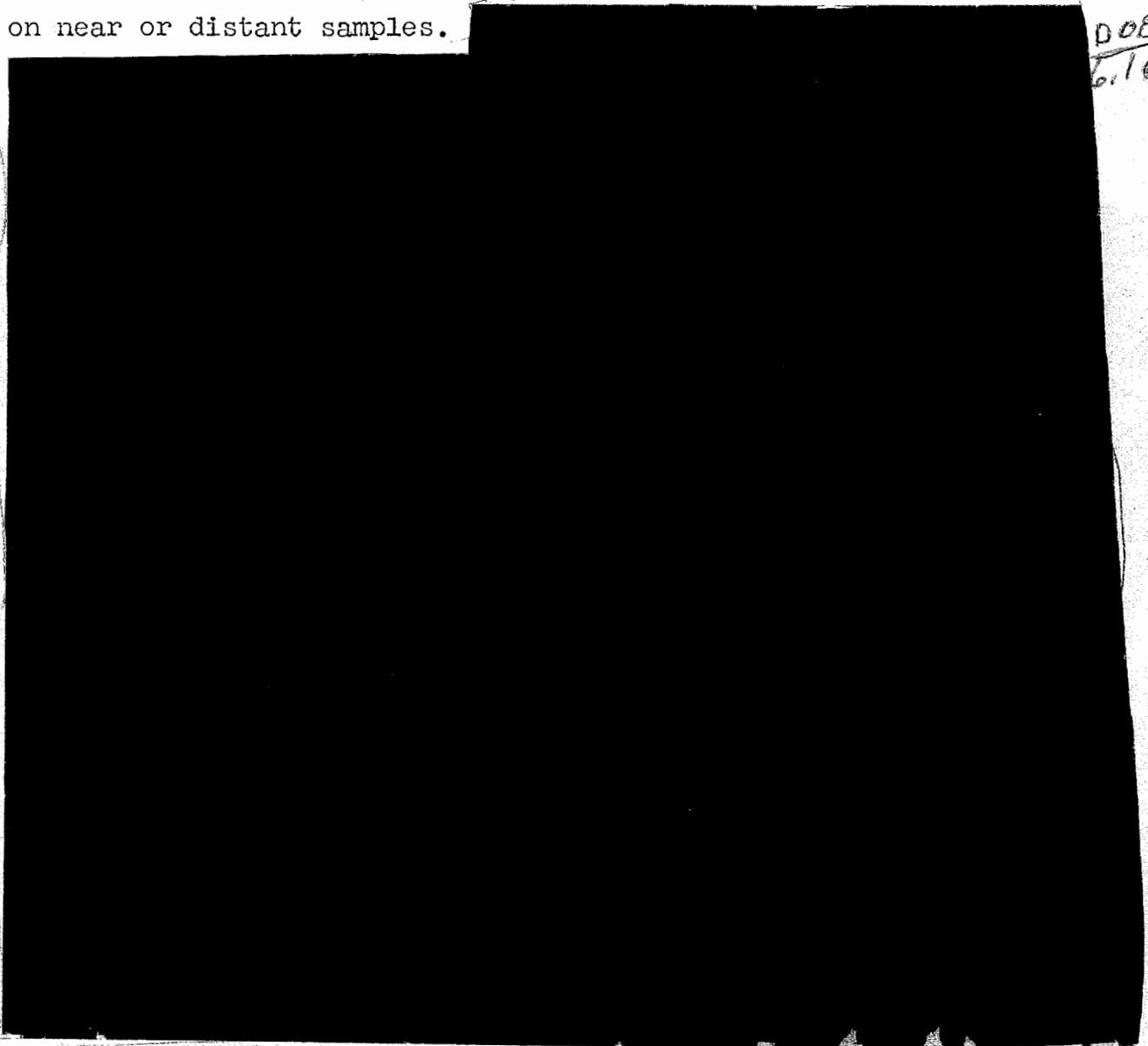
#### DISCUSSION

5. If the fission yield is to be established by simple radiochemistry, it will be necessary to add to the shot a bulk tracer, such as many tons of depleted uranium. The weight of the uranium, but not its isotopic content, would be made known to the observers. Aircraft samples would be taken and turned over to technicians in a laboratory created for the purpose at the Test Site. These technicians, knowing the amount of the tracer, could establish the fraction of the bomb they are analyzing and could determine therefrom the total fission yield which had occurred. Such an analysis should be capable of accomplishment in the period of three to seven days after the shot. Establishing the laboratory facilities and controlling the observers would be a complex problem, though not insurmountable.

