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J.C.S. 1552/5

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JOINT CHIEFS OF STAFF

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TESTS OF THE EFFECTS OF ATOMIC EXPLOSIVES

Reference: J.C.S. 1552 Series

Report by the Joint Staff Planners

THE PROBLEM

1. To recommend the general requirements, scope and means of implementation of tests to determine the effect of atomic explosives against military targets and naval vessels.

FACTS BEARING ON THE PROBLEM

2. a. In J.C.S. 1490/3, the Commanding General, Army Air Forces, proposed that the remnants of the Japanese fleet be preserved for experimental purposes with all types of weapons, including primarily the atomic bomb.

b. In J.C.S. 1552 the Chief of Naval Operations confirmed the advisability of conducting tests using the atomic bomb against naval combatant vessels and suggested that studies be initiated to determine the scope of these tests for the purpose of making recommendations to the President.

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c. The Secretary of War and the Secretary of the Navy, on 10 December 1945, after approval by the President, made public announcement of the fact that joint tests were to be undertaken to determine the effect of the atomic bomb against naval vessels.

d. In approving J.C.S. 1552/1, as amended, the Joint Chiefs of Staff directed that the Joint Staff Planners in consultation with the Officer in Charge of the Atomic Bomb Project and members of the Military Advisory Board to the Officer in Charge of the Atomic Bomb Project:

(1) Prepare, as a matter of priority, an outline of the type of tests to be conducted, the general requirements, and the desired information.

(2) Recommend the agency to be selected for the implementation of these tests.

(3) Draft a directive to the implementing agency.

(4) Prepare such of the above as is appropriate for submission to the President for approval.

#### DISCUSSION

3. See Appendix "D" (page 28).

#### CONCLUSION

4. Early determination of the full effects of atomic explosives against naval vessels and other military targets, as practicable in connection therewith, is essential in order to appraise strategic implications of the application of atomic energy and to make such readjustments in the military program of the United States as may be indicated to assure best continuing provisions for national security.

#### RECOMMENDATIONS

5. It is recommended that the Joint Chiefs of Staff:

a. Approve in principle the plan set forth in Appendix "C", page 23, showing the type of atomic test to be conducted, general requirements and desired information.

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b. Agree that the operation be conducted by a joint task force operating under the Joint Chiefs of Staff with a task force commander appointed by them and assisted by a staff composed of Army and Navy personnel and civilian scientists. Full support (including procurement of additional funds if required) should be furnished by agencies of the War and Navy Departments, including the Manhattan District. In addition, there will be constituted an evaluation board or committee composed of representatives from the Army, Navy, the Manhattan District, and civilian life. The principal function of this board or committee would be to evaluate the results of the test for the Joint Chiefs of Staff. It would not constitute a part of the joint task force. It would be available for advice to the task force commander during preparations for the tests.

c. Appoint immediately an officer charged with the mission of initiating at once plans and arrangements pertaining to the technical aspects of the test; this officer to report to the Commanding General, Manhattan District pending appointment of the task force commander and assumption of responsibility by him.

d. Transmit this report and the attached memorandum (requesting Presidential approval to proceed with the tests) to the Secretary of War and the Secretary of the Navy (Appendix "A", page 18).

e. Issue the directive in Appendix "B", page 21, after approval of the test is obtained from the President.

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MEMORANDUM FOR THE PRESIDENT  
FROM THE SECRETARY OF WAR AND THE SECRETARY OF THE NAVY

The Joint Chiefs of Staff have informed us that they consider an early determination of the effects of atomic explosives against naval vessels essential to evaluate the strategic implications of the advent of the atomic bomb. These tests are necessary in order to determine, among other things, the consequences of this powerful aerial weapon with respect to the size, composition, and employment of the armed forces and should particularly facilitate an analysis of future naval design and tactics.

They have recommended conducting tests against selected naval vessels which provide good representation of modern construction of combatant and merchant types. The ships selected as targets will be chosen from surplus vessels of the American Navy and possibly some vessels which have been allocated to the United States from the former fleets of Germany and Japan. Types of tests under consideration are an air burst, a surface explosion, and/or an underwater explosion. In each case vessels will be arranged at varying distances from the point of detonation to obtain a gradation of damage from maximum to negligible. Full advantage will be taken of the opportunity to obtain information with regard to other military targets. Detailed plans must await further study.

