~~SECRET~~

This document consists of 1 page
Copy No. 13 of 16 Series A

~~SECRET~~

R

412003

~~S E C R E T~~

COPY NO. 13

November 24, 1947

ATOMIC ENERGY COMMISSION

MEMORANDUM FOR INFORMATION

TEST PROGRAM FIRING SEQUENCE

Note by the General Manager

1. The attached draft study on the subject of test program firing sequence, prepared by the Los Alamos Laboratory, is circulated for the information of the Commissioners.

2. Copies of this draft study have been furnished the General Advisory Committee and the Military Liaison Committee for their information.

3. Your attention is invited to the fact that the definitive recommendations of the Los Alamos Laboratory will not be ready until December 1. Shortly thereafter the staff will be ready with firm recommendations to you as to firing sequence and as to the necessity for a third shot.

DISTRIBUTION	COPY NO.
Acting Secretary	1
Commissioners	2 - 6
General Manager	7
General Counsel	8
Ass't General Manager	9
Director of Military Application	10,11,12
Secretariat	13 - 16

SECRET

[redacted]

"When separated from enclosure, handle this document as Secret"
(Insert proper classification)

~~SECRET~~

~~SECRET~~

~~SECRET~~

~~SECRET~~

This document consists of 15 pages
Copy No. 13 of 16 Series A

~~SECRET~~

TEST PROGRAM FIRING SEQUENCE

Rough Draft, Revision One

5 November 1947

John H. Manley

~~TOP SECRET~~

~~TOP SECRET~~

S E C R E T

FOREWORD

The sequence of test shots set forth herein represents the stage of thinking of the Laboratory as of 4 November 1947, and should not be interpreted as a Laboratory recommendation at this time. Definite recommendations must await the results of tests now in progress and which should be complete before 1 December 1947.

It should be noted that the members of the Laboratory are in good agreement if the first two models tested prove successful, but diversity of opinion exists if the first two are unsuccessful. This arises from the different emphasis that persons put upon the aims of the test program.

SECRET

TEST PROGRAM FIRING SEQUENCE

First Draft, Revision One
John H. Manley
5 November 1947

I. General Considerations

Any test plan must achieve to the maximum degree possible the objectives of the test. These are two-fold:

(a) to improve the short range military position of the nation through testing models which may rapidly become stockpile items, and

