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AEC 944/2

December 3, 1956

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ATOMIC ENERGY COMMISSION

PROPOSED TEST PLANS FOR CY 1957

Note by the Secretary

The General Manager has requested that the attached report by the Director of Military Application be circulated for consideration by the Commission during the week of December 3, 1956.

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W. B. McCool
Secretary

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ATOMIC ENERGY COMMISSION

MEANS OF REDUCING OFF-SITE FALLOUT WHICH
MAY RESULT FROM OPERATION PILGRIM

Report to the General Manager by the
Director of Military Application

THE PROBLEM

1. To consider the implications of decreasing or eliminating the possibility of off-site radiological fallout from Operation PILGRIM (CY 1957 tests) in the vicinity of the NTS and outside the boundary of the test site and the Las Vegas Gunnery Range by:

a. Removing all or a part of the Operation from the Nevada Test Site to the Eniwetok Proving Ground; and/or

b. Redesigning the test devices and/or the means of suspension from that contemplated in AEC 944.

SUMMARY

2. The following three plans designed to reduce the expected fallout, are described in some detail in Appendix "A" and implications of their adoption are discussed in some detail therein:

Plan I - Move Operation PILGRIM, except the underground and one-point safety tests to the EPG to be conducted as a Fall 1957 operation.

Plan II - Move the six difficult shots from PILGRIM to Operation HARDTACK (EPG Spring 1958), and conduct the remainder as presently planned.

Plan III - Redesign the test devices and/or suspension systems of the difficult shots to the extent possible and to reduce fallout, firing in NTS as presently planned. The changes from the plan of AEC 944 are as shown in Appendix "B".

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3. Fallout Hazard. Any of the three approaches will reduce the expected fallout to some degree under that of the earlier presented plan for PILGRIM. Plan I, of course, would remove possibility of fallout around NTS. Plan II would assure that off-site fallout on any community around NTS would be limited to a low level and that the operation could be conducted with relatively few long delays. Plan III could be nearly as effective as Plan II in limiting the fallout. It is believed that either Plan II or Plan III could be carried out with almost certainty of success and without prohibitive delays under the "10 R in 10 year criteria." For neither II or III could such assurance be given for a value of "5", or "6 R in 10 years."

4. Effect on Weapons Development Schedules. Adoption of Plan I would have a very unfavorable impact on the AEC and the DOD with respect to weapons readiness and development schedules, and morale of personnel. It would delay materially completion of HARDTACK. Plan II could be adopted with some undesirable effect on the weapons program. It would prolong HARDTACK somewhat. Plan III would have little effect on weapons readiness schedules, and would not delay or prolong Operation HARDTACK.

5. With respect to AEC funding, Plan I would probably not require additional FY 1957 or FY 1958 funds, but would add some \$10 million to FY 1959 test costs because the 1957 Pacific Operation would push Operation HARDTACK farther into FY 1959. Plan II would require some \$10 million additional funding authority in FY 1957. Plan III would result in relatively minor adjustments in expenditure of funds.

6. Effect on DOD Effects Programs. Plan I would have a very detrimental effect on the DOD and Civilian Defense effects

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test programs. Plans II and III should result in lesser change in the effects programs.

7. International Criticism. Plan I could create additional international criticism of our Pacific testing activity, since it could be construed to be exposing the Pacific islander and Far East population in order to reduce risk to the U.S. population. On the other hand, Plans II and III would result in test programs to which the U.S. public might object even though no serious fallout incidents should occur.

8. DOD Support. Under Plan I DOD overseas support, for which DOD has not planned, will be required for the Fall 1957 Pacific series. The securing of agreement to this will not be easy upon such short notice and considering their budget problems and the DOD commitments under the present state of international tension. Plan II probably would require DOD overseas support for HARDTACK to start earlier and to be provided for a longer period of time than the DOD now plans.

9. Timing of Operation and Number of Shots. In the rescreening effected with laboratory representatives in the preparation of this paper, it appears that essential objectives of PILGRIM can be attained with 25 instead of 26 shots. Also it now appears that it is now preferable to plan PILGRIM, if to be conducted in NTS, as a single operation extending from 1 May 1957 to October 1957.

10. The Nevada Test Organization Planning Board is preparing operational safety criteria for the NTS tests, which will be submitted to the Commission for approval. Under present operating orders, shot schedules recommended by the Planning

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Board will be designed in accordance with the approved operational safety criteria. An expert Advisory Panel will make recommendations to the Test Manager on the advisability of executing or delaying each detonation, and the Test Manager will adjust shot schedules as necessary. If deletions of shots from PILGRIM are advised by the Planning Board the Test Manager will forward the recommendation to DMA. A partial result of their study to date is attached as Appendix "C".

STAFF JUDGMENTS

11. The Divisions of Biology and Medicine, and Finance and the Office of the General Counsel concur in the recommendation of this paper. The Division of Information Services concurs in the public information judgments reflected in the recommendation.

CONCLUSIONS

12. Plan I could not be adopted without a serious impact on the weapons developments, and effects programs and considerable interference with current DOD commitments. Plan II could be adopted with some effect on the weapons program and with possibly a months extension of Operation HARDTACK. Plan III could be accomplished without these difficulties.

RECOMMENDATION

13. The General Manager recommends that the Atomic Energy Commission:

a. Approve conducting Operation PILGRIM as outlined in Plan III of paragraph 2 above and in paragraph 4 (page 10) of Appendix "A";

b. Note that under Plan III Operation PILGRIM becomes one continuous operation at the Nevada Test Site starting about May 1, 1957 and continuing until October, 1957, which is a change from the two Phase operation authorized for PILGRIM in AEC 944.

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c. Note that the DOD will be advised of the change in plans for Operation PILGRIM.

d. Note that Presidential approval of these plans for CY 1957 tests will be requested by letter such as that in Appendix "E" immediately after confirmation from DOD that they concur in and will support the operation, and that Presidential authorization for expenditure of the required fissionalbe materials will be requested as soon as possible.

e. Note that the draft public announcement of the operation (Appendix "H" of AEC 944) and the draft letter to the JCAE and the Nevada Congressmen (Appendices "I" and "J", respectively, of AEC 944) will be revised to describe the approved plan for conducting PILGRIM.

