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Bureau of Ordnance Group

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OPERATION CROSSROADS

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Enclosure (D)

Subject: Bureau of Ordnance Material Group Final Report for Tests "A" and "B".

PART VIII - FIRE CONTROL

1. Planning.
2. Ship Inspection.
3. Test "A":
   (a) Optics
   (b) Fire Control
   (c) Fire Control Radar.
4. Test "B":
   (a) Optics
   (b) Fire Control
   (c) Fire Control Radar.
5. Table of Damage to Fire Control Equipment Tests "A" and "B".
6. Charts showing Damage in Tests "A" and "B".
7. Summary.
8. Conclusions and Recommendations.

PLANNING

The Fire Control Unit was organized in February, 1946. The Unit was divided into, Optical, Fire Control (Surface Vessels), Fire Control (Submarines) and Fire Control Radar sections. The officers and chiefs who made up the various sections were carefully selected for their experience, knowledge and skill in the operation and maintenance of fire control equipment in their special fields. The heads of the sections were chosen for their experience and qualities of leadership. Two civilian engineers recruited from the New York Naval Shipyard constituted the Fire Control Design Section. These engineers were to be used to inspect and record the condition of Ordnance equipment before and after the tests from a design viewpoint. Another civilian engineer had similar duty with the Radar design section.

All of the subsections of the Fire Control Research Section of the Bureau of Ordnance cooperated in furnishing the Fire Control Unit with a list of data desired from the Atomic Bomb Tests. These subsections were consulted in drawing up the Fire Control inspection forms which were organized into the "Instructions to Target Vessels for Tests and Observations by Ship's Force" (Redbook). The preparation of the forms was assigned to the personnel of the Fire Control Unit.

Information was obtained from the research subsections on the destination of fire control equipment damaged in the Atomic Bomb Tests. Classification of the pictures which would be taken of various fire control equipment was also determined in consultation with the research subsections. The desires of the subsections regarding the location and type of measuring-instruments relative to the fire control equipment were ascertained.

The Fire Control Unit left Washington for Bikini on 29 April, 1946, to discharge the duties assigned to it by DSM (Assistant for BuOrd).

The optical section had cognizance over all Ordnance telescopes, periscopes, spotting glasses, rangefinders, binoculars, director scopes and lead computing sights. The primary duty of this section was to assist target vessels in obtaining, recording and evaluating data in assessing damage to Optical equipment caused by the Atomic Bomb. Inspection forms were prepared for recording the information desired from the tests.

In March, 1946, an officer was sent to the U. S. Naval Shipyard, Philadelphia, to make a preliminary inspection of the Optical equipment in the Prins Eugen and two CSAO's were sent to the west coast and then to Pearl Harbor to inspect target vessels.

PLANNING (Continued)

The preliminary inspections of the target ships disclosed the fact that most of the ships had turned their test equipment into store and that they had no personnel aboard qualified to make optical inspections. The test equipment required was therefore obtained by the Optical section to permit the inspections to be made. The various Naval Shipyards assisted with the final inspections prior to Test "A".

It was intended to return Optical equipment damaged in the tests to New York Naval Shipyard for inspection and study. The damaged equipment was to be made available for inspection by personnel associated with its design, manufacture, or procurement.

To gain first hand information on the condition of the target vessel's fire control systems, one officer and three Chief Firecontrolmen were sent to west coast shipyards and one Chief Firecontrolman was sent to Pearl Harbor in late March, 1946. Sample copies of the Fire Control Forms, which had just been printed, were taken to acquaint the target ship's forces with the type of information desired from the tests. The U.S.S. NEVADA, U.S.S. ARKANSAS, U.S.S. PENSACOLA, U.S.S. SALT LAKE CITY and U.S.S. INDEPENDENCE were visited in Terminal Island, the U.S.S. PENNSYLVANIA was visited in Puget Sound, and the U.S.S. SARATOGA was visited in San Francisco. In March, one officer and three chiefs were sent from the west coast to Pearl Harbor to assist the shipyard in preparing the Destroyers and the APA's. At that time a survey was conducted to determine the number of Fire Control personnel in target ships. A report was forwarded to the cognizant Task Force Officer that there were not on board sufficient Fire Control personnel to run the required tests and to inspect the equipment then installed in accordance with instructions. Seven destroyers did not have any rated Firecontrolmen on board. Action was taken and this condition was remedied.

The four fire control representatives assisted the shipyard personnel in the preparation of the target ships. A, B, rate control , and transmission tests were run in five target vessels. The 5"/38 battery was aligned and transmission tests were run in eleven target vessels.

A total of fifty-eight pressure gauges were located, installed and photographed by the Staff's fire control representatives. These gauges were installed at ordnance locations in eighteen target vessels.

Thirty-seven peak accelerometer bases were located and installation supervised in thirteen target vessels. In addition, a fire control inspection was made of the Prinz Eugen.

In order to determine the relative susceptibility of operating and non-operating equipment it was decided to energize and have in normal

PLANNING (Continued)

operating conditions, at varying distances from the center of the array, all types of fire control systems. The U.S.S. PENNSYLVANIA, U.S.S. PENSACOLA, U.S.S. WAINWRIGHT and U.S.S. PARCHE were designated as operating ships. The amount of electrical power was not sufficient in all cases to supply power for all systems so it was decided that where two systems in the same ship were identical, one should be energized and one secured. Thus comparable data could be obtained. The following equipment was scheduled for operation in Test "A":

Three Gun Director Systems, Mark 37, two Gun Fire Control Systems, Mark 63, three Torpedo Directors, Mark 27, one Gun Fire Control System, Mark 57, one Gun Director, Mark 34, four Gun Directors, Mark 51, and two Gun Directors, Mark 33.

In addition to those vessels originally scheduled as operating ships, additional fire control equipment on the following ships was scheduled for operation during Test "A": U.S.S. SARATOGA, U.S.S. RALPH TALBOT, U.S.S. RHIND, U.S.S. WILSON, U.S.S. BRACKEN, U.S.S. CORTLAND, U.S.S. CRITTENDEN, U.S.S. DAWSON, and the U.S.S. ANDERSON. The U.S.S. MUSTIN was substituted for the U.S.S. ANDERSON just prior to "A" day due to a diesel generator casualty in the ANDERSON.

The U.S.S. SARATOGA, U.S.S. PENSACOLA, U.S.S. PENNSYLVANIA, U.S.S. WAINWRIGHT, and the U.S.S. MUSTIN had one gun director system in each ship set up to maintain a constant true or relative bearing by means of a signal from the ship's master gyro-compass. The true bearing selected permitted the director to point at targets previously specified by the Electronic Coordinating Officer or by other special groups.

The Officer-in-Charge of the Submarine Fire Control Section of the Fire Control Unit operated from the U.S.S. FULTON. The Fire Control Equipment of interest to this Unit consisted of Torpedo Data Computers, Gyro Setting Indicator Regulators, Bearing and Range Indicators and Target Bearing Transmitters. Five of the eight submarines in the test had this equipment installed. For the "A" day test these submarines were scheduled to be surfaced and for the "B" day test the submarines were to be moored below the surface of the lagoon. The U.S.S. PARCHE was scheduled to have the Ordnance equipment energized for both tests.

The head of the Submarine Fire Control Section went to Pearl Harbor in April, 1946, to assist in conditioning the submarines for the Tests. While there, he made a thorough check of all of the Submarine Fire Control Equipment and assisted in its alignment. When the submarines arrived at Bikini the data was again checked and recorded.

Early in January, 1946, the Radar Research Section of the Bureau of Ordnance requested the Assistant for Electronics (ECO) to the Director of

PLANNING (Continued)

Ship Material to obtain certain information from the CROSSROADS Tests regarding Fire Control Radar Equipment.