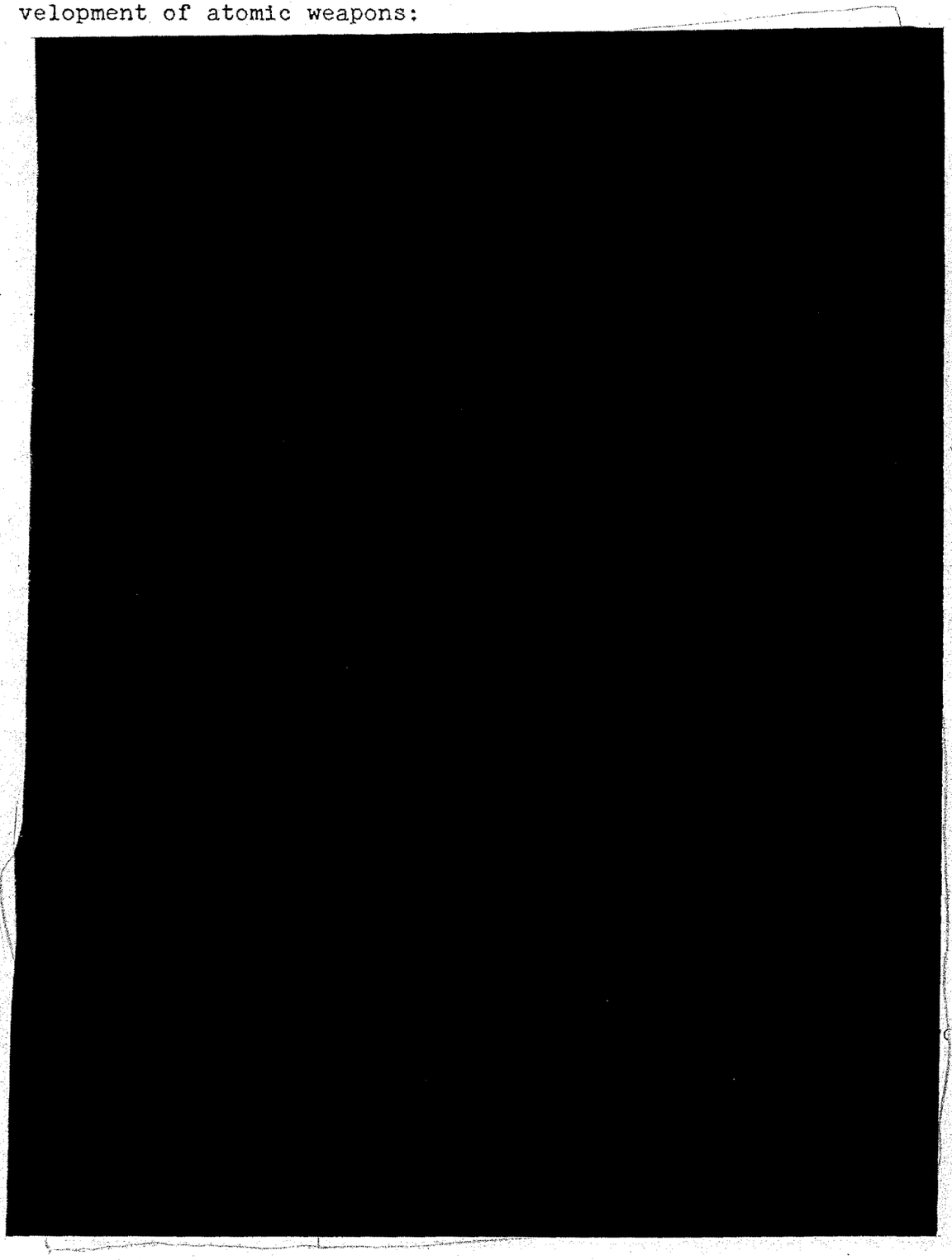
(b) to improve the longer range military position by obtaining such information from the behavior of particular models that better and more efficient weapons may be designed.

Wherever possible, both objectives should be attained to the fullest extent, but in a clear case of conflict it is assumed that (a) takes precedence over (b).

It may be recalled (a) that the significant past development of atomic weapons was the FM method of assembly, and (b) that the phenomena involved in this weapon are so complex that it was considered necessary to test this model, whereas the gun weapon was used without test. The success of Trinity and subsequent detonations therefore clearly indicated that the direction of weapon improvement would be along the line of the FM model. However, the test of one model is obviously insufficient basis for a program of weapon development, especially since the phenomena occurring in that particular model are not completely understood. One can neither be confident of improved designs of weapons employing the same material (Pu) as the Trinity bomb, nor of FM models employing other material (U-235), without additional tests.

~~S E C R E T~~

As the result of the work of the Los Alamos Laboratory and from considerations of production and stockpile, information on the following items is of utmost importance to the development of atomic weapons:



With only one model of each type, which would therefore rigorously give only one point on a behavior curve, five shot-

165

SECRET

would be required (including one repeat for an initiator test), unless some combinations of the five items are possible. Certain combinations are possible, at sacrifice of definiteness, but it will be shown by the detailed considerations of the specific plan that the minimum number of shots is three, each one of which has to be "good", in a sense to be defined. When it is realized that atomic weapons are subject to fluctuations in behavior beyond human control, even a three-shot program appears thin. A test plan involving a small number of shots has to ignore such statistical considerations and rely on a degree of compensation provided by the fact that an unfavorable fluctuation, resulting in low yield, can still yield behavior information, especially from other measured quantities such as alpha, the rate of rise of the reaction rate. In fact, this is generally true regardless of the cause of a low yield and emphasizes that the test program is a series of experiments on weapon types rather than simply a confirmation or disproof of behavior predicted from the performance of the first FM type.