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6. We must assume the Soviets would take distant samples and make extensive analyses thereof. Knowing the amount of tracer, and if the sample were not obscured by doctoring, the following types of information could be gained by them: that the device was multi-stage; approximate amount of material in the primary and secondary; the approximate efficiency and yield of the primary and secondary; the probability that radiation implosion and propagation burning were utilized to attain the efficiencies and compressions measured.

7. Much can be done through doctoring of the device to conceal important information from individuals making the sample analysis on near or distant samples.



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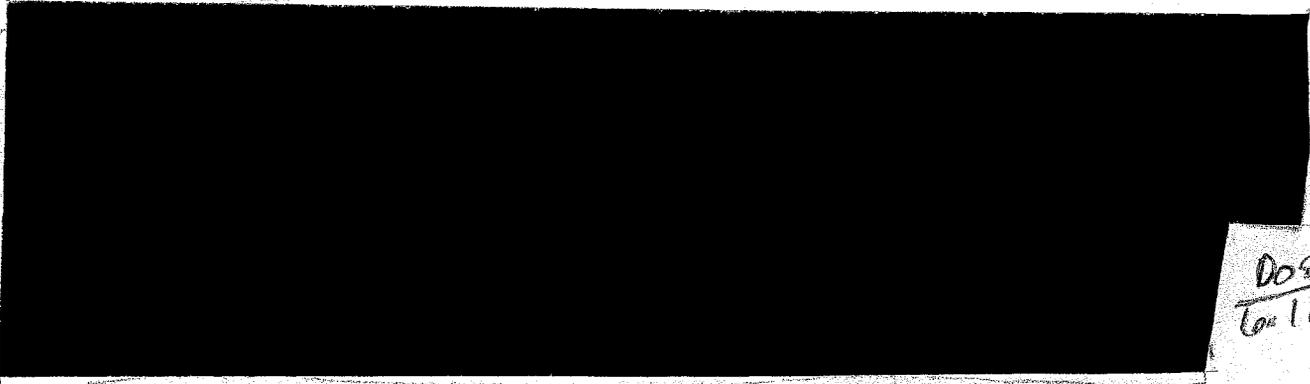
The observers must be held well away from the detonation, -- away by the order of 35 miles. There is a definite question as to whether the observers will be more impressed by the "cleanliness" or by the awesomeness of the detonation. Observers, particularly neutral observers, may depart with the feeling that the "cleanliness" is, after all, not too important an aspect of the problem of high-yield nuclear weapons.

10.

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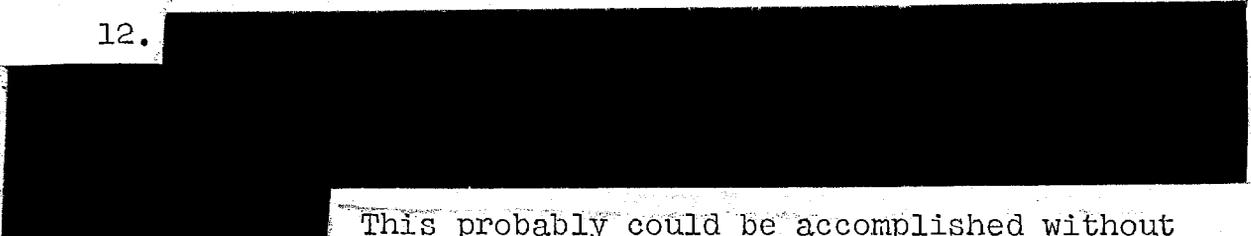


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11. One cannot foretell whether or not the Soviets would attend our demonstration firing. It would appear that their most advantageous position, if they desire to keep their country's tests closed to observers, would be as follows: they should not attend our shot, criticizing it as a propaganda stunt; they should claim that their own firings are "clean" and hence the U. S. is just putting on a show; they could have certain other members of the Soviet Bloc attend to secure all possible information; they should claim again that their only interest is in stopping all tests.