The Joint Chiefs of Staff consider and we agree that the tests can best be conducted by a joint task force operating under their direction and with the support of the War and Navy Departments including the Manhattan District. The task force commander will be assisted by a staff composed of Army and Navy personnel and civilian scientists.

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There will be organized to evaluate the results of the test, a board or committee composed of representatives from civilian life and from the Army, Navy, and the Manhattan District. This board or committee will be responsible directly to the Joint Chiefs of Staff.

The program calls for the expenditure of only two or three bombs but it must be remembered that only three bombs have been used to date and there is a possibility of mechanical or other failure which may require the use of further bombs to accomplish the purposes of the test.

If you approve we will so inform the Joint Chiefs of Staff in order that they may designate a suitable task force commander. Appropriate directives will be issued to proceed with preparations for the test. You will be kept informed of significant developments.

**CONFIDENTIAL**APPENDIX "B"D R A F TDIRECTIVE TO COMMANDER OF JOINT TASK FORCE  
FOR TESTS OF ATOMIC EXPLOSIVES

1. By direction of the President, you are designated commander of a task force under the Joint Chiefs of Staff for the purpose of conducting tests for the determination of the effects of atomic explosives against naval vessels in order to appraise the strategic implications of the application of atomic bombs including the results on naval design and tactics. You will organize a joint staff with adequate representation of land, sea and air forces. You will include civilian scientists in your organization.

2. The general requirements of the test will be to determine the effects of atomic explosives against ships selected to give good representation of construction of modern naval and merchant vessels suitably disposed to give a gradation of damage from maximum to minimum. It is desired to include in the tests both air detonation and underwater detonation if the latter is considered feasible. Tests should be so arranged as to take advantage of opportunities to obtain the effects of atomic explosives against ground and air targets and to acquire scientific data of general value if this is practicable.

3. You are authorized to deal directly with agencies of the War and Navy Departments in all matters relating to the preparation for and the conduct of these tests, including direct access to the Manhattan District. Usual service lines will be available for administrative and logistic support of forces assigned to the project.

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4. The Joint Chiefs of Staff will appoint as a separate agency, directly responsible to them, an evaluation board (committee) for the express purpose of evaluating the results of the tests. This board will be available to you for advice during the preparation of the tests. Appropriate sections of your organization will collaborate with this board as necessary, and you will provide it with all necessary facilities it may require to fulfill its functions.

5. You will prepare plans for the test including selection of a suitable site which will permit accomplishment of the tests with acceptable risk and minimum hazard. Your plans for the operation and final report will be submitted to the Joint Chiefs of Staff for their approval.

~~TOP SECRET~~APPENDIX "C"**CONFIDENTIAL**COMPILATION OF INFORMATION ON THE TESTS  
FOR THE ASSISTANCE OF THE IMPLEMENTING AGENCY

1. The Joint Staff Planners recommend that consideration be given to tests of the following types:

a. With bomb detonated in air against ships of various types, suitably disposed at proper distances to give a gradation of damage from negligible to maximum. (First priority)

b. With bomb detonated at the surface and/or under water at moderate depth - of the order of one hundred feet - against ships of various types so disposed as to give a gradation of damage from negligible shock damage to maximum underwater damage resulting in sinking. (Second priority)

c. Same as b except that bomb is detonated at a great depth below the surface of the water - of the order of several thousand feet. (Third priority)

2. The general requirements recommended for these tests are:

a. That the types of ships selected for targets be sufficient to give good representations of the various principal types of constructions used in modern warships and merchants, and the number of ships used be the maximum practicable in order to gain the maximum useful information from each shot and to obtain general laws of relationship between damage and distance.

b. Consistent with attainment of the primary objective of determination of the effect of atomic explosives against ships, all possible information be obtained applicable to the effect against personnel and military materiel of all types including installations and facilities on shore.

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c. That adequate preparation be made to insure that the targets are in proper condition for the tests and that provision is made for adequate photography and other instrumentation and post-test examination to obtain information listed below.

d. It is considered that the practical employment of this weapon is unavoidably linked with the operational factors involved in its delivery, placement on the target, and detonation. Therefore, it is desirable that the conditions of the test approximate, to the extent practicable, without prejudice to the major objectives of the test, actual combat conditions both with regard to delivery of the bomb and in the disposition and condition of targets. Hence, in determining the strategic implications of the atomic bomb, consideration must be given to our ability to employ it so as to approach the optimum desirable conditions.