[redacted]

Finally, considerations of production indicate that it would be very desirable, if possible, to investigate the effect of a decrease in the permissible lower limit of initiator strength. It is agreed, however, that fissionable material is more

valuable than initiator material; therefore, tests relative to utilization of the former take precedence.

II. Specific Plan

These considerations, amplified in detail below and restricted by the 3-shot limitation, lead to the plan of Figure I. The last line, "Stockpile Position", gives an approximate picture of the types of weapons on which information suitable for a decision as to stockpile types would exist as the result of any combination of "good" or "bad" criteria of the diagram. Such a picture is approximate at this time because all of the measurements will not be available for consideration until after the test. A firing sequence plan for field operation cannot be based on so detailed evaluation of all results on one shot before the next, as can a subsequent evaluation of factors affecting a stockpile program.

In order to establish a reasonable method of determining the sequence to follow in the field, a relatively simple criterion of "good" or "bad" has been agreed upon:

[redacted]

DOE 6.1(a)

In reaching a conclusion for the "goodness" of a particular shot, the Scientific Director shall weigh the results of each measurement according to his judgment of the accuracy and thus obtain a weighted average of available results.

[redacted]

DOE 6.1(

SECRET

[redacted] DOE 6.1(a)

III. Detailed Considerations

In order to follow particular paths of Figure I, the four possible sequences are listed as A, B, C, D. For example, A sequence moves to the left at the branch-point following each shot, indicated as Shot #1 good; Shot #2A good; Shot #3A.

A. Sequence: Shot #1 good; Shot #2A good; 3A

[redacted] DOE 6.1(a)

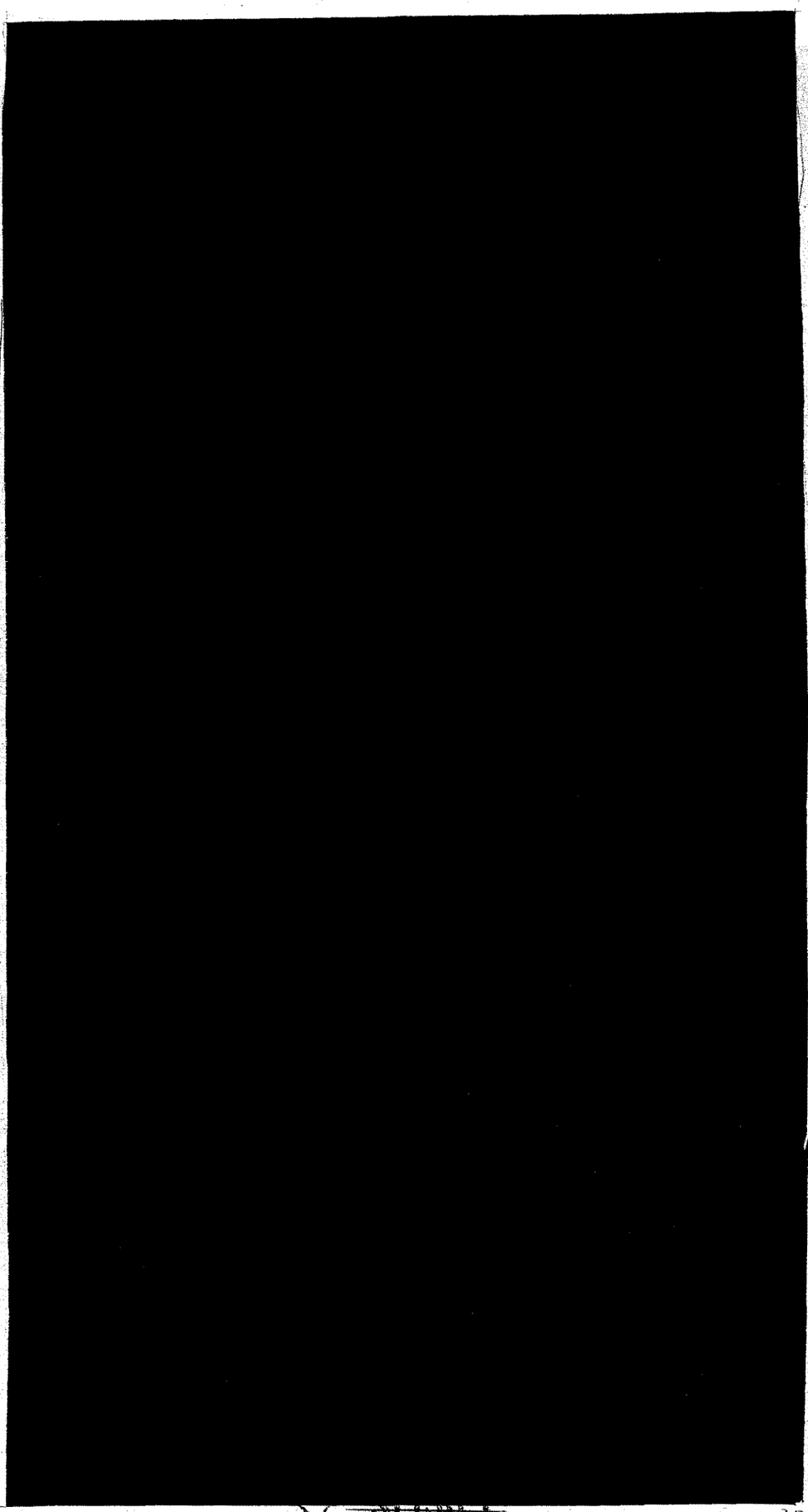
(b) [redacted] DOE 6.1(a)