CONCLUSION

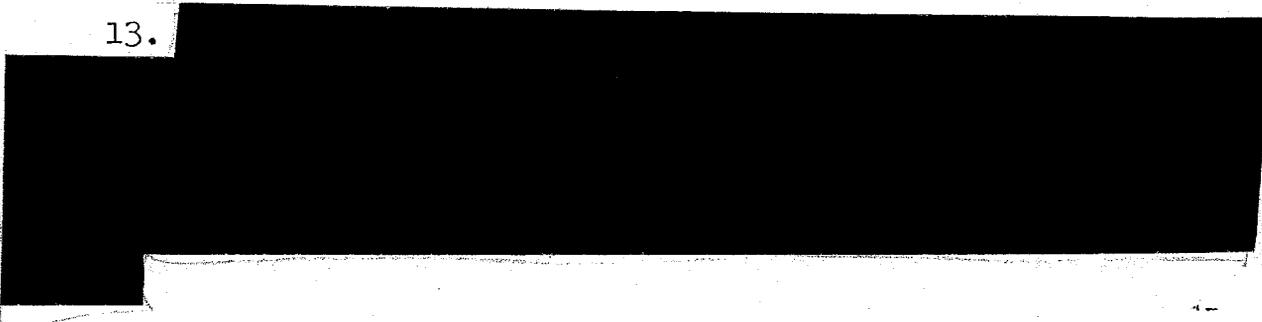
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This probably could be accomplished without revealing to the Soviets important design information not already known to them. However, it would be necessary to declassify for the purpose the total yield and total fission yield of the shot. To determine the fission yield at all convincingly, the radio-chemical analysis of samples should be the method used.

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14. There is a propaganda advantage to the proving of our contention that we can make "clean" weapons. On the other hand, there are possible propaganda disadvantages as described in paragraph 9 above. We do not feel qualified to evaluate the balance between advantages and disadvantages.

15. An alternate approach might be taken which would be less difficult but less convincing. Observers might be invited to one shot, allowing them to measure the total yield by simple instrumentation and be told the general percent of "cleanliness" (say 5 - 10%). Failure to permit more sophisticated instrumentation could be explained as not possible without revealing important design information. One of the smaller "clean" weapons might be that observed but only after a successful prior firing.



16. We do not know how strongly the President feels as to our making an effort to prove a shot "clean". The staff believes it needs to discuss this problem with the Commission to secure Commission guidance.

CONCURRENCES

17. The Divisions of Intelligence, Classification, and Information Services, and the Offices of Operations Analysis and Planning and the General Counsel concur in the recommendation of this paper.