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APPENDIX "A"

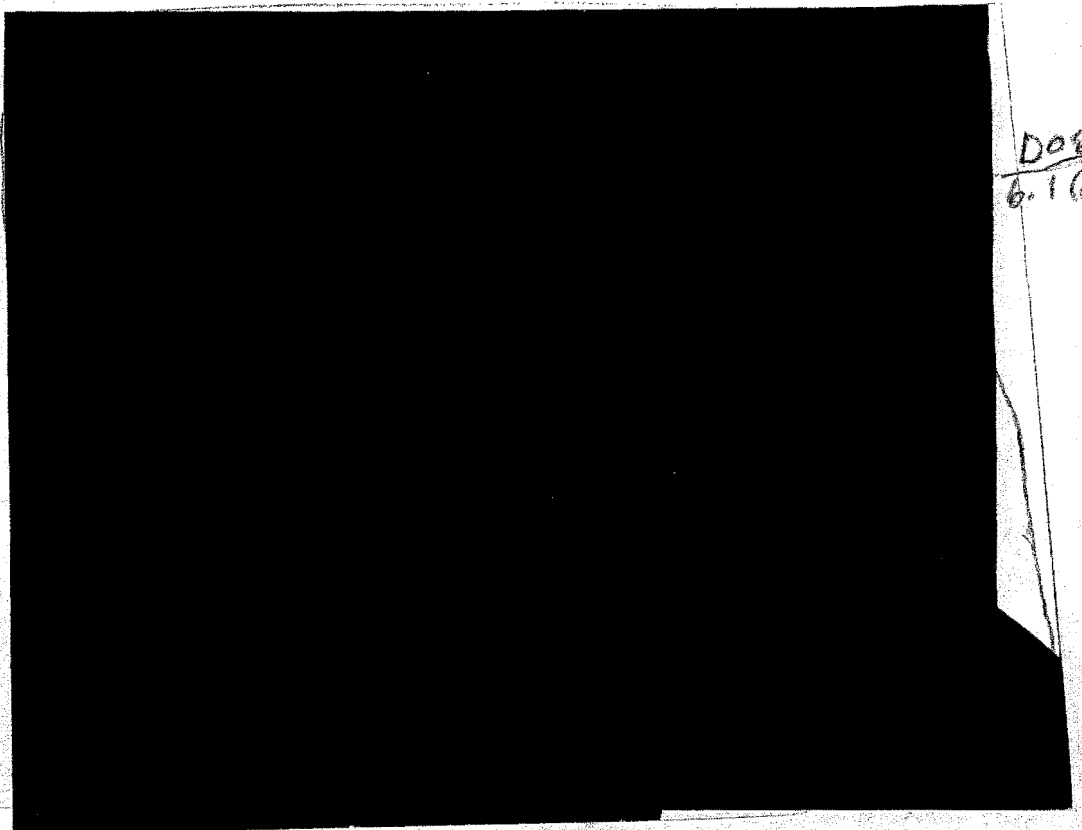
BACKGROUND AND DISCUSSION

1. A listing of shots tentatively planned for PILGRIM is contained in Appendix "B". This Appendix also indicates the weapons which might be expected to develop therefrom and possible date of stockpile entry.

2. Moving all nuclear shots of PILGRIM, except the underground test, from the NTS to the Pacific (Plan I) would have the following effects:

a. It would eliminate the problem of further contaminating the Nevada area. It would, however, bring forth some world-wide opposition which would not develop from a Nevada series.

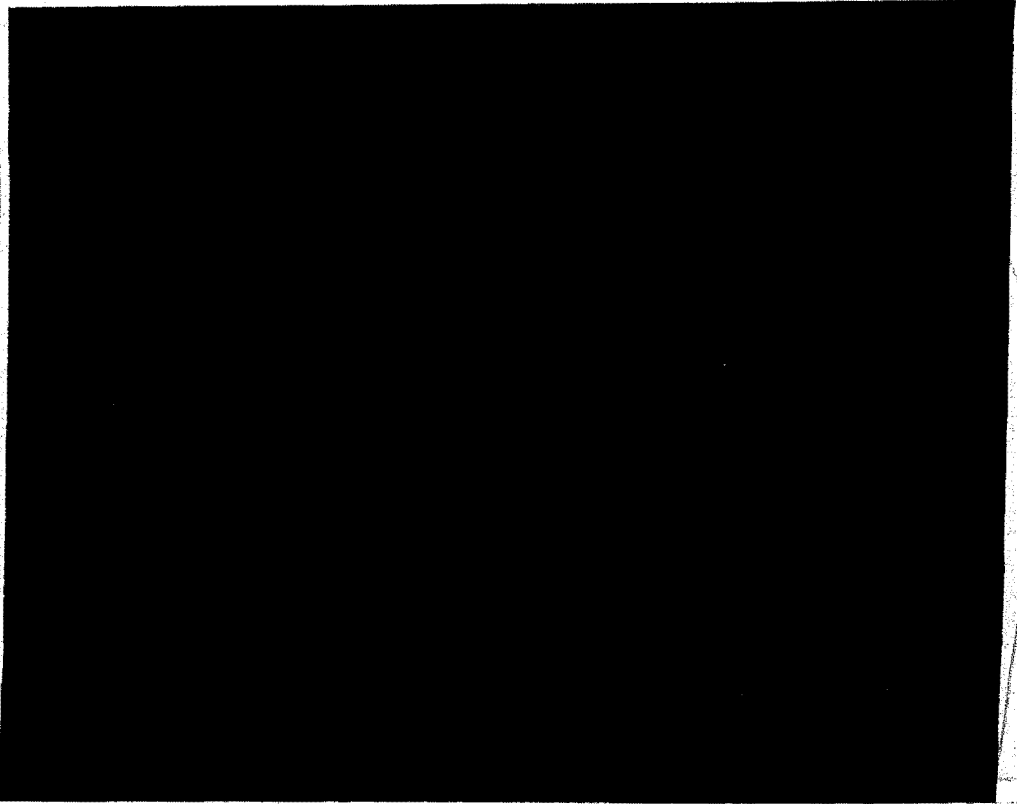
b. The first shot probably could not be fired until late fall of 1957. The development of weapons scheduled for stockpile entry from now through 1960 will tax the capabilities of the laboratories and will be difficult to meet even with tests conducted as presently planned. Specific implications of this delay on AEC weapons readiness schedules include:



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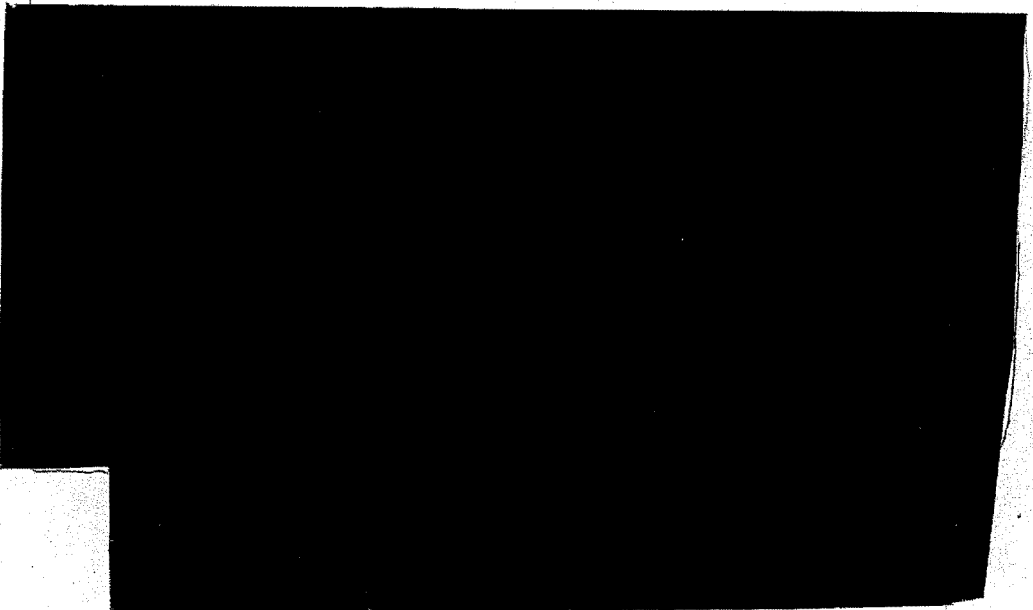
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c. It is considered mandatory that Operation HARDTACK, now scheduled for EPG in May, June and July of 1958, be conducted as scheduled. PILGRIM, if conducted in the Pacific, could be expected to start no earlier than November 1957 and continue for two to three months. If the information therefrom is to be digested properly, and new devices fabricated, it is most doubtful HARDTACK could start May 1, 1958 and be completed in a reasonable period. It probably would prove necessary to delay its start and extend materially the completion date. HARDTACK will be made up of proof tests of weapons that will be stockpiled more than 9 to 18 months later, and of development tests of devices that will enter stockpile more than 30-36 months later. The following comments indicate the impact of delaying HARDTACK.



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(4) The effect of delaying HARDTACK, upon programs relating to devices that will be subjected to development testing in 1958, would be the effect of the delay on weapons with OAD's after June 1960. It is not possible to predict more specific effects than a general 6-month slippage of such programs, which would include advanced ballistic missile warheads, high yield AA warheads, and clean weapons of advanced design.

d.



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However, since the present AEC budgets for FY 1957 and FY 1958 provide for full-scale tests at both proving grounds, the transfer of PILGRIM to the EPG would probably not require additional AEC funds in FY 1957 or FY 1958. The effect of changing PILGRIM to an overseas operation will be to push completion of operation HARDTACK further into FY 1959 and heavier AEC test costs (perhaps \$10 million) will fall in that year than would have otherwise occurred. It should be noted however, that the AEC cost of a Pacific operation is probably only one-third that of the DOD.

e. There would be a major loss of military and civil effects programs since the Hill and Dale and the MET effects tests could not be effectively conducted at EPG. Although some parts of the scientific and technical programs could be salvaged, this would require a complete re-design of the effects test programs and effects test groups in terms of scientific personnel, logistics and budgeting. A majority of the civil effects programs associated with the MET shot would be lost. Of highest importance would be loss of the Federal Civil Defense Administration shelter program, which has been designed and planned under Congressional prompting as represented in part by testimony taken by the Holifield Committee. The shelter program may amount to as much as \$1.5 million and represents more than 50% in costs of the total CETG program. Other programs deleted would amount to possibly another 20%. The DOD effects programs would be hard hit by deletion of the MET shot. In addition, DOD would lose their Hill and Dale effects test since the terrain would not permit its conduct in the Pacific.

f. There would be considerable detrimental effect on the morale of participating laboratory personnel.

g. The ability of DOD and JTF-7 to support a PILGRIM operation at EPG would be a very important consideration in a decision to move this operation. In order to conduct the operation at EPG, the concurrence and full

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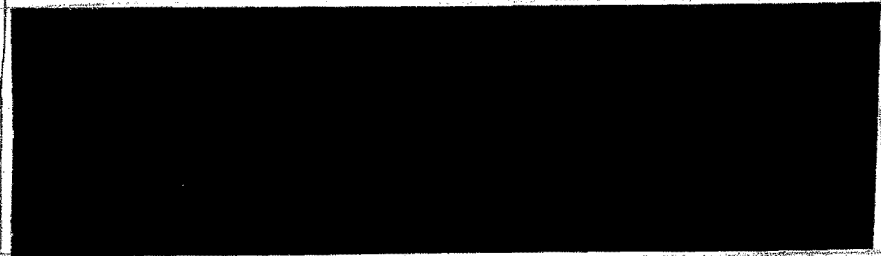
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support of DOD would be required. This support must be given on a very high priority basis in order to meet the time scales envisaged, and with the knowledge that it will interfere with competing DOD programs. Details as to men, ships and aircraft required as DOD support, and the disadvantageous aspects of the plan from the standpoint of the JTF operations, are summarized in Appendix "D".

h. The weather during the proposed EPG firing period (November 1957-January 1958) would be extremely poor for firing. If yields are held to those now planned this should not cause undue difficulty. However, since PILGRIM would force HARDTACK (if conducted as a separate operation) to slip into the Fall or Winter of 1958, the weather situation would be unfavorable for successful conduct of HARDTACK. Some of the more serious weather problems associated with test operations at EPG are outlined in Appendix "D".