A Liaison officer was sent from the Ordnance Material Group to the Electronics Group.

It soon became apparent to the Ordnance Radar Research Section that the Electronics Group would be unable to give sufficient attention to Fire Control Radar because of the enormous amount of electronics equipment installed in the target vessels. Accordingly an officer was obtained from the Naval Research Laboratories and attached to the Fire Control Unit of the Ordnance Material Group. It was agreed in conference that the Ordnance Group should have complete cognizance over all antenna assemblies, antenna alignment, and the obtaining and checking of actual range, train, and bearing readings of all fire control radar equipments installed in the target vessels. It was further understood that divided cognizance would exist in regard to equipments in non-operating target vessels on the periphery of the array. At a later conference after arrival of the task force at Bikini the ECO assumed cognizance of all "electronics" portions of fire-control radar equipment.

The head of the Fire Control Radar Section with the advice of the head of the Radar Research Section of the Bureau of Ordnance and the cooperation of other interested organizations devised a set of forms and instructions, to be issued to the target vessels.

Copies of these forms and instructions are included in the "Red Book".

A member of the Radar Unit was sent to the U.S.S. WHARTON in March, 1946, to make arrangements for the disposition of certain items of radar test equipment.

Members of the Radar Unit performed inspections on all Fire Control Radar equipment installed in target vessels at Pearl Harbor. A second inspection was made at Bikini. Radar beacons were set in charted locations ashore and operated by members of the Unit for the benefit of target vessels desiring to make radar calibrations. The unit also made arrangements for helicopter and airplane flights suitable for radar calibrations. It is believed that considerably better results would have been obtained from the target barrage balloons originally requested for use by the Unit.

PLANNING (Continued)

In general, the responsibility of the radar unit was to be the collection of accurate data on all the effects of the Atomic Bomb explosions on fire control radar equipments. These data were to be collected from reports by ship's forces, inspections by members of the radar unit, reports from the Electronics and Instrumentation Groups, and photographs of damaged equipment.

It was anticipated that invaluable assistance in the collection and assessment of data would be rendered by the civilian engineers associated with the section. A representative of the Guided Missles Section of the Bureau of Ordnance was to accompany the radar section in the post-test inspection of equipments.

SHIP INSPECTION

General

The inspections of Fire Control, Fire Control Optics and Fire Control Radar equipments were performed by personnel of the Fire Control Unit assisted by the ship's force and personnel at the various Naval Shipyards on the west coast and Pearl Harbor, T.H., at which the target ships were stationed for preparation for the tests. The equipment was inspected and tested in accordance with instructions from the Bureau of Ordnance. The target ships were first visited at the west coast Naval Shipyards and at Pearl Harbor, T.H., by members of the Fire Control Unit, and the ship's Gunnery Officers were acquainted with the forms and reports that they were expected to submit and the assistance the ship's force were expected to give. All target ships were again revisited at Bikini, prior to Test "A", by members of the Fire Control Unit and assistance given where needed on preparing the prior-to-Test "A" reports and in the setting up of equipment for Test "A".

Inspection Procedures

The Fire Control data included in this section of the Test "A" report, were obtained by personnel of the target vessels assisted by members of the Fire Control Unit. These members were organized into several small groups which made "flying" visual inspection trips to all of the target vessels immediately after re-entry day following, Test "A". The information obtained from these first inspections was recorded and used to organize groups of Fire Control section representatives to make more thorough visual operating and testing inspections where required. The ship's forces in the meantime made independent inspections and recorded the data on the CROSSROADS forms as directed by the "Red Book". In some cases data obtained by the staff from thorough inspections were used by target ships' personnel to complete such CROSSROADS forms as those for Optics and Fire Control Radar. Ship's forces were cautioned not to disturb damaged equipment before it had been inspected and photographed by the Staff. Guidance had been supplied by the Staff to the ship's forces concerning precautions to be taken prior to applying power, but the ship's forces were responsible for supplying the power required for the operation of Fire Control equipment. Care was exercised by the ship's force and by the Staff members in energizing all equipment for testing functional efficiency. Special care was taken in the case of equipment visibly damaged by first operating it in manual control before energizing the system. Equipment was energized at first for short periods only and under close surveillance to ascertain any tendency to further damage as a result of shorts or excessive friction before equipment was finally energized for functional tests.

Inspection Procedures (Continued)

The high concentration and persistence of radioactivity in the target vessels caused by the Underwater Atomic Bomb explosion, especially in ships near the center of the array, necessitated a change in inspection plans from those followed after Test "A". Organization of the inspections in the limited time available was essential. The inspection time was limited by a daily tolerance factor, which was established and strictly adhered to, for the purpose of safeguarding the health of the inspection personnel. In general the target ship's forces were permitted to return to their ship only during the time the inspection party was aboard. This prevented the personnel of most of the target vessels from independently obtaining data for completion of the "Redbook" inspection forms as was done after Test "A". Ships' forces in some of the less contaminated target vessels were able to submit inspection reports which were as complete as the limiting conditions permitted. Reference was made to these reports in compiling the data, but the majority of the data was obtained by visual and operational inspections made by members of the Fire Control Unit assisted by personnel of the target vessels.

The degree of concentration of radioactivity in the different target vessels in many cases limited the inspections to less than one hour. It was therefore impossible for inspection personnel to visit more than one contaminated target ship in one day without exceeding the radioactivity tolerance limit. In general, return visits were authorized only for the purpose of obtaining extremely important additional data. Power was limited on the target vessels and in many cases could not be obtained. A special effort was made, however, by the Director of Ship Material to supply power for limited periods by various means such as auxiliary diesel generators and by power plants on tugs alongside the target vessels. Power was supplied for inspection purposes after Test "B" on 15 of the 34 surface vessels inspected by the Fire Control Unit. Wherever practicable the fire control equipment was energized and as many tests as were possible, in the tolerance time available , were run. The time limitation prevented thorough and detailed examination of all damaged equipment. Every possible effort was made to discover reasons for non-operation of the important items of ordnance equipment.

S-E-C-R-E-T

TEST "A"

OPTICS

GUN SIGHTS, MARK 14

1. The damage caused by the effects of the air burst of the nuclear fission bomb to the Gun Sights, Mark 14, installed in the U.S.S. ARKANSAS (BB 33) at a distance of about 400 yards from the burst, is described below:

(a) On the Gun Sight, Mark 14, Mod. 6, located on the starboard signal bridge, the cast-aluminum supporting bracket was broken and the sight was found lying on deck about 10 feet from the mount. The cables and air hoses parted, but there was no visible damage to the optical system. (See Photographs AACR-60-144-2 and 3)

(b) On the Gun Sight, Mark 14, Mod. 6, located on the starboard signal bridge, the cables and air hoses parted and the cast-aluminum sight bracket was cracked but was still intact. An operational check revealed that the reticle would not move in train.

(c) On the Gun Sight, Mark 14, Mod. 6, located at the starboard side of the mainmast, the front window and the elevation mirror were shattered. The air inlet hose parted and the four prongs on the hose receptacle were bent. The sight was sent to the New York Naval Shipyard, there it was disassembled and it was found that the air filter was missing, allowing foreign matter to enter the sight and lodge in the needle valve of the air regulator rendering the regulator inoperative. An elevation error of 45 mils was introduced by a shift of the elevation gyro lever. An error of nine mils range shift in the train gyro was caused by the misalignment of the range unit. A 20 mil crosscoupling error resulted from a shift in the position of the train gyro. The wheel speed and consequently the precessive force of the train gyro were lowered because the adjustment of the air nozzles had changed. (See Photographs AACR 60-130-2, 3, and 4).