SECRET

S E C R E T

[redacted]

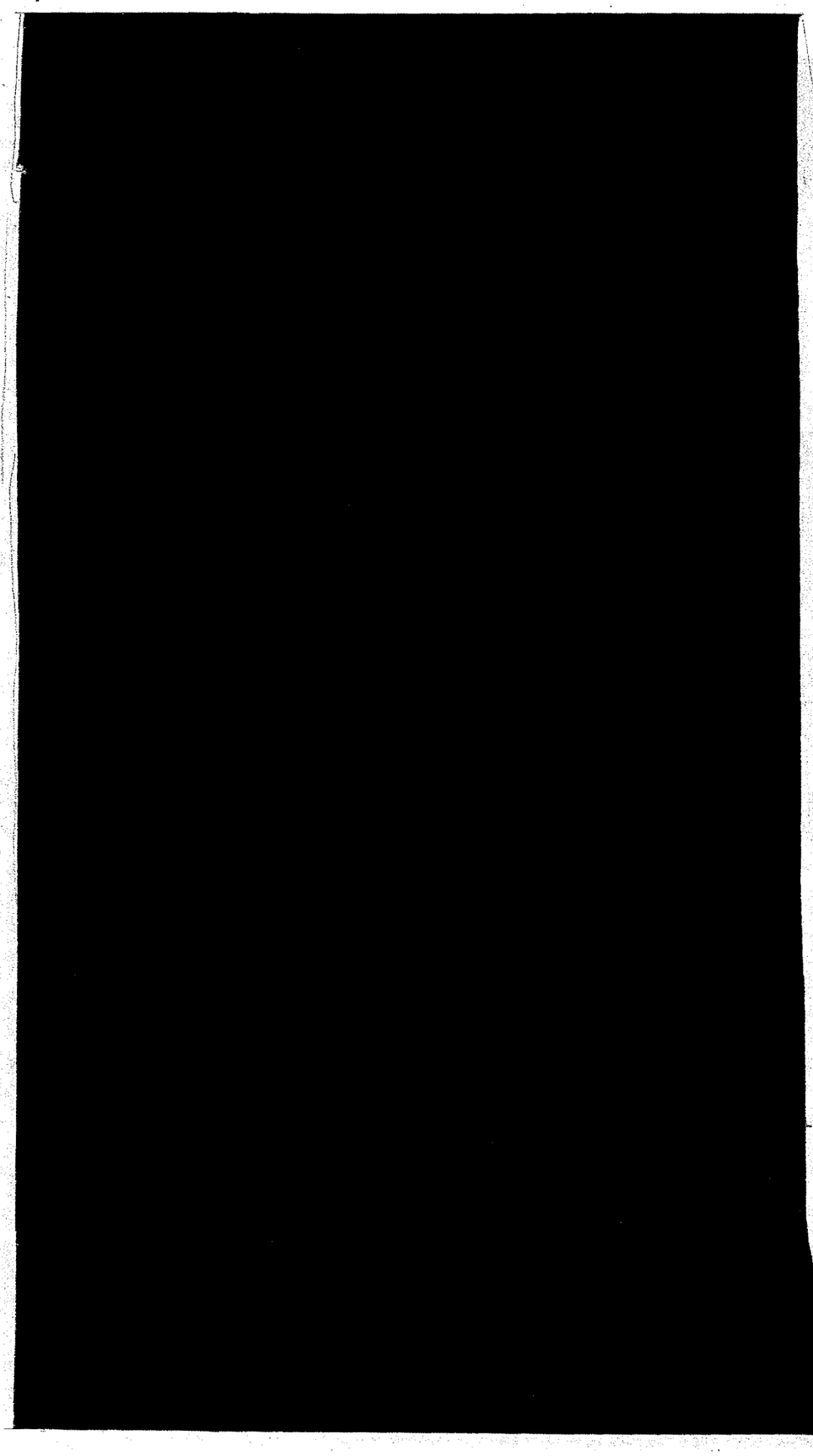
Shot 3-A (Good Shot 2-A): Solid Composite, Weak Initiator