3. Plan II would limit shots to be fired in Nevada to the 20 shots (see App. "B") which have a degree of difficulty (as defined in Appendix "C") of less than 3.0, and move the remaining 6 shots to the Pacific to be fired in the first part of Operation HARDTACK. The "easy" shots would then be fired in two phases at NTS as presently scheduled. The six shots to be moved to the Pacific under Plan II are:



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Movement of these shots would have the following implications:

a. Off-site fallout on any community around NTS would be limited to a low level and the operation could be conducted with relatively few long delays.

b. Approximately \$10 million dollars additional funding authority in FY 1957 would be required. The FY 1958 budget, under this plan appears adequate.

c. Implications on our weapons readiness schedules would be as follows:



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(3) Delay in the entire long range UCRL large-weapons development program would result since their five test devices involved include extensive case research tests. Since the results of these tests are required before the full-scale devices can be fired, scheduling of events are more difficult, additional delays may be anticipated. At the same time greater risks are assumed because failure of the mockups would lead either to extension of the operation or delay of test to the next operation.

4. Under Plan III the PILGRIM tests would be conducted at NTS as presently planned but would require the redesign of some test devices and suspension systems to accomplish a desired reduction in the degree of difficulty (D-factor).

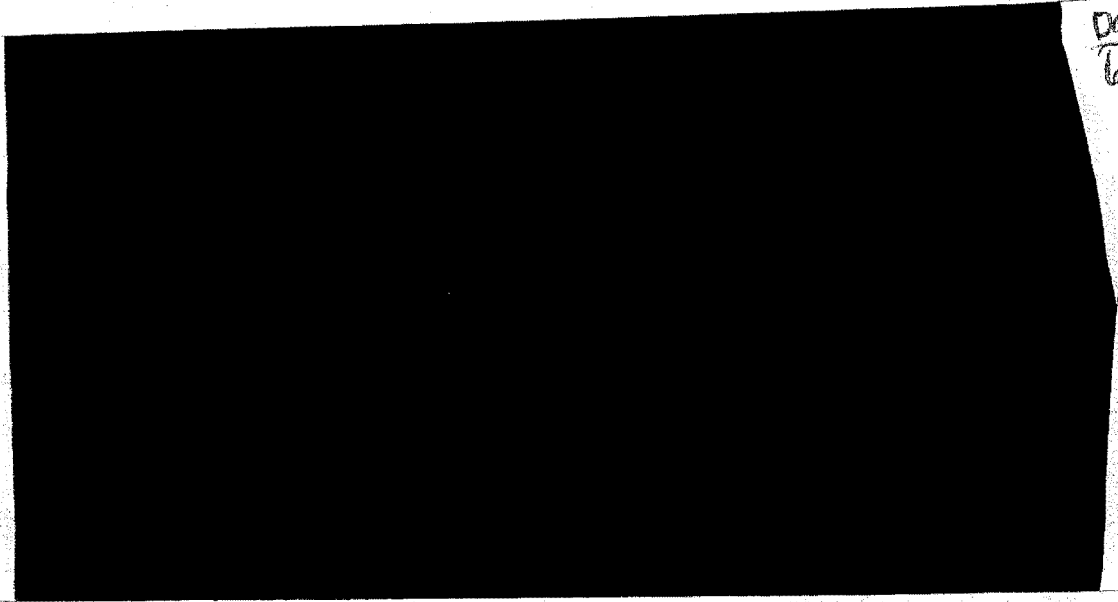
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b. The implications of Plan III are:

(1) Danger of off-site fallout on any community around NTS would be limited to a lower level than earlier planned and the operation could be conducted without excessive delays.

(2) Tower requirements would have to be modified. Procurement of steel for towers is behind schedule at present because of the steel strike and modification of the orders will probably result in later delivery. Under the circumstances, scheduled Spring tower shots might not be completed until August. This would make a single phase PILGRIM appear more desirable than the two phase program earlier planned. The single phase would start as scheduled (about May 1, 1957) and continue until finished, probably in October.

(3) The weapon development tests and the effects tests would be completed essentially as planned, except that some diagnostic data would be lost or degraded as a result of the modifications in test devices and in suspension systems. This would be far less serious than attempting to move the devices to the Pacific.

(4) Only minor adjustments in present funding is expected under this Plan.