(d) On the Gun Sight, Mark 14, Mod. 8, located on 40MM director #3, the objective window was cracked and the elevation and train mirrors were broken. (See Photograph AACR 60-134-11)

(e) On the Gun Sight, Mark 14, Mod. 8, located on 40MM director #4, the reticle did not move in either train or elevation.

(f) On the Gun Sight, Mark 14, Mod. 6, located on the portside of the mainmast, the front window was shattered, but a shipboard check revealed that the operation of the sight mechanism was normal.

TEST "A" (Continued)

OPTICS (Continued)

GUN SIGHTS, Mark 14, (Continued)

2. (a) The Gun Sight, Mark 14, Mod. 6, located on the starboard forward 20MM gun in the U.S.S. CRITTENDEN (APA-77) at a distance of about 500 yards from the center of the blast, was rendered inoperable by the effects of the blast. The electric cables and air hoses were found to be torn from the sight and the ray filter was jammed at the "IN" position.

(b) The Gun Sight, Mark 14, Mod. 6, located on the forward 20MM gun, port side, in the U.S.S. CRITTENDEN (APA-77), was also rendered inoperable. The reticle lamp did not function and the ray filter mechanism was jammed.

(c) The Gun Sight, Mark 14, Mod. 8, located on the Gun Director, Mark 51, forward in the U.S.S. CRITTENDEN (APA-77), was found to be inoperable. The associated hoses and cables were deeply charred and an air hose had parted. The ray filter mechanism was inoperative.

3. The damage caused by the effects of the explosion to the Gun Sights, Mark 14, installed in the U.S.S. NEVADA (BB-36) at a distance of about 600 yards from the burst, is described below.

(a) A faulty electrical connection was found in the Gun Sight, Mark 14, Mod. 6, located on a 20MM gun on the starboard side, forward.

(b) On a Gun Sight, Mark 14, Mod. 8, located on the starboard Gun Director, Mark 51, the ray filter mechanism was jammed, the spot corrector knob was scorched, and the electrical cables were parted. (See Photograph AACR 60-134-12).

(c) On the Gun Sight, Mark 14, Mod. 8, located on the port Gun Director, Mark 51, the front and rear windows were broken, the ray filter mechanism was jammed, and the support rods were bent.

(d) On the Gun Sight, Mark 14, Mod. 8, located on the starboard Gun Director, Mark 51, the ray filter mechanism was jammed and the spotting knobs were badly charred. All of the electrical cables were parted, and the gunsight was inoperable.

(e) On the Gun Sight, Mark 14, Mod. 6, located on 20MM gun #19, the rear window was blasted out and the train and elevation mirrors were broken and had fallen into the bottom of the sight. (See Photograph AACR 97-1535-6).

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 14 (Cont'd)

(f) All other Gun Sights, Mark 14, was given an operational check and found to be in operating condition.

4. The damage caused by the effects of the explosion to the Gun Sights, Mark 14, installed in the U.S.S. PENSACOLA (CA 24) at a distance of about 600 yards from the burst, is described below:

(a) The Gun Sight, Mark 14, Mod. 6, located on 20MM Gun No. 22, was sent to New York Naval Shipyard for inspection. The exterior of this gun sight was burned and scorched. The ray filter mechanism was jammed in the "IN" position because the spring stop slid by the stop-notch allowing the ray filter mount to jump its guide, thus preventing the mechanism's being thrown to the "OUT" position. The sight exhibited a 45 mil range shift in the train and elevation gyros. The shift was caused by misorientation of the range units and was probably the result of shock. It was only necessary to orient the range units to correct this error. Both gyros were found to be slightly out of balance and their air nozzles incorrectly set.

(b) The Gun Sight, Mark 14, Mod. 13, located on Gun Director, Mark 51, on the starboard searchlight platform, was returned to the New York Naval Shipyard for inspection. A complete inspection revealed that the ray filter mechanism was jammed in the "IN" position because the spring stop slid by the stop-notch allowing the ray filter mount to jump its guide, thus preventing the mechanism's being thrown to the "OUT" position. The sight was found to be operable.

(c) Gun Sights, Mark 14, Mod. 6, located on 20MM Guns Nos. 21, and 22 could not be operated due to a ground in the electrical power supply. Both gunsights had a broken rear window. (See Photographs AACR 60-145-2, and 3).

(d) Gun Sight, Mark 14, Mod. 13, located on the Gun Director, Mark 51, on the port searchlight platform was found to produce excessive range shift and could be operated only at reduced efficiency.

5. The U.S.S. ANDERSON (DD 411), about 600 yards distant from the burst, was sunk and no information on the gun sights is available.

S-E-C-R-E-T

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 14 (Cont'd)

6. The damage caused by the effects of the explosion to the Gun Sights installed in the U.S.S. INDEPENDENCE (CVL 22), located at a distance of about 700 yards from the burst, is described below:

(a) Gun Sights, Mark 14, Mod. 2, located on 20MM guns Nos. 2, 4, and 6, were blown off their mounts and were missing.

(b) Gun Sight, Mark 14, Mod. 2, located on 20MM Gun No. 1 was damaged beyond repair.

(c) Four Gun Sights, Mark 14, Mod. 4, located on Gun Directors, Mark 51, at frames 27 and 120, starboard side, and frames 28 and 97, port side, were found to be in operable condition, but two of the directors were found to be out of commission.

7. The U.S.S. HUGHES (DD 410) was located at a distance of approximately 800 yards from center of the blast.

(a) Gun Sight Mark 14, Mod. 6, located on 20MM gun amidships aft, and Gun Sight, Mark 14, Mod. 6, located on 20MM gun aft, starboard side, were found with the ray filter mechanism jammed in the "IN" position.

(b) Gun Sight, Mark 14, Mod. 6, located on the port forward 20MM gun was inoperable because the optics were fogged, and the air hose was burned and parted.

8. The U.S.S. LAMSON (DD 367), about 900 yards distant from the burst, was sunk and no information on the gun sights was available.

9. The U.S.S. DAWSON (APA 79) was located at a distance of about 900 yards from the center of the burst, and the following damage to Gun Sights, Mark 14, was observed:

(a) On Gun Sight, Mark 14, Mod. 6, located on the starboard forward 20MM gun, the elevation mirror was found to be broken and the ray filter mechanism jammed in the "IN" position.

(b) On Gun Sight, Mark 14, Mod. 8, located on the after port Gun Director, Mark 51, the range knob securing-screws were found to be missing and the ray filter mechanism was found to be jammed in the "IN" position.

S-E-C-R-E-T

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TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 14 (Cont'd)

(c) On Gun Sight, Mark 14, Mod. 8, located on the forward Gun Director, Mark 51, the ray filter mechanism was jammed in the "IN" position, and the elevation and deflection spot mechanisms were frozen.

10. On the U.S.S. SALT LAKE CITY (CA 25) located at a distance of about 1000 yards from the center of the burst, the mounting bracket of Gun Sight, Mark 14, Mod. 2, located on No. 8, 20MM gun, was partially broken and the ray filter was shattered by the blast.

11. The U.S.S. RHIND (DD 404) was approximately 1000 yards distant from the center of the burst.

(a) Gun Sight, Mark 14, Mod. 6, located on the starboard 20MM gun, was found with the support rods sprung out of alignment. The ray filter mechanism frozen, and the surface of the range input knob charred. Consequently, the sight was inoperable.

(b) Gun Sight, Mark 14, Mod. 6, located on the starboard forward 20MM gun, was found with the ray filter mechanism jammed and the elevation mirror discolored. The sight was operable at reduced efficiency.