DOE 6.11c

~~S E C R E T~~

Stockpile Position



DOE 6.1(a)

DOE 6.1(a)

[redacted]

~~S E C R E T~~

[redacted]

DOE 6.1

C.

DOE 6.1(a)

Stockpile Position

(a) Shot #1 good, #2-A bad, #3-B good.

DOE 6.1(a)

[redacted]

(b) Shot #1 good, #2-A bad, #3-B bad.

[redacted]

DOE 6.1(a)

S E C R E T

Design Information

[redacted]

D

DOE 6.1(

DOE 6.1(

Stockpile Position

[redacted]

DOE 6.1(a)

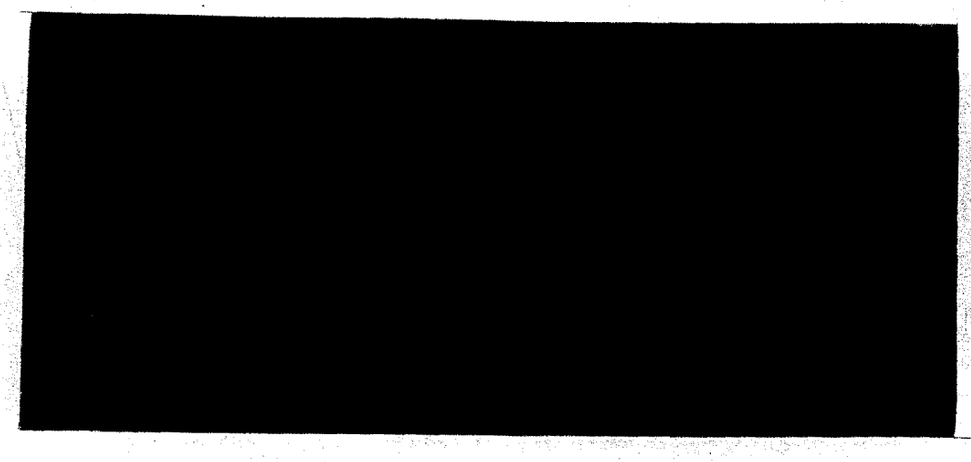
Design information

(a) Shot #1 bad, #2-B good, #3-C good.

