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October 7, 1953

Honorable Robert LeBaron
 Chairman
 Military Liaison Committee
 to the Atomic Energy Commission

RECEIVED 6 Oct 1953
 U. S. ATOMIC ENERGY COMMISSION
 BY: RE Fields - Armstrong
 DOCUMENT NO. 2478-4A

Dear Mr. LeBaron: **BEST AVAILABLE COPY**

Reference is made to the October 1, 1953, joint AEC-MLC meeting at which the scope and timing of the CASTLE program were discussed and general agreement was reached on a seven shot program scheduled to commence March 1, 1954.

Operation CASTLE embraces both short-term and long-term goals of the thermonuclear program. The short-term goal is to prove in an emergency capability with one or more thermonuclear weapons currently being engineered for production and delivery. The long-term goal is to test new designs which should lead to thermonuclear weapons that are smaller, lighter, more deliverable, and perhaps of higher yield in the future.

The tests of the [REDACTED] are directed toward determining the content of the emergency capability program. Testing all three weapons provides the greatest assurance of achieving an "emergency capability" by minimizing the possible consequences of any unanticipated delay in solving the difficult engineering problems [REDACTED]

The test of the [REDACTED] may enable the weight of the emergency capability weapons to be reduced and, together with the tests of the [REDACTED] should point the way to the next generation of thermonuclear weapons and assure earliest development of better weapons. The Atomic Energy Commission's programmed capacity to produce lithium-6 is to be phased into the weapons program.

A CASTLE program consisting of the above-named seven shots is presently believed to be the maximum practicable program. While the magnitude and complexity of a seven shot program is not to be underestimated, it appears ill-advised to consider anything short of a maximum effort in view of the importance of thermonuclear

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ARMSTRONG, H. G. Secretary
 DORSEY, E. T. [REDACTED] BUTMAN, P. N. [REDACTED] PIPE, P. C. [REDACTED] GUTHRIE, M. P. [REDACTED] ASHWORTH, M. P. [REDACTED] HUSTON, V. G. [REDACTED]

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applying radiation implosion on a smaller scale to boosted fission devices led to the idea of the [REDACTED] which would employ U-235, lithium-6, and tritium to attain a yield of a megaton or more, but would have a weight and size in the range of ordinary fission weapons.

3. In order to explore [REDACTED] designs for emergency capability and thereby improve the odds of achieving at least one successful weapon, the Los Alamos Scientific Laboratory proposed on November 28, 1952 (AEC 597/2) that CASTLE be expanded to include [REDACTED]

[REDACTED] In order to accomplish this program, Los Alamos recommended that CASTLE be held in the Spring of 1954.

UCRL-Livermore proposed on November 24, 1952 (AEC 597/2) that two thermonuclear devices, [REDACTED] be tested in CASTLE

to investigate the potentialities of [REDACTED] radiation implosion and stated that these devices probably could not be ready for test until

late Winter or early Spring of 1954. By letter of January 2, 1953

(AEC 597/7) the Commission proposed to the MLC that CASTLE be held as

early in 1954 as technical progress permitted, and by letter dated

January 19, 1953 (AEC 597/11) the MLC advised of Department of Defense concurrence.

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4. In the course of further study of various thermonuclear weapon designs at Los Alamos in 1953, consideration was given both to [REDACTED] containing normal lithium and to [REDACTED] containing lithium

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partially enriched in lithium-6. The latter would have a better chance of success and would give a higher yield, but would be dependent on lithium-6 production. Meanwhile, in the Spring and Summer of 1953, the Air Force indicated the importance of reducing the weight of thermonuclear weapons for delivery by the B-47, a medium bomber being produced in large numbers, and for delivery by the Hustler, a new medium bomber under development. Los Alamos responded by proposing that the enriched [REDACTED] be scaled down to about a 3/4 scale version [REDACTED] with a reduction in weight from 42,000 to 25,000 pounds. Since the [REDACTED] has been under design for only a few months, engineering for production and delivery is not as far advanced as in the case of the [REDACTED] [REDACTED] which are the emergency capability weapons.

5. The program for thermonuclear development, testing, and emergency capability have been going forward with great emphasis and speed. The importance of these programs is increased by the fact that the Soviet Union conducted an atomic test on August 12, 1953, that involved both fission and thermonuclear reaction.