(c) On Gun Sight, Mark 14, Mod. 8, the mirrors were fogged, the ray filter mechanism was jammed, the electric cables were parted and consequently the sight was inoperable.

12. On the U.S.S. BRULE (APA 66), located at a distance of approximately 1000 yards from the center of the burst, the two Gun Sights, Mark 14, were found to be undamaged.

13. All Gun Sights, Mark 14, in the U.S.S. RALPH TALBOT (DD 390), located at a distance of about 1200 yards from the center of the burst, were found to be operable.

14. The Gun Sights, Mark 14, installed in the U.S.S. STACK (DD 406) about 1200 yards distant from the center of the burst, were found to be damaged as described below:

(a) On the Gun Sight, Mark 14, Mod. 6, located on No. 1, 20MM gun, the front window was cracked and discolored and the paint was scorched. The gun sight was inoperable prior to TEST "A" because of moisture that collected on the elevation mirror.

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 14 (Cont'd)

(b) Gun Sight, Mark 14, Mod. 6, located on No. 2, 20MM gun, was rendered inoperable by moisture that condensed on the elevation mirror.

(c) On Gun Sight, Mark 14, Mod. 8, located on the forward Gun Director, Mark 51, the front window was cracked and the exterior paint was scorched.

15. All Gun Sights, Mark 14 (Mods. 6 and 8), installed in the U.S.S. BARROW (APA 61), located at a distance of approximately 1300 yards from the point of burst, were given shipboard checks and it was found that they had sustained no damage from the effects of the explosion.

16. All Gun Sights, Mark 14 (Mod. 6 and 8), installed in the U.S.S. BANNER (APA 60) located at a distance of approximately 1400 yards from the point of burst were given shipboard checks and it was found that they had sustained no damage from the effects of the explosion.

17. Two Gun Sights, Mark 14, Mod. 6, located on 20MM guns aft, port and starboard, in the U.S.S. FALLON at a distance of approximately 1400 yards from point of burst, were found with moisture collected on the optical system so that it was impossible to see through the sights.

18. Of six Gun Sights, Mark 14, installed in the U.S.S. WILSON (DD 408), located at a distance of approximately 1600 yards from the center of the burst, only one sight, located on the forward port 20MM gun, was damaged by the effects of Test "A". The optical system of the damaged gun sight was found to be covered with moisture.

19. The four Gun Sights, Mark 14, installed on 20MM guns, two on the port and two on the starboard side of the signal bridge of the U.S.S. BRISCOE (APA 65), were 1700 yards distant from the point of burst and were found to be undamaged by the effects of the burst.

20. On the U.S.S. PENNSYLVANIA (BB 38), located at a distance of about 1800 yards from the center of the burst, no damage to Gun Sights, Mark 14, could be observed.

21. On the U.S.S. NEW YORK (BB 34), about 1900 yards distant from the point of burst, only one Gun Sight, Mark 14, (Mod. 6) located on No. 3, 20MM gun on the mainmast, was damaged. The movement of the reticle and the elevation mirror was jumpy and the elevation mirror did not return to its zero position.

S-E-C-R-E-T

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 14 (Cont'd)

22. The Gun Sights, Mark 14, installed in the U.S.S. BUTTE (APA 68), about 2000 yards distant from the center of the burst were not damaged.

23. One Gun Sight, Mark 14, Mod. 6, installed on the port after 20MM gun in the U.S.S. CARTERET (APA 70), located at a distance of about 2000 yards from the burst, was rendered inoperable by the entrance of moisture into the sight mechanism.

24. In one Gun Sight, Mark 14, Mod. 6, located on the after 20MM gun in the U.S.S. WAINWRIGHT (DD 419) at a distance of about 2200 yards from the point of burst, the train gyro bearings were frozen. It is believed that this damage was due to the blast despite the distance of the ship from the center of the burst.

25. On the U.S.S. BRACKEN (APA 64) about 2200 yards distant from the center of the burst, two Gun Sights, Mark 14, Mod. 6, located on 20MM guns, one on the port side of the signal bridge and the other on the port side aft, were found to be full of moisture and inoperable.

26. Gun Sights, Mark 14, on ships located at distances greater than 2200 yards from the point of explosion sustained no damage from the effects of the explosion.

GUN SIGHTS, MARK 15

1. The Gun Sights, Mark 15, did not withstand the effects of the bomb burst as well as was expected. Damage directly attributable to the effects of the burst were observed out as far as 1400 yards. All Gun Sights, Mark 15, Mod. 12, were rendered inoperative. Several instances were noted where the gun sights were rendered inoperable due to moisture on their internal components. The collection of moisture was probably due to the fact that the sights had not been operated regularly for a length of time prior to the test.

2. The U.S.S. GILLIAM (APA 57) and the U.S.S. CARLISLE (APA 69) were sunk by the effects of the explosion in Test "A".

3. The U.S.S. ARKANSAS (BB 33), located at a distance of about 400 yards from the burst, was the closest surviving ship of the target array. The Gun Sight, Mark 15, Mod. 2, located in the forward air defense starboard, sustained some

S-E-C-R-E-T

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 15 (Cont'd)

external damage. The silica gel cartridge container mounting was broken. The pump motor was broken off, and the sight did not develop a lead-angle in elevation, indicating damage to the elevation gyro. On the Gun Sight, Mark 15, Mod. 2, Serial #567, located in the after port air defense, the front window was shattered but the glass was still in the frame. This sight was sent to the New York Naval Shipyard for further analysis. (See Photographs AACR 60-138-12; AACR 60-134-1; AACR 60-134-2; AACR 125-2036-10). At the New York Naval Shipyard, the sight was mounted on a test stand for a static balance check. It was found that the boresight error was excessive. A slight shift in position of the gyros was easily corrected by moving the eccentric balls on the bell-crank and mirror assembly.

4. The Gun Sight, Mark 15, Mod. 2, Serial #567, shipped to the New York Naval Shipyard from the U.S.S. ARKANSAS (BB 33), was placed on a test stand for a sensitivity check, and it was found that no readings were out of tolerance. Except for the shattered front window, the sight was apparently in normal operating condition.

5. On the Gun Sight, Mark 15, Mod. 2, Serial #215, located in the after starboard air defense on the U.S.S. ARKANSAS (BB 33), the front windows were shattered and the silica gel cartridge-container was broken off at the mounting flange. This gun sight was sent to the New York Naval Shipyard for further analysis. (Refer to Photographs AACR 60-138-10, and 11; AACR 125-2036-11). At the New York Naval Shipyard the sight was placed on a test stand for a static balance check, and it was found that an error of 13 mils range shift was introduced by the train gyro. The gyro was removed from the sight case and sent to the gyro laboratory for analysis. It was found that the range shift was caused by misalignment of the train gyro range unit and the error was corrected by properly orienting the range unit. No other internal errors was observed and after the error in boresight was removed the sight was found to be in normal operating condition.

6. The Gun Sight, Mark 15, Mod. 2, located in the forward starboard air defense station aboard the U.S.S. ARKANSAS (BB 33) was tested, and it was found that no lead angle was developed. The silica gel cartridge-container mounting flange was broken causing loss of air pressure and the pump unit was broken off.

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Enclosure (D) to Director Ship Material Serial 001500.

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 15 (Cont'd)

7. On the U.S.S. CRITTENDEN (APA 77), which was located at a distance of 500 yards from the center of the explosion, the reticle lamp would not light in the Gun Sight, Mark 15, Mod. 3, indicating that the filament of the lamp had failed. The ray filter mechanism was jammed. This sight did not appear to be damaged seriously but no operational checks were performed because of the faulty reticle light.