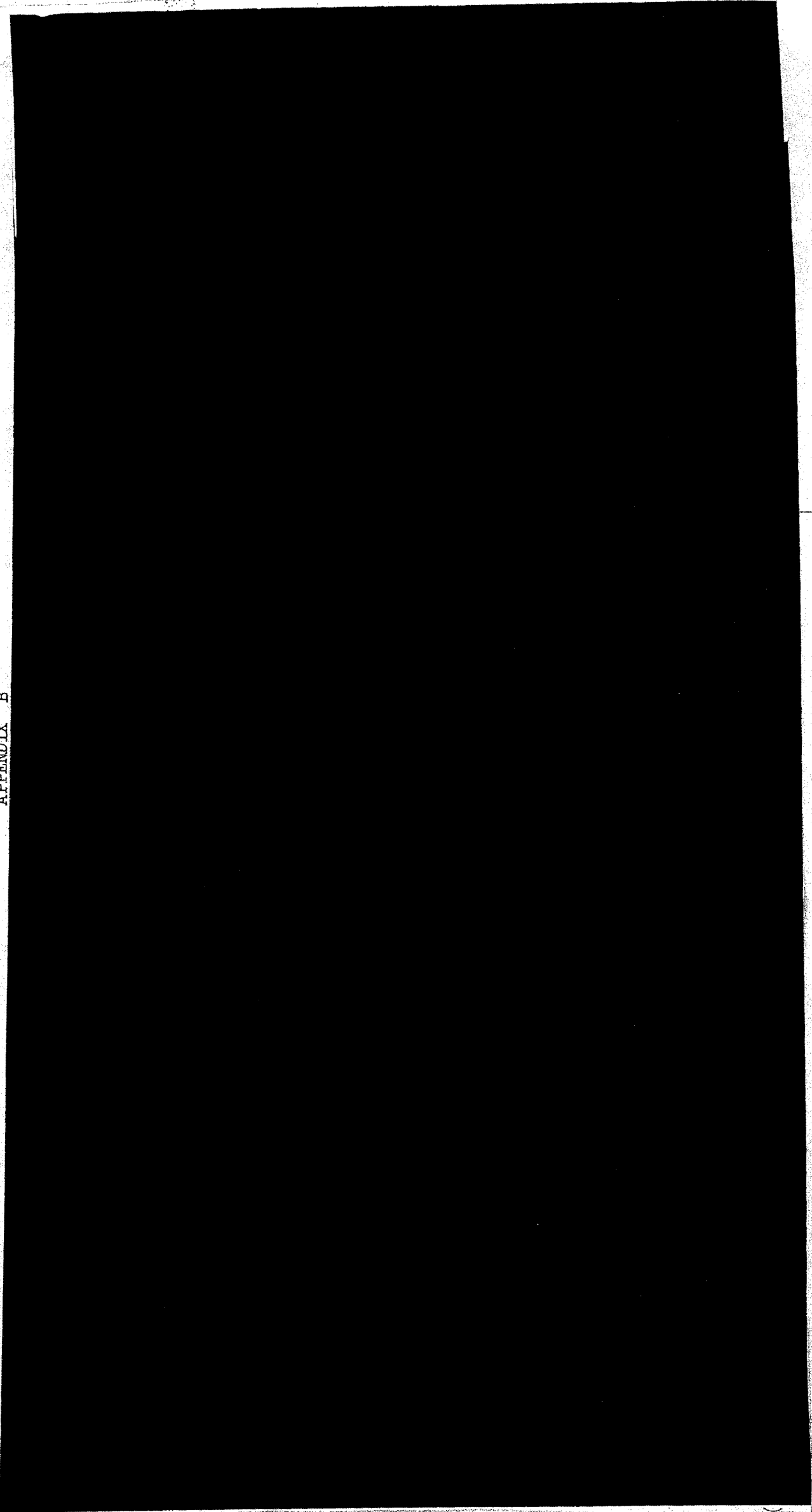
(5) The program would be completed with very little conflict with preparations for HARDTACK.

(6) Effect on weapon readiness schedules would be essentially the same as present program.

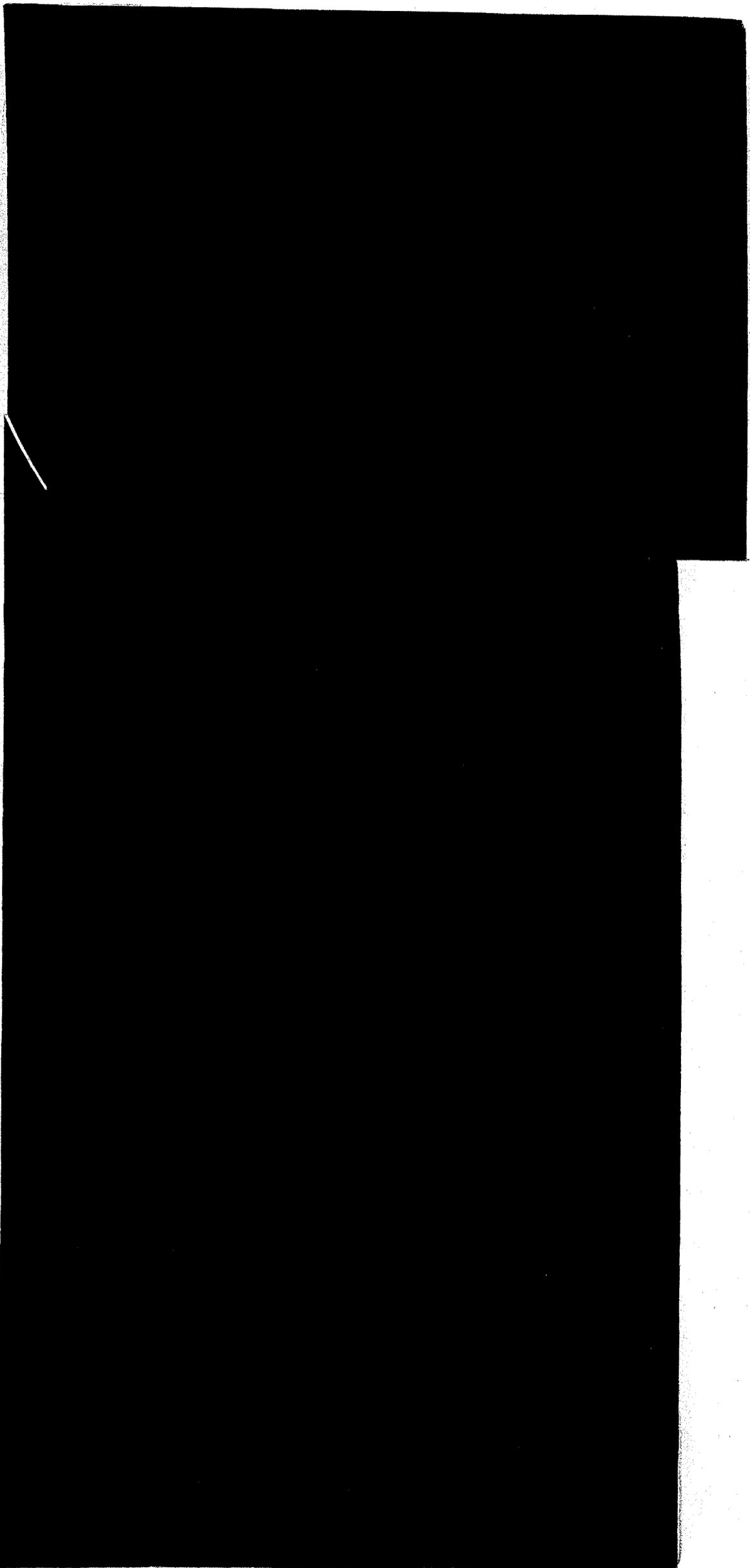
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APPENDIX "B"