[redacted]

DOE 6.1(a)

SECRET



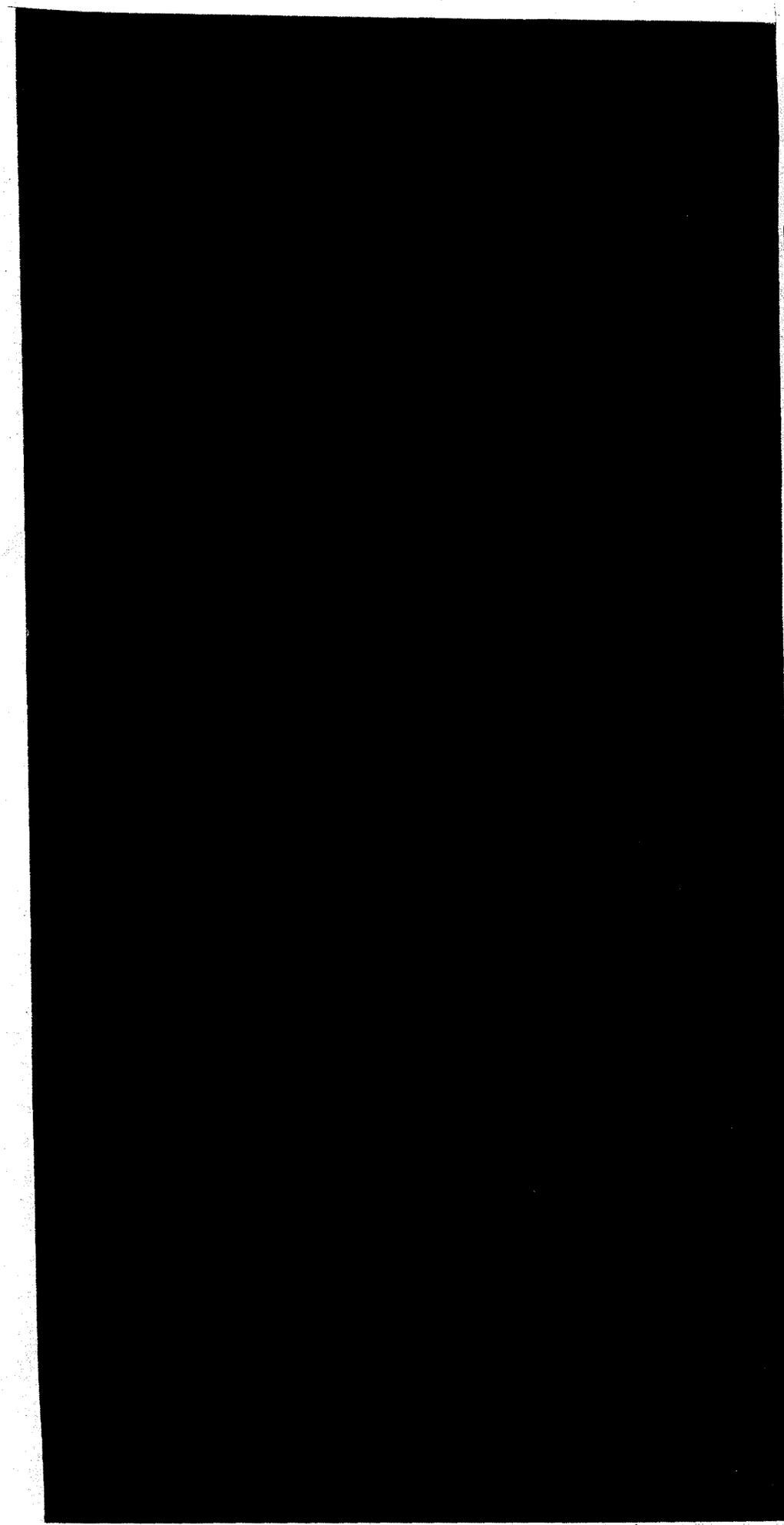
DDE 6/16

IV. Conclusion

The plan of Figure 1 represents the best compromise in view of the need to determine value of possible stockpile models, design information for future developments, and effect of initiator from only three detonations. No reconsideration of this plan should be permitted after it is adopted as an operational procedure and the Test Organization has started procurement and plans on this basis.

SECRET

~~SECRET~~



~~SECRET~~

FIGURE 1