8. The U.S.S. PENSACOLA (CA 24) was located at a distance of about 600 yards from the center of the burst. The Gun Sight, Mark 15, Mod. 12, Serial #4559, which was located on the starboard Gun Director, Mark 51, was found lying on its side. The input cables to the radar were parted and the air inlet and outlet hoses were parted. The sight was sent to the Naval Shipyard New York for further analysis. (See Photographs AACR 59-1566-1, 2, and 4; AACR 60-147-7). At the New York Naval Shipyard the gun sight was mounted on a test stand and checked for static balance and sensitivity. It was found that the sight had an error of 30 mils in boresight caused by a loose train lever-arm on the gimbal shaft. A set-screw on the lever arm had worked loose, but the casualty probably was not caused by the effects of the Test "A" explosion. It was also found that the reticle vibration of the sight was excessive. Weights were added to the gyro studs and the vibration ceased. No internal damage attributable to the direct effects of the Test "A" explosion, was observed.

9. The U.S.S. NEVADA (BB 36) was located at a distance of about 600 yards from the center of the burst. There were four Gun Sights, Mark 15, aboard and of these four, only one was found to be inoperative after Test "A". The inoperative Gun Sight, Mark 15, Mod. 3, mounted on the Gun Director, Mark 51, amidships port, was found to have a defective range unit. The range scale window was cracked, and paint on the sight case was scorched.

10. The Gun Sight, Mark 15, Mod. 3, located in the U.S.S. DAWSON (APA 79), at a distance of approximately 900 yards from the center of the burst, was not damaged by the effects of the explosion.

11. Power was not available on the U.S.S. BARROW (APA 61) located at a distance of approximately 1300 yards from the center of the explosion, but a thorough visual inspection of the Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, revealed that the sight had not been damaged by the effects of the explosion.

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 15 (Cont'd)

12. One Gun Sight, Mark 15, Mod. 3, located in the U.S.S. BANNER (APA 60) at a distance of approximately 1400 yards from the center of the Test "A" bomb burst, was found to be inoperative after the Test "A" explosion due to a faulty reticle lamp. A thorough visual inspection revealed that the sight itself was undamaged, but two screws were sheared on the elevation locking-pin on the director mount.

13. The Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, located aboard the U.S.S. FALLON (APA 81) approximately 1400 yards distant from the center of the explosion, was inoperable before Test "A" because the electric leads and air-hose connections were disconnected. A visual inspection was performed after Test "A", and it was found that the sight had not been damaged by the effects of the explosion.

14. One Gun Sight, Mark 15, Mod. 12, mounted on the after starboard Gun Director, Mark 51, in the U.S.S. PENNSYLVANIA (BB 38), located at a distance of approximately 1400 yards from the center of the explosion, the objective window was chipped and the eyepiece focussing key was sheared. The train mirror movement was erratic and the elevation mirror did not move. The gun sight was shipped to the New York Naval Shipyard for further analysis. At the New York Naval Shipyard the Gun Sight was mounted on a stand and given a static balance check and a sensitivity check. The static balance readings were in excess of tolerance due to unbalanced mirrors and an unbalanced elevation gyro. The balance nuts on the mirrors and gyro were found to be installed singly rather than properly locked in pairs, and the nuts had vibrated out of position. The elevation characteristic time was not satisfactory indicating an inoperative thermoswitch. The sensitivity check revealed that the elevation gyro was faulty. The gyro was removed from the sight and sent to the gyro laboratory for further analysis, when it was found that an 18 mil range shift was present. The shift was caused by a shifted range unit, and was corrected by orientation of the range unit.

15. The Gun Sight, Mark 15, Mod. 12, mounted on the Gun Director, Mark 51, port side aft in the U.S.S. PENNSYLVANIA (BB 38), was moderately damaged by the primary effects of the explosion and was not operable. The objective window

TEST "A" (Cont'd)

OPTICS (Cont'd)

GUN SIGHTS, MARK 15 (Cont'd)

was blurred when the plastic filler between the glass laminations was damaged by the heat. The focussing key was sheared and the first eye-lens was chipped. The air-hoses and paint were blistered and the mirrors did not move in train or elevation. The sight was shipped to the New York Naval Shipyard for further analysis. At the New York Naval Shipyard the sight was placed on a test stand for a static balance check. The sight checked 15 mils dead-zero in train and the reticle did not move in elevation. The dead-zero error was caused by dirty pivots and bearings in the train and elevation mirror assembly. The elevation gyro was removed and the following defects were observed. The thermo-switch had failed, causing the sight to overheat, consequently the elevation gyro bearings had seized, the wiring was burned and charred, and the rubber hose was hard and inflexible, while the range-hub was frozen and the slide rods and needle bearing were covered with corrosion. The hard-baked rubber diaphragm rendered the caging unit inoperable. The damping fluid had leaked out of the rear damping assembly, and the rotor and gimbal assembly were out of balance.

16. The Gun Sight, Mark 15, Mod. 12, Serial #4088, and the Gun Sight, Mark 15, Mod. 12, Serial #4067, in the U.S.S. PENNSYLVANIA (BB 38), were moderately damaged and inoperable. They were marked for shipment to the New York Naval Shipyard but were lost over the side of the ship by the ship's personnal during the removal process.

17. On the U.S.S. CARTERET (APA 70), located at a distance of approximately 2000 yards from the center of the explosion, it was found that the balsam was broken in the telescope eyepiece lens, of the Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51.

18. The Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, in the U.S.S. BRACKEN (APA 64), located at a distance of approximately 2200 yards from the point of burst, was subjected to visual and operational tests and was found to be undamaged.

19. The U.S.S. GASCONADE (APA 85) was located at a distance of approximately 2800 yards from the center of the burst. No damage attributable to the effects of Test "A" was observed on the Gun Sight, Mark 15, Mod. 3, mounted in the Gun Director, Mark 51. However, it was observed that a small amount of moisture had condensed on the internal parts of the sight, and it is possible that the moisture may have entered because the gasket seals were loosened by the effects of the explosion.

TEST "A" (Continued)

OPTICS (Continued)

GUN SIGHTS, Mark 15 (Continued)

20. The U.S.S. CATRON (APA-71) was located at a distance of approximately 2900 yards from the center of the explosion. The Gun Sight, Mark 15, Mod. 3, mounted on the Gun Director, Mark 51, was found to be undamaged.

21. The Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, in the U.S.S. CORTLAND (APA-75) at a distance of approximately 3200 yards from the center of the explosion, was found to be undamaged by the effects of the explosion.

22. The Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, in the U.S.S. NIAGARA (APA-87), approximately 4000 yards distant from the center of the atomic bomb explosion, was found to be undamaged by the effects of the explosion.

RANGEFINDERS

1. The Test "A" nuclear fission experiment produced conclusive evidence that the modern rangefinder is practically impervious to the pressure, shock and temperature caused by an above-surface atomic bomb explosion. The rangefinders subjected to Test "A" were of many different types in a great variety of installations, and were a representative cross-section of the rangefinders and rangefinder mountings used in the U.S. Navy at the present time. In the few instances that the efficiency of a rangefinder was reduced by the blast, the damage occurred to the mounting rather than to the instrument itself. In a few cases, a slight change in calibration of the main optical system was noted. This condition, when it occurred, was usually found in the 26-1/2 foot coincidence-type Rangefinder, Mark 33, and was probably caused by a slight shift of the coincidence prism. In all cases, this change in calibration was sufficiently small that it could be corrected by use of the internal adjuster system.

2. Of the surviving ships of the target array, the U.S.S. ARKANSAS (BB-33) was the closest to the point of detonation, being located at a distance of 400 yards from the center of the blast.