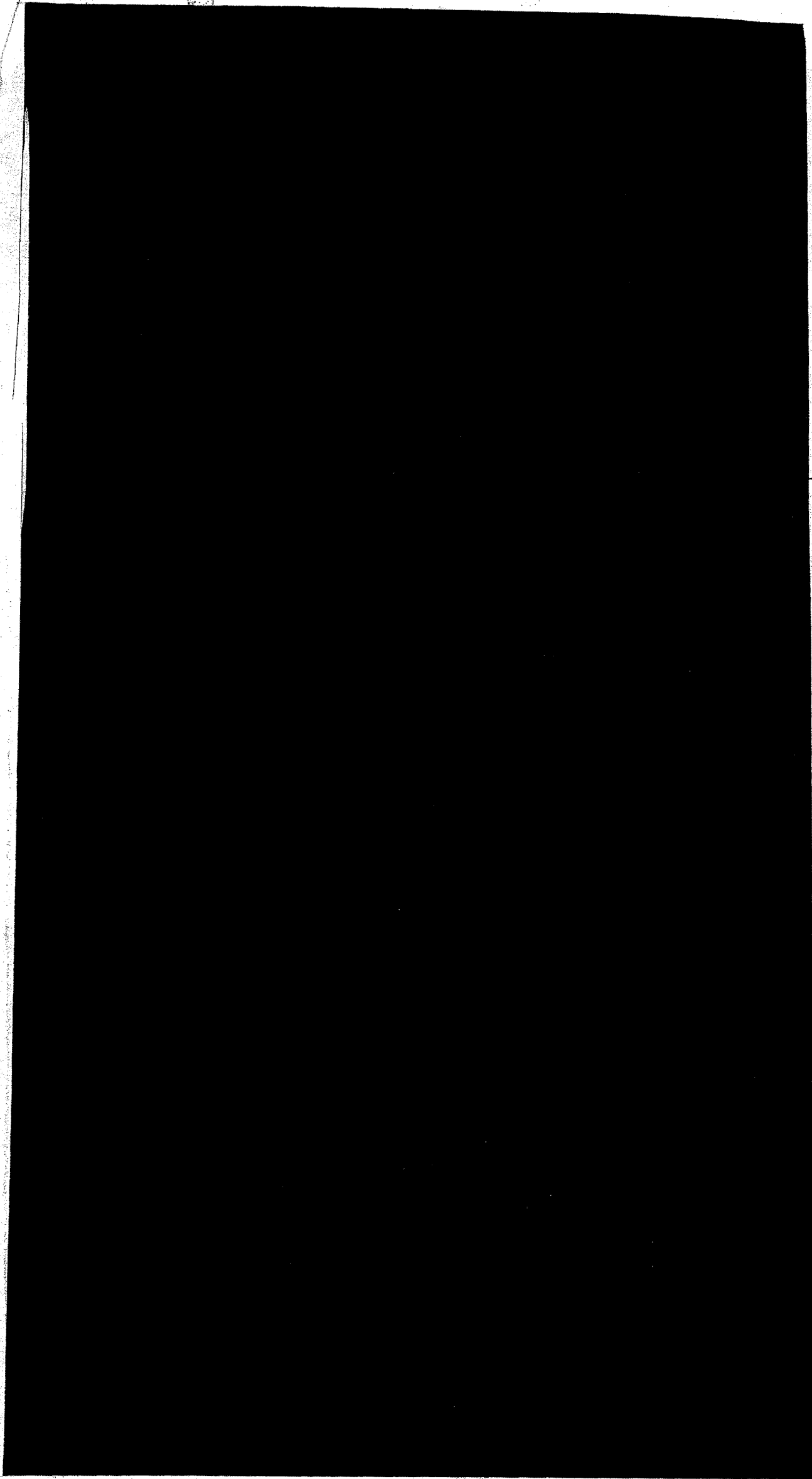
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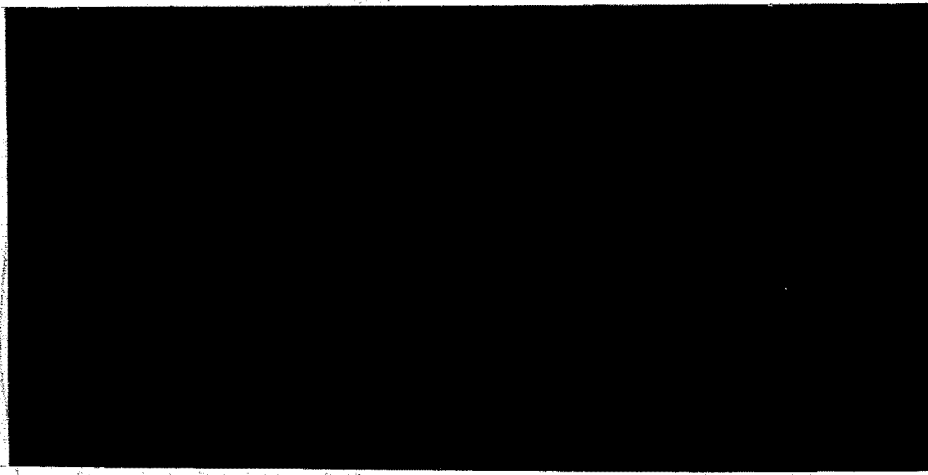
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APPENDIX "C"

DETERMINATION OF D FACTOR

1. The NTS Planning Board is working on preparation of a paper which will include recommended limiting operational criteria for this and future operations. Dr. Graves, as Chairman of the Board, has established a subcommittee to, among other things, develop the best method of classifying individual detonations as to their degree of difficulty of execution as related to the established off site rad safe criteria. At this date these studies are still in progress, however, indications are that an empirical relationship of measured fallout of past shot and detonation conditions including yield, height above ground surface, surface conditions, tower or other vaporized material and weather conditions can be developed that will provide a method of classifying various proposed detonations as to degree of difficulty. It has been established that a reasonably good relationship exists between measured close-in (150-200 mi) off-site fallout and yield and detonation height for air and tower bursts. The following tables present this relationship.