3. The objective of the tests should be to determine all practicable information along the following lines:

a. Air Tests

(1) Range at which targets of each type are rendered militarily ineffective by blast from detonation in air; character of damage at other ranges.

(2) Range at which products of fission preclude operation of ship.

(3) Range at which severe underwater damage occurs.

(4) Pressure-time curves of blast at selected targets, suitably spaced.

(5) Pressure-time curves of underwater shock at selected targets, suitably spaced.

(6) Complete description with photographs of all damage.

~~TOP SECRET~~**CONFIDENTIAL**b. Underwater Tests

(1) Range at which targets of various types are sunk; time required to sink in each case.

(2) Range at which targets of various types are rendered inoperable by underwater shock damage.

(3) Range at which products of fission preclude operation of ship.

(4) Pressure-time curves of underwater shock at selected targets, suitably spaced.

(5) Description of damage as complete as practicable by following means:

(a) Divers inspection of sunken ships where depth of water permits and of damaged ships as necessary.

(b) Inspection of damaged ships above water and internally.

(c) Final inspection in drydock of certain ships selected to give good coverage of typical cases.

c. For all tests

(1) Adequate instrumentation of various types to determine total energy release of bomb, and other characteristics of bomb performance.

(2) Determination of any effects of the detonation on fuel, gasoline, munitions and other expendable material essential to military operation of the ship.

(3) Estimation of effects on personnel on shipboard in various stations above and below deck.

(4) Any information which can be obtained on the effect on amphibious operations of atomic explosions in the vicinity of a beachhead to include result of such explosions on:

(a) Landing craft deployed at the moment of landing.

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(b) Beach installations, including temporary harbors, piers, roadways and beach dumps of ammunition, food, gasoline and transportation.

(c) Field communication equipment.

(d) Lethal effect on personnel in the open, sheltered by light cover such as light decks of landing craft, in foxholes and sheltered in heavy cover such as heavy armored decks or under ground shelters.

(e) Effect of residual radio activity on the operation of a beachhead.

(5) Any information which can be obtained on the effect of atomic explosions, considered both from the offensive and the defensive aspect, on the following types of targets:

(a) Personnel, to include blast, burn and radiation hazards and effects.

(b) Buildings of modern reenforced construction in order to establish data from which blast pressure and impulses, heat radiation data, earth shock and residual radio activity effects can be generally determined.

(c) Above ground and under ground shelters and fortifications.

(d) Aircraft, airdromes, their revetments and other facilities including supplies.

(e) Road nets and bridges.

(f) Harbors and canals, including tidal wave effects, water and earth shock on locks and dams, and effects of residual radio activity, particularly in the water.

(g) Storage installations, including effect on bulk storage of gasoline, ammunition, foods and storage of atom bombs.

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(h) Water supply installations, water storage and sources of potable water.

(i) Range of and residual effect on reception, transmission and propagation of radio and radar signals.

(j) Long term effects on weather.

(k) Photographic materials.

(6) Any information which can be obtained on the effect of atomic explosions on normal military targets in the field to include:

(a) Terrain in so far as it limits effect of explosions.

(b) Lethal radii of bursts of various heights on flat terrain, against personnel in the open, personnel in slit trenches, personnel in vehicles, personnel in armored vehicles.

(c) Residual radio activity effects on personnel in varying degrees of shelter described above.

(d) Length of time after explosions at various heights required before armored vehicles, personnel in unarmored vehicles, personnel on foot can safely pass through the area affected.

(e) Effect of exposure to explosion and resultant radio activity upon metals of tanks, vehicles and armament; upon ignition systems, fuel, ammunition, rubber tracks and tires, cooling systems, oils and gases in recoil and recuperation systems, electric cables, field communication equipment, etc.

d. Partial data on many of the items listed in the paragraph above can be obtained by arrangements such as utilizing decks of ships, or a nearby island, if the test is conducted in the vicinity of one, or both. It is apparent, however, that much of the information desired may be incomplete or in certain instances may not be attainable from the test contemplated.

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APPENDIX "D"

DISCUSSION

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1. It is desirable to determine the detailed effects of atomic explosives on all types of targets in the air, on the ground, under the ground, on the sea, and under the sea. Some data are already available from the initial tests in New Mexico and from examinations of the areas in Japan which were affected by the two bombs dropped during the war. This information can be accepted for the time being as establishing effects of the atomic bomb against ground targets from an air burst. The effect of underground burst of atomic explosives against ground targets may be approximated by detonating the proper amount of conventional high explosives underground. There is an urgent need to determine the effects from air burst and underwater explosion of the bomb against naval vessels. Analysis of available data and that to be obtained from the tests recommended herein should provide a basis for estimating effects of atomic explosions against targets in the air.