3. A Rangefinder, Mark 10, and mount were located atop #2 turret. This instrument was blasted off the top of the turret and smashed on the deck. (See Photographs AACR 60-144-4, and 5). A Rangefinder, Mark 10, in a similar installation was mounted atop #5 turret. This rangefinder and mount were blown off the top of the turret and demolished. (See Photographs AACR 60-134-10; AACR 60-138-8; AACR 60-134-8).

TEST "A" (Cont'd)

OPTICS (Cont'd)

RANGEFINDERS (Cont'd)

4. A Rangefinder, Mark 54, Mod. 0, Serial #6, mounted on Rangefinder Mount, Mark 35, installed in the port forward superstructure, was damaged by blows from parts of the rangefinder shield that were blasted away. The rangefinder was seriously damaged and was shipped to the New York Naval Shipyard for further examination. (See Photographs AACR 125-2036-4; AACR 60-144-7, 8, and 12).

(a) The results of the inspection and disassembly of the rangefinder showed that the instrument was damaged beyond repair. The major part of the damage was caused by blows from parts of the damaged rangefinder shield. The canvas lagging was ripped and torn throughout the entire length of the rangefinder. There was a large dent in the right end-box, top side, about two inches from the end. The dent was about two inches long and a quarter of an inch deep. There was also a large dent, located about forty five degrees back from top center, between the right bearing and right end-box, about five inches from the right bearing. The dent was four inches long and one and one-quarter inches deep. The sun-shade on the right end-window received a blow which bent it out of round. The left end of the rangefinder had a series of small dents on the top side extending from the left bearing to the end of the left end box. The outer tube appeared to be bent downward on the ends and upward in the middle. The searchlight ray filter shaft was bent and inoperative. The illumination housing on the trainer's sight eyepiece unit was sheared by a blow to the illumination housing. The eyepiece unit of the trainer's sight had received a blow which caved-in the eyepiece rear lens cell and shattered the rear eyelens. The four screws securing the elevation handle were sheared.

(b) The left end-box was twisted clockwise approximately five degrees. The bolt-circle flange (279409-2) that held the left end-box in position was broken loose from the outer tube. The flange had been held in position on the outer tube by solder. Upon removal of the right end-box it was found that the first reflector mirror was badly chipped at the points of suspension and the second reflector mirror was shattered. The second reflector mirror holding-down spring (279407-2) had jumped out of its supporting slots allowing the reflector mirror to fall out of position. The end reflector mount supporting casting (279410-1) was broken on the underside. The damage to this end-box assembly was caused by a blow received from the inner side of the end-box when it was bent downward. Upon removal of the left end-box it was found that the first end reflector mirror was chipped on the outer edge and the second end reflector was loose because the reflector guide (279404-4) was bent. This damage was caused by a blow received from the inner side of the left end-box

TEST "A" (Cont'd)

OPTICS (Cont'd)

RANGEFINDERS (Cont'd)

(c) After removing the right and left end-boxes the rangfinder was placed on roller pads to determine the degree of the bend in the outer tube. The left end of the outer tube was found to have been bent downward and slightly forward. The center of the left end was found to be about 0.3 inches forward of a vertical plane though the original axis, and the total deflection from the axis measured radially, was 0.893 inches. The right end of the outer tube was also found to have been bent downward and slightly forward. The center of the right end was found to be about 0.1 inches forward of a vertical plane through the original axis, and its total radial deflection from the axis was 0.320 inches. The center of the tube between the bearings was found to be bent upward and backward. It was found to be about 0.1 inches back of a vertical plane through the original axis, and its total radial deflection from the axis was found to be 0.275 inches. The inner tube was then removed from the outer tube and set up on roller pads to determine the amount of bend. It was found to be bent in very nearly the same manner as the outer tube, but the bend was not so great. The left end was found to be bent downward 0.333 inches, the right end was found to be bent downward 0.075 inches, and the middle was bent upward 0.190 inches. The inner tube was found to have a dent one-half inch deep and three inches long, betwen the right bearing and right end of the tube. The dent was five inches from the bearing and approximately 45 degrees back from top center of the tube. This dent was caused by a continuation of the blow that dented the outer tube in the same relative position. The tubes were bent by the combination of blows received from the rangefinder mount.

(d) The lucite trainer's telescope cross-line illumination rod was broken and the lucite adapter-flange (272142-11) was sheared by a blow from the outer tube. The right end of the searchlight ray filter assembly sustained a sheared screw in the connecting link assembly (279426-7). The compensator was removed from the inner tube and set up on a collimator for an alignment check. No damage to the optical alignment or to the mechanism of the compensator unit was observed. The correction wedge was removed and was found to be intact.

TEST "A" (Cont'd)

OPTICS (Cont'd)

RANGEFINDERS (Cont'd)

(e) The internal target mountings were removed and inspected but no damage to the targets or objectives was found. The optical bar was removed and thoroughly checked for optical and mechanical misalignments. The bar was set up in a collimator and checked for parallax, alignment of reticles and eyepiece prisms, and damaged optical components. No damage or misalignment was noted.

(f) After removing all optical components from the optical bar, the bar was swung between centers on a lathe. The bar was found to be in proper alignment. One of the inner tube optical bar supporting blocks (322918-13) was found to be broken loose. This block had been soldered to the inner side of the inner tube. The rangefinder right and left bearings were checked for "out of round" with a micrometer. The bearings were found to be true to within 0.001 inch.

(g) The damage to the injured parts of this rangefinder, was caused by the force of direct blows from the broken shield. The internal components of the rangefinder that did not receive a direct blow were not damaged.

5. The Rangefinder, Mark 54, Mod. 0, Serial #8, installed in the starboard forward superstructure, sustained no damage during the test, although the Rangefinder shield was blown apart with only the front plate remaining. (See Photographs AACR 125-2036-5; AACR 60-144-9; AACR 60-150-1).

6. The Rangefinder, Mark 58, Mod. 0, Serial #81, located on the forward Gun Director, Mark 50, was inoperable because of damage from primary and secondary causes. The only damage noted to the rangefinder was duplication of field, probably caused by a slight shift of an end reflector. The rangefinder securing brackets were loose and the gearing to the director was disconnected in elevation and cross-level.

7. The Rangefinder, Mark 58, Mod. 0, Serial #203, was inoperable and was sent to the optical shop, New York Naval Shipyard, for a detailed inspection. The inspection revealed that a line lock spring (302158-3) was missing from the director input assembly (323009-5). The line lock spring had probably been removed by repair personnel and had not been replaced upon reassembly of the unit. In

TEST "A" (Cont'd)

OPTICS (Cont'd)

RANGEFINDERS (Cont'd)

normal operation the line lock spring prevents the differential's director input shaft from turning when range values are cranked in by the range knob, and the rotation of the differential actuates the intermittent drive mechanism assembly (302185). The intermittent drive mechanism, not re-acting properly because of the missing line lock spring, did not cause the optical range scale to rotate. The spring was replaced from stock and the unit functioned perfectly. It was found that the rangefinder did not hold gas pressure satisfactorily. Leaks resulting from loose flange bolts were discovered around both end-box flanges. No damage to the rangefinder as a direct result of the primary effects of Test "A" was noted.

8. The U.S.S. CRITTENDEN (APA 77) was located at a distance of about 500 yards from the center of the blast. A Rangefinder, Mark 65, Mod. 0, Serial #469, was mounted on the bridge. The rangefinder was mounted in an open rangefinder mount, Mark 65. The damage sustained by this installation was minor. An illumination battery-box was found torn loose from the deck, and the sheet metal hood extending over the face plate was found to be bent.

9. The U.S.S. NEVADA (BB 36) was located at a distance of approximately 600 yards from the center of the explosion, and was equipped with one Rangefinder, Mark 33, one Rangefinder, Mark 36, and two Rangefinders, Mark 42.