DISCUSSION

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6. Following a meeting on September 17, 1953, at Los Alamos among representatives of the Atomic Energy Commission, Los Alamos, UCLL-Livermore, Oak Ridge, and Joint Task Force

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Seven, proposals for the CASTLE tests were formally submitted by Los Alamos and UCRL-Livermore and are attached as Enclosures "B" and "C". These proposals recommend testing the [REDACTED]

7. The purpose of the [REDACTED] tests is to prove in emergency capability weapons. The third emergency capability weapon, [REDACTED] was not included in the Los Alamos proposals because of considerable doubt as to its nuclear performance and because of the previous assumption that Los Alamos would be limited to four shots in the CASTLE Operation. However, if the [REDACTED] were successful it would have the advantage of being a [REDACTED] weapon independent of lithium-6 production; it would be a hedge against failure or limited availability of the [REDACTED] and it would also be a hedge against logistic and delivery problems that may arise [REDACTED]. Because the [REDACTED] offers the greatest assurance of good nuclear performance, it must be heavily depended on in the early emergency program. However, better decisions regarding [REDACTED] future production can be made after CASTLE on the basis of actual results and experience gained from testing each type. This is particularly important since the present situation indicates a large military requirement for emergency capability weapons soon after CASTLE.

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8. A preview of the performance of the [REDACTED] will be afforded by the test of the [REDACTED]. The [REDACTED] is essentially a [REDACTED] reduced in scale but enriched in lithium-6. If the yield of the [REDACTED] were to be low because of inadequate propagation of the thermonuclear reaction, then the [REDACTED] would not merit testing. On the other hand, if the yield of the [REDACTED] were high, the chances for the [REDACTED] would be increased. Since the test of the [REDACTED] is to be the most thoroughly instrumented one in CASTLE detailed information should be available on its performance. Because of the potential advantages of the [REDACTED] in the emergency capability program, it therefore appears advisable to include a test of the [REDACTED] in CASTLE, contingent on the performance of the [REDACTED].

9. The tests which are intended primarily to provide information for the future development of thermonuclear weapons are the [REDACTED]. The goal is to obtain data which will enable the next generation of thermonuclear weapons to be of smaller size, lighter weight, higher efficiency, or greater yield. Results of the test of the [REDACTED] may permit the [REDACTED] to be redesigned and their weight reduced by as much as 10,000 pounds, with a smaller reduction in weight possible for the [REDACTED]. The tests of the [REDACTED] are aimed at the development of weapons having yields of a megaton or more for weights and sizes in the range

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of present fission weapons. Detailed discussions are contained in Enclosures "B" and "C".

10. In regard to the timing of the CASTLE Operation, Los Alamos proposes in Enclosure "B" that March 1, 1954, be set as the target date for the first test. This is based on the rate of supply of lithium-6, the time required for fabrication, shipment, and assembly of weapon components, and the schedules for construction of test sites and installation of equipment at Bikini and Eniwetok. Although there is no one phase of the preparations which prohibits the start of CASTLE a little earlier, every phase is so tight that March 1 seems the best target date to set for the initial detonation. Tentatively establishing a less realistic date would lead to confusion in planning and conducting the operation and would probably not result in an earlier successful completion of the operation.

11. Scheduling the date of the first CASTLE test for March 1 does not adversely affect the time when the first emergency capability is to be achieved. The plan is to initiate emergency capability with ~~SECRET~~ and these are the thermonuclear weapons that can be stockpiled with greatest assurance of their nuclear performance prior to CASTLE tests. In accordance with the directives of the Commission on September 23, 1953, every effort will be made to have ~~SECRET~~ ED available for emergency capability in January 1954.

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12. Consideration was given to limiting the CASTLE program to a maximum of four shots and deferring the remaining tests to a later operation. While this would be favorable from the point of view of simplifying and shortening the CASTLE Operation, it would not be consistent with the maximum effort toward thermonuclear progress. It would also involve greater expense inherent in two separate operations. As to the relative difficulty of seven versus six shots, it now appears that a seventh shot would be feasible, at reasonable cost in time, dollars, and efforts, if the barge technique ~~proves favorable enough for extension to an additional barge shot at essentially the same site. Radiation hazard of these over-water shots appears sufficiently low to permit firing at the close time intervals anticipated. The instrumentation mounted on the islands could, if not damaged, service three shots probably as well as two.~~

13. The CASTLE program recommended in this paper is believed to be the maximum practicable program. It covers all available possibilities for providing an emergency capability and should furnish an excellent basis for the future development of thermonuclear weapons.