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RECOMMENDATION

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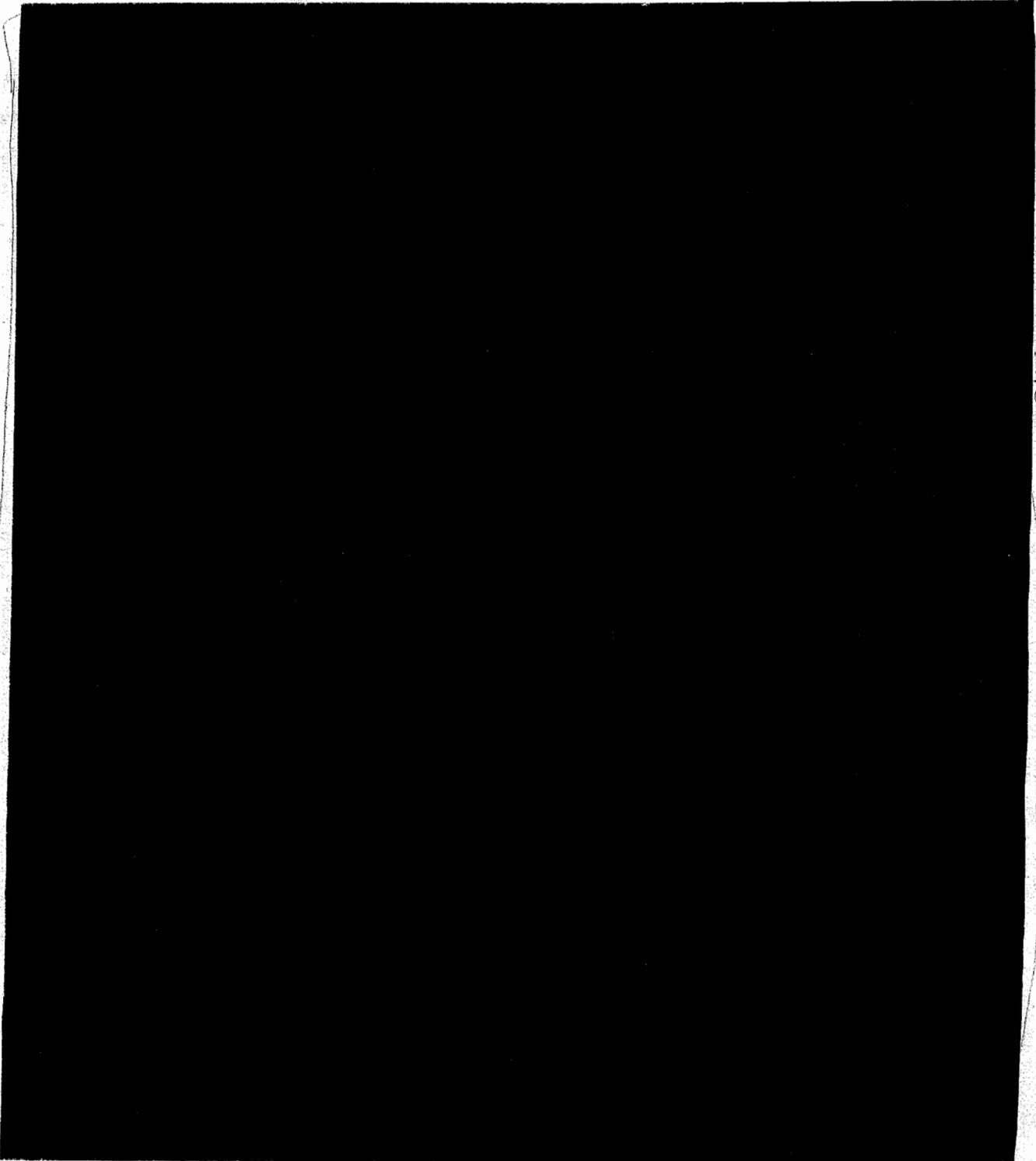
APPENDIX

Foreign Weapons Evaluation Committee  
Chairman, Prof. H. A. Bethe



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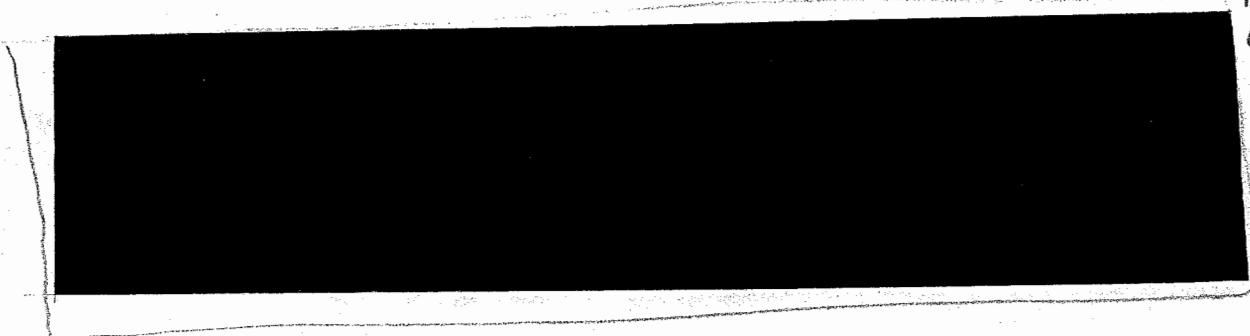
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/s/

H. A. BETHE  
Chairman

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