10. The Rangefinder, Mark 42, Mod. 12, Serial #272, was mounted in the forward Gun Director, Mark 37. The defrosting nozzle and end window sunshade were blown off. The bloomers were blown out and the paint was slightly scorched on both end-boxes. However, the rangefinder operated at nearly normal efficiency.

11. The Rangefinder, Mark 42, Mod. 12, Serial #273, was mounted in the after Gun Director, Mark 37. The defroster heater unit was blown from the right end. (See Photographs AACR 60-150-6; AACR 60-150-12; AACR 60-150-9).

12. The Rangefinder, Mark 33, Mod. 0, Serial #3, mounted in #4 turret and the Rangefinder, Mark 36, Mod. 0, Serial #4, mounted in #2 turret operated at normal efficiency. (See Photograph AACR 60-150-5).

13. The U.S.S. PENSACOLA (CA 24) was approximately 600 yards distant from the center of the blast. The Rangefinder, Mark 42, Mod. 13, Serial #497, was located

TEST "A" (Cont'd)

OPTICS (Cont'd)

RANGEFINDERS (Cont'd)

in the after anti-aircraft director. The exposed lagging was deeply burned, but the rangefinder operated at normal efficiency. The Rangefinder, Mark 42, Mod. 12, Serial #488, mounted in the forward anti-aircraft director, was found to operate at normal efficiency.

14. The Rangefinder, Mark 43, Mod. 0, Serial #14, (After Main Battery Director) was found to be inoperable because the end-window covers were frozen in place. After the covers were removed, the instrument was found to be operable at normal efficiency. Sections of the canvas lagging were burned and the lighting circuit wiring was loose.

15. The Rangefinder, Mark 43, Mod. 13, Serial #20, in turret #3 was inoperable. The shutter on the left turret ear was blasted inward and wrapped around the rangefinder end-box.

16. The U.S.S. HUGHES, (DD 410) was located at a distance of about 800 yards from the burst. The Rangefinder, Mark 41, Mod. 2, was found to operate at normal efficiency.

17. The U.S.S. DAWSON (APA 79) was located at approximately 900 yards distance from the center of the blast. The Rangefinder, Mark 65, Mod. 0, was found to be unscathed, but inoperable because of the failure of the mount. The mount bearings failed, allowing the rangefinder to shift about six inches laterally. In this position the rangefinder could not be depressed or elevated.

18. The U.S.S. SALT LAKE CITY (CA 25) was located at a distance of about 1000 yards from the burst.

19. The Rangefinder, Mark 33, Mod. 0, Serial #5, mounted in turret #1, was found to be operable at reduced efficiency. The internal adjuster reading was found to be lowered considerably, probably by the shifting of the coincidence prism.

20. Rangefinder, Mark 33, Mod. 1, Serial #33, mounted in turret #4, was found to be operable at slightly reduced efficiency. It is believed that the adjuster pentaprism shifted slightly causing an error in the height adjustment of the internal targets.

21. The U.S.S. RHIND, (DD 404) was located at a distance of 1000 yards from the center of the blast. The paint was found to be slightly burned on the ex-

TEST "A" (Cont'd)

OPTICS (Cont'd)

RANGEFINDERS (Cont'd)

posed parts of the Rangefinder, Mark 41, Mod. 9, Serial #85, but the instrument operated at normal efficiency.

22. The rangefinders installed on ships located at distances greater than 1000 yards, from the burst were found to operate at normal efficiency. In the few cases of rangefinder damage noted throughout the target array it was found that the damage resulted from weakness of mounts and associated equipment, rather than from weaknesses in the mechanism of the rangefinder.

TELESCOPES

1. On the U.S.S. ARKANSAS (BB 33) approximately 400 yards distant from the center of the burst, the following named telescopes were found to be damaged as described below:

(a) On two Telescopes, Mark 20, Mod. 1, located on No's. 9 and 13, 5"/51 gun mounts, the telescope body tubes were cracked and broken at the point where the body tube of the telescope was clamped to the sight bracket.

(b) On two Telescopes, Mark 20, (Mod. 1 and Mod. 2) located on No's. 10 and 14, 5"/51 gun mounts, the cross-line lens was broken out of the lens-mount but the bodies of the telescopes remained undamaged.

(c) On Telescope, Mark 20, Mod. 2, located on No. 10, 5"/51 gun mount, a hard adherent black deposit was found on the outer surface of eyepiece lens and the surface was lightly pitted. The telescope was rendered inoperable.

(d) The Telescope, Mark 27, Mod. 7, located on the target bearing transmitter in Spot 1 was demolished when the top of the target bearing transmitter fell upon it. The Telescope, Mark 74, Mod. 0, located on No. 3, 3" gun mount was displaced from its mounting bracket by the effects of the explosion and was smashed beyond repair when it landed on deck.

(e) A Telescope, Mark 60, located in the after Gun Director, Mark 50, was removed and returned to the New York Naval Shipyard for inspection and for determination of light transmission. The telescope checked within tolerance and was found to be serviceable. The objective end-window was discolored by the effects of the burst and was sent to the

Material Laboratory at the Naval Shipyard for a comparative test of light transmission. Using the Hardy Recording Spectrophotometer, the light transmission of a new window was compared with that of the window taken from the damaged telescope. It was found that the difference in light transmissions was 3.7%, the transmission of the new window being about 91% and that of the damaged window about 87.3%. The Material Laboratory estimated that the total loss in light transmission for the telescope was about 4%.

2. On the U.S.S. NEVADA (BB 36) located at a distance of approximately 600 yards from the center of the burst, two Telescopes, Mark 28, Mod. 7, located on Gun Director, Mark 20, Mod. 3, in the main-top, were smashed against the splinter shield when the director was blasted off its foundations.

3. On the U.S.S. PENSACOLA (CA 24) approximately 600 yards from the center of the explosion of the atomic bomb, two Telescopes, Mark 36, and one Telescope, Mark 37, located on the 5"/25 gun mount, starboard side aft, were demolished by the blast.

4. On the U.S.S. SALT LAKE CITY (CA 25) located at a distance of approximately 1000 yards from the center of the Test "A" explosion, the following named telescopes were damaged as described below:

(a) On the Telescopes, Mark 36, and Mark 37, located on No's. 5 and 7 5"/25 gun mounts, the crossline illumination bulbs were shattered and the rheostats damaged. The rheostats developed short circuits, tended to stand, or spun free of contact grips.

(b) On the telescope, Mark 36, located on No. 6, 5"/25 gun mount the ray filter and the eyepiece housing were blasted from the telescope and were missing.

(c) On the Telescope, Mark 37, located on No. 5, 5"/25 gun mount the objective lens was found to have been shattered by the effects of the explosion.

5. On the U.S.S. STACK (DD 406) approximately 1200 yards distant from the center of the explosion of the atomic bomb, the end-window of the Leveler's Telescope, Mark 28, Located in Gun Director, Mark 33, was found to have been cracked. (See Photograph AACR 234-1984-5).

TEST "A" (Cont'd)

OPTICS (Cont'd)

PERISCOPES

1. The only Periscopes damaged in Test "A" were as follows:

   (a) On Periscope, Mark 6, Mod. 2, located in turret No. 3 of the U.S.S. ARKANSAS (BB 33) at a distance of approximately 400 yards from the point of the air burst of the atomic bomb, the objective end was sheared off by the aircraft on the top of the turret which was carried away by the effects of the explosion. On Periscope, Mark 6, Mod. 2, located in turret No. 5 of the U.S.S. ARKANSAS (BB 33) the objective end was bent by flying debris. (See Photograph AACR 60-138-9). On Periscope, Mark 6, Mod. 2, located in turret No. 6 of the U.S.S. ARKANSAS (BB 33) the objective prism was discolored but the periscope could be used at reduced efficiency. Periscope, Mark 7, Mod. 2, located in Spot 1 of the U.S.S. ARKANSAS (BB 33) was demolished by the upper half of the director telescope when it carried away.