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TABLE II. Tower Shots



2. The relationship between the functions of Table I and II and the probability of acceptable weather conditions to permit execution of tests has not yet been completed. However, a review of past shots does give a fairly clear picture of these relationships.

3. Table III presents pertinent information of past shots and general extent of fallout.

4. It will be noted that there exists considerable variation in extent of the fallout distances for shots having similar megacuries of fallout. This is due to several factors, the principal one being the weather conditions under which the particular shot was detonated. In the past, the weather conditions under which shots have been detonated have varied considerably. Table IV indicates the wide range of extent of fallout that can occur for shots having the same amount of potential megacuries of fallout. Table IV also illustrates the importance of weather conditions. It illustrates that by taking advantage of the best suitable weather conditions it is possible to reduce greatly the extent of the fallout pattern. However, to accomplish this on shots in the higher megacurie fallout brackets requires longer delays in shooting which is obviously objectionable for several reasons.

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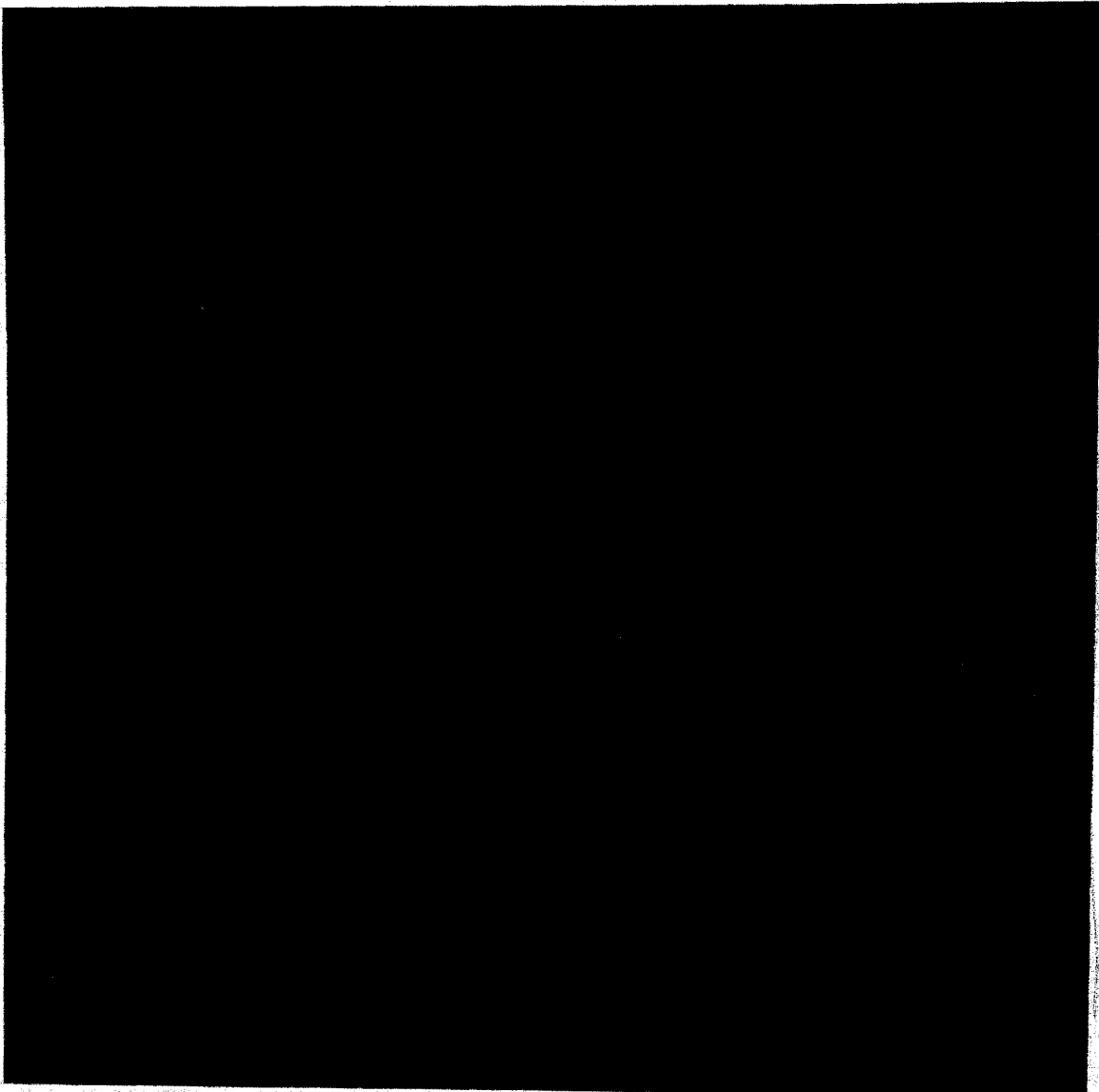
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Table IV

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5. It is considered that this data indicates that detonations having in the neighborhood of 200-300 megacuries of fallout potential can be detonated in reasonable numbers without exceeding the proposed operating criteria and without unacceptably long delays waiting for unusual weather and with very little possibility of exceeding the criteria even though weather predictions may prove poor on occasional shots. Also that occasional shots having megacurie potential of around 500-600 could be detonated safely with appreciable delays waiting assured satisfactory weather with some slight possibility of exceeding criteria if predictions proved wrong.

6. The "D" factor (degree difficulty factor) given in the table of the Appendix "B" is the estimated megacuries of local fallout divided by 100.