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ENCLOSURE "A"

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BY: [Signature]
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CASTLE PROGRAM BACKGROUND AND DISCUSSION

DIVISION OF MILITARY APPLICATION, AEC

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REVIEWED BY [Signature] DATE 3/3/87

BACKGROUND

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This document contains data as defined in the Atomic Energy Act of 1954. Its transmittal to unauthorized persons is prohibited.

1. In a letter of June 23, 1952, the AEC requested MLC agreement to proposals for an urgent program to (1) fabricate the first deliverable version of a thermonuclear weapon, the ~~SECRET~~ for test toward the end of 1953 and (2) establish an "emergency capability" for use of this device shortly after its first test if this turned out to be successful (AEC 493/5). The MLC advised of concurrence by the Department of Defense in a letter of July 3, 1952 (AEC 493/8). The possibility was envisaged at that time that other radiation-implosion devices might be included in the test operation.

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2. The successful MIKE shot in Operation IVY on November 1, 1952, stimulated a vigorous program for developing a deliverable cryogenic weapon patterned after the MIKE device and called the ~~SECRET~~. Subsequently, calculations on the feasibility of combining the virtues of ~~SECRET~~ with the favorable implosion characteristics of ~~SECRET~~ led to a ~~SECRET~~ design ~~SECRET~~ which would utilize normal lithium. Finally, the possibility of

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Mr. LaBaron

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weapon progress. Any alternative plan such as postponing a portion of the shots until the Fall of 1954 would be uneconomic and harmful to either the immediate "emergency capability" program or future progress in the field of thermonuclear weapons.

The earliest feasible date for scheduling the start of the CASTLE tests is March 1, 1954. This is based on the rate of supply of lithium-6, the time required for fabrication, shipment, and assembly of weapon components, and the schedules for construction of test sites and installation of equipment at BIKINI and ENIDZOK, work on which is underway in both places.

Reports prepared by the Division of Military Application, Los Alamos Scientific Laboratory, and the University of California Radiation Laboratory, Livermore, are enclosed as background information relative to the CASTLE program and for detailed information relative to the weapon prototypes and test devices to be exploded. Appended to the Los Alamos report are possible production schedules for the emergency capability period. These schedules are being reconsidered in light of the recently received Joint Chiefs of Staff's requirements for thermonuclear weapons.

In summary, CASTLE plans are as follows:

- a. The scope of the program will comprise tests of the

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- b. The first test will be scheduled for March 1, 1954, and the sequence, exact dates, and locations of the various tests will be determined by the Commander of Joint Task Force Seven in conjunction with the Los Alamos and UCRL-Livermore Laboratories.

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Assurance of the Department of Defense support of this very important program is requested.

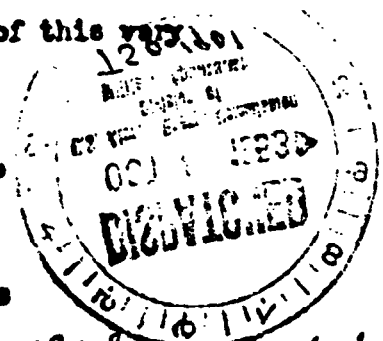
Col Dorsey/mbp

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3A: 3A: Secretariat w/encls 2A, 2C, 2E
4A: DMA Files 3C, 3B

Sincerely yours,

Lewis L. Strauss
Chairman

Ref: see Staff Paper 597/23



Jan 15 1954
for call to...
10/19
Enclosures:
"A" - CASTLE Program Background,
& Discussion prepared by DM, Cpy 1A

1 Cpy Series C made sent to SFO - Ref. 11-9-53
90

"B" - Rpt, 9/22/53, from LASL, Cpy 1E
"C" - Rpt, 9/22/53, from UCRL, Cpy 1E

LXI-2419-3A
CX-836-PC
CXK 11-6-710

1 Cpy Series "B" made by Col. Ketter...
11/6/53
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