   (b) On the U.S.S. PENSACOLA (CA 24) approximately 600 yards distant from the point of burst, the coroprene gasket under the objective window of the Periscope, Mark 27, located in the after control station was damaged by heat and the inside of the objective window presented a smoky appearance, but the periscope was still usable at slightly reduced efficiency.

SPOTTING GLASSES

1. The only damage to Spotting Glasses in Test "A" was as follows:

   (a) On the U.S.S. NEVADA (BB 36), approximately 600 yards distant from the point of burst of the atomic bomb, a Spotting Glass, Mark 4, located on the after Gun Director, Mark 20, was severely damaged when the director pedestal failed and the director struck the side of the splinter shield.

   (b) On the U.S.S. SALT LAKE CITY (CA 25) located at a distance of approximately 1000 yards from the point of explosion the Spotting Glass, Mark 4, located in No. 2 director on the mainmast, was seriously damaged by the effects of the explosion. The spotting glass pedestal was broken about twelve inches from the deck, and the upper half of the pedestal and the spotting glass were missing.

   (c) On the U.S.S. NEW YORK (BB 34) located at a distance of approximately 1900 yards from the point of burst, two Spotting Glasses, Mark 4, were found to have been jarred out of collimation in both high and low power.

~~S-E-C-R-E-T~~

TEST "A"

FIRE CONTROL

RANGEKEEPERS AND COMPUTERS

The ships listed below were equipped with rangekeepers or computers which were mounted in topside stations at the approximate distances from the point of explosion of the atomic bomb as shown:

1.	U.S.S. ARKANSAS (BB-33)	400 yards
2.	U.S.S. PENSACOLA (CA-24)	600 yards
3.	U.S.S. LAMSON (DD-367)	900 yards
4.	U.S.S. SALT LAKE CITY (CA-25)	1000 yards
5.	U.S.S. RHIND (DD-404)	1000 yards
6.	U.S.S. RALPH TALBOT (DD-390)	1200 yards
7.	U.S.S. STACK (DD-406)	1200 yards
8.	U.S.S. WILSON (DD-408)	1600 yards
	U.S.S. NEW YORK (BB-34)	1900 yards
10.	U.S.S. MUGFORD (DD-389)	2900 yards
11.	U.S.S. CONYNGHAM (DD-371)	3100 yards
12.	U.S.S. MAYRANT (DD-402)	3600 yards

The ships listed below were equipped with rangekeepers or computers which were mounted below decks at the approximate distances from the point of burst of the nuclear fission bomb as shown:

1.	U.S.S. ARKANSAS (BB-33)	400 yards
2.	U.S.S. ANDERSON (DD-411)	500 yards
3.	U.S.S. NEVADA (BB-36)	600 yards
4.	U.S.S. HUGHES (DD-410)	800 yards
5.	U.S.S. PENNSYLVANIA (BB-38)	1800 yards
6.	U.S.S. NEW YORK (BB-34)	1900 yards
7.	U.S.S. WAINWRIGHT (DD-419)	2200 yards
8.	U.S.S. MUSTIN (DL-413)	2400 yards

The equipments exposed to the effects of the nuclear fission bomb burst at a distance of approximately 500 yards were on the U.S.S. ARKANSAS (BB-33).

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

RANGEKEEPERS AND COMPUTERS (Cont'd)

Two Rangekeepers, Mark 2, Mod. 0, Serial Numbers 198 and 216 were demolished by the blast. One Computer, Mark 10, Mod. 1, Serial Number 16, located in the forward computer room and one Computer, Mark 10, Mod. 1, Serial Number 18, located in the after computer room were undamaged by the effects of the explosion.

The equipments in the U.S.S. PENSACOLA (CA-24) exposed to the blast at approximately 600 yards distance were one Rangekeeper, Mark 10, Mod. 52, Serial Number 126, located aft; one Rangekeeper, Mark 10, Mod. 51, Serial Number 51, located forward; one Rangekeeper, Mark 11, Mod. 0, Serial Number 8, located in the forward main battery director; and one Rangekeeper, Mark 11, Mod. 0, Serial Number 3, located in the after main battery director. None of these equipments were damaged as a result of Test "A".

It was not possible to determine the condition of a Rangekeeper, Mark 10, Mod. 54, Serial Number 141, located on the U.S.S. LAMSON (DD-367) at a distance of about 900 yards from the point of origin of the blast because the U.S.S. LAMSON (DD-367) was sunk by the effects of the blast.

The equipments located on the U.S.S. SALT LAKE CITY (CA-25) at a distance of approximately 1000 yards from the point of explosion were one Rangekeeper, Mark 10, Mod. 51, Serial Number 161; one Rangekeeper, Mark 10, Mod. 52, Serial Number 150; one Rangekeeper, Mark 5, Mod. 0, Serial Number 4; and one Rangekeeper, Mark 5, Mod. 0, Serial Number 2. None of the equipments were damaged by the effects of the explosion.

A Rangekeeper, Mark 10, Mod. 31, Serial Number 83, located at the same distance from the blast on the U.S.S. RHIND (DD-404) was not damaged.

A Rangekeeper, Mark 10, Mod. 31, Serial Number 81, located on the U.S.S. RALPH TALBOT (DD-390) at a distance of about 1200 yards from the point of burst suffered no damage.

The equipments in the U.S.S. STACK (DD-406), U.S.S. WILSON (DD-408), U.S.S. NEW YORK (BB-34), U.S.S. MUGFORD (DD-389), U.S.S. CONYNGHAM (DD-371),

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

RANGEKEEPERS AND COMPUTERS (Cont'd)

and U.S.S. MAYRANT (DD 402) were not damaged by the effects of the Test "A" explosion.

An examination of all available data indicated that no damage to rangekeepers and computers resulted from the effects of the explosion on ships that were over 500 yards from the point of detonation of the nuclear fission bomb. A further examination of the data on the effects of the explosion on computers and rangekeepers located below decks shows that no damage resulted from the blast with the possible exception of that on the U.S.S. ANDERSON (DD-411) which was sunk.

STABLE ELEMENTS

During Test "A" stable elements in below-decks locations were located in the plotting rooms of the below listed vessels at the following approximate distances from the center of the blast:

U.S.S. ARKANSAS (BB-33)	400 yards
U.S.S. ANDERSON (DD-411)	500 yards
U.S.S. NEVADA (BB-36)	600 yards
U.S.S. HUGHES (DD-410)	800 yards
U.S.S. PENNSYLVANIA (BB-38)	1800 yards
U.S.S. NEW YORK (BB-34)	1900 yards
U.S.S. WAINWRIGHT (DD-419)	2200 yards
U.S.S. MUSTIN (DD-413)	2400 yards

Stable elements in topside locations were located in either a Gun Director, Mk. 33, or a Gun Director, Mk. 35, on the below listed ships at the following approximate distances from the point of origin of the blast:

U.S.S. PENSACOLA (CA-24)	600 yards
U.S.S. LAMSON (DD-367)	900 yards
U.S.S. SALT LAKE CITY (CA-25)	1000 yards
U.S.S. RHIND (DD-404)	1000 yards
U.S.S. RALPH TALBOT (DD-390)	1200 yards

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

STABLE ELEMENTS (Cont'd)

U.S.S. STACK (DD-406)	1200 yards
U.S.S. WILSON (