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APPENDIX "D"

IMPACT ON JOINT TASK FORCE

1. A factor of major importance in considering the feasibility of moving all or part of PILGRIM to EPG is the effect of such a decision on JTF-7 and the DOD. Because of the long lead times inherent in JTF-7 planning for an operation at EPG and obtaining the required logistic support they could not be ready to support such an operation in less than 14 months from the time the decision was made. JTF-7 is now in an interim period phase and is planning now for HARDTACK on the basis of the start of the operational period in April 1958 and the first detonation approximately May 1, 1958.

2. If it is desired to mount an operation at EPG in the late Fall 1957, JTF-7 would immediately be faced with the problem of competing with other DOD scheduled programs for men, money, ships, planes, transportation, supplies and other equipment. Consequently, we must assume, and it must be realized that this assumption is the only basis on which the operation would be feasible within the time scale in our present thinking, that DOD would fully support it with the highest priorities so that competing DOD programs would yield. On this basis JTF-7 could be ready by October 1957 if the decision were made now.

3. During the proposed operational period the weather is characterized as a typhoon period. The everpresent threat of typhoons may force a complete shutdown of operations and evacuation of the atolls. Even typhoon alerts will disrupt operation because of the necessity to take precautionary measures.

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In the event a typhoon strikes the atoll it would result in inundation of land areas and severe damage to some of the installations. Although there is a great deal of bad weather from the standpoint of firing, if yields are held to those now planned there should not be excessive delays. If the PILGRIM shot program were transferred to EPG unchanged from the present program then it is estimated that it would take about two to three months.

4. One cannot disregard the implications of such a Fall 1957 EPG operation on HARDTACK. Separate planning staffs would have to be set up for HARDTACK since it would not be possible for the same groups to plan for HARDTACK in 1958 while conducting PILGRIM at EPG in 1957. If the HARDTACK planning date must remain firm then it would not be possible to go into the normal interim phase between PILGRIM and HARDTACK. Thus there would not be a PILGRIM roll-up and a HARDTACK build-up as is now customary since such a sequence with deactivation of the major portion of the Task Force normally consumes 18 months. Instead the Task Force would remain operational and there would be a clean-up and construction phase during which overhaul, maintenance and replacement of equipment and construction for HARDTACK would be accomplished. It is obvious that this type of operation would border upon a continuous operation over an extended period of time, since although there would be no firing between January and May 1958, there would be a considerable amount of work being done to prepare for HARDTACK. This would have a very deleterious effect on the morale of the participants, civilian as well as military.

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5. Another major implication is the effect on the FY 58 construction program of moving PILGRIM to the Pacific. With the PILGRIM operation in progress, it would not be possible to complete permanent construction considered essential for HARDTACK. The airfield runway extension, airfield facilities, utilities construction and communication facilities construction would be affected. For example, although the maintenance work on the existing airstrip could be completed by October 1957 the runway extension which requires 10 months construction time could not be completed in time for HARDTACK. It must be recalled that with the present runway length, operations in 1958 aircraft would always present a calculated risk to planes and crews and an unacceptable one under certain wind conditions.

6. It is estimated that the Task Force would be somewhat smaller than that for REDWING, substantially fewer personnel, 8 major ships compared to 15, 100 or fewer aircraft of all types compared to 120. This is based upon the assumption that the operation would be conducted on two atolls with minimum effects participation.

7. JTF-7 (and probably DOD) would not have adequate operational funds from those presently appropriated in the Task Force and DOD budgets for FY 57, the Task Force because they have budgeted FY 57 on the basis of an interim period and DOD because the cost of carrying out their PILGRIM commitments would rise considerably. JTF-7 estimates that 75 percent of its operational period budget of 10 million would have to be funded in FY 57 assuming that the operational period starts in October 1957. In addition, this would also affect the HARDTACK budget which would have to absorb the other 25 percent or 2.5 million in the same FY 58.

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APPENDIX "E"

DRAFT LETTER TO THE PRESIDENT

1. A number of low yield nuclear devices for early entry into our defense stockpile, or important to the most rapid advancement of improved weapons designs, will require testing in calendar year 1957. Such tests would include: the proof-firing of certain air defense and anti-submarine weapons scheduled for early production; research or development shots of fission devices of advanced design and for possible later production; and research shots of components of new type thermonuclear devices. In addition, the Department of Defense and the Federal Civil Defense Administration have indicated a need to secure from any test series this year certain effects data important to the protection of our populace and military forces. A portion of this data can be secured from diagnostic shots. However, one or more special shots designed specifically to secure such effects information may be required. The Department of Defense wishes also to conduct a systems test involving an air burst of the nuclear warhead in the new USAF air-to-air rocket following its launching from an interceptor aircraft. Finally, it will be necessary during the year to conduct certain safety tests -- tests wherein the high explosive is detonated to prove that no nuclear reaction will occur if the weapon, while safed, is subjected to fire or accident, and to determine any contamination which might result from the spread of nuclear material from weapons involved in fire or accident.

2. We currently estimate that some 25 nuclear shots will be required during the year and five or more safety tests. It is estimated that this number of shots will require about five

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months to accomplish with the first nuclear detonation planned on or about May 1, 1957. Safety tests, however, from which no nuclear reaction is expected, would be fired on an "as needed" basis throughout the year.

3. The nuclear series would be designed as PILGRIM. So as to avoid hazard to participants or the public, shots will be limited to those of low yield, will be implaced so as to minimize fallout to the maximum extent practical, and will be fired only under favorable weather conditions.

4. It is not possible at the present moment to specify exactly what shots are to be fired. This information is now being developed by the laboratories who are studying intensively the detailed results from REDWING and laying their plans for PILGRIM. It is our intention, however, to finalize a schedule as early as possible and immediately thereafter to request your approval for the expenditure of the necessary special nuclear material.

5. In the meantime, however, it is necessary that major preparations proceed. These include the mobilizing of forces at the proving ground and the inauguration of large-scale construction. Importantly, too, it should involve the informing of the personnel of the area and others possibly affected, such as the photography industry, of the timing of our series.

6. We request your approval, therefore, for the conduct of the tests on the scale and in a manner as we have described above. As soon as practical after receipt of your approval, it is our intent to issue a public announcement as to our plans for tests at the Nevada Test Site during calendar year 1957.

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Appendix "E"

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