2. Representatives of the Navy Department suggest that tests should be conducted against selected ship targets which provide good representation of the principal types of construction used in modern warships and merchant vessels. The numbers of ships used for the tests should be the maximum practicable in order to gain the greatest useful information from each burst.

3. The Navy Department has selected a group of combatant and merchant vessels of representative types which will be available for destruction in connection with scientific investigations (Annex, page 31). Vessels for the test of atomic explosives can be chosen from this group. The assembly,

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movement stationing, and the logistic support of target vessels will be an operation of considerable magnitude. Ships employed for the tests will be in sound condition.

4. The Officer in Charge of the Manhattan District has stated that there probably will be three atomic bombs available for the test during the spring of 1946. It appears that with appropriate priority it will be possible to assemble necessary equipment for the control of the test and for the instrumentation and measurement of results. Scientists and skilled technicians in this field can be obtained if the test is conducted prior to 1 July 1946. These personnel are anxious to return to their civilian pursuits and retention of their services beyond that date will be difficult.

5. Detailed planning for the tests will require extensive study not only from the scientific but also from operational standpoint. The hazards involved are not only great but many are of an unknown magnitude and character. While the feasibility of conducting the test employing an air burst is assured and the risk of an underwater burst is probably acceptable, detailed arrangements of the former and a practical solution of the latter remain for future study. Information is not yet available which will permit definite selection of a site for the test. However fundamental requirements indicate that a location in the western Pacific will be probable. The over-all complexity of the problem makes necessary early initiation of detailed plans and designation of an implementing agency.

6. It is considered that the test can best be conducted by a joint task force operating directly under the Joint Chiefs of Staff with necessary agencies of the War and Navy Departments furnishing the project full support. The importance of the test warrants high priority in allocation of funds, personnel

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and material resources. Operations involved in the test are of two major categories - naval and scientific. The magnitude of the task from the naval standpoint and the vital bearing of the results on naval design and tactics are strong arguments that the task force commander should be a flag officer of the Navy with extensive operational experience, provided with a staff comprising air, ground and sea elements and fully capable of accomplishing the non-technical planning and operation of the test. On the other hand, the experimental nature of the bomb, the radiation and other hazards, the extensive scientific requirements which must be met from the resources of the Manhattan District constitute strong arguments for the designation of the task force commander from the Manhattan District or its successor. A very important end result of the conduct of the tests is confidence in, and general acceptance of, the results by the many factions, service, scientific and political, who have legitimate and vital interests in consequent decisions. The choice of a commander and his staff should reflect these requirements and guarantee the objectivity in planning and implementing the tests. The fact that the general plans for the tests and the evaluation of the results are to be reviewed by the Joint Chiefs of Staff should contribute largely toward the attainment of this objective. Consideration might well be given at this time to the establishment of a board to evaluate the strategic implications of the test results.

7. A joint staff comprising officers of the Navy, Army, and Army Air Forces should be provided the task force commander, and to facilitate evaluation of the results of the test, the task force commander should have the assistance of an evaluation board. Such a board, composed of officers of the Navy, Army and Army Air Forces with one or more civilians appointed by the Secretary of War and the Secretary of the Navy, will be of value in establishing the dispassionate character of the test for historical purposes.

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ANNEX TO APPENDIX "D"

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VESSELS AVAILABLE FOR EXPLOSIVE TESTS

1. The following United States naval vessels are currently designated for explosive tests. From among them may be selected ships of representative types of modern construction for tests of atomic explosives.

BATTLESHIPS

Arkansas  
New York  
Texas  
Nevada  
Pennsylvania

AIRCRAFT CARRIERS

Saratoga  
Ranger

CRUISERS

Pensacola  
Salt Lake City

PC'S

A total of four (4).

DESTROYERS, 1500 ton

A total of twenty-nine (29).

DESTROYERS, 1850 ton

A total of three (3).

SUBMARINES

A total of twenty-four (24).

AUXILIARIES, LIBERTY HULL

A total of thirty (30)

AUXILIARIES, VICTORY HULL

A total of thirty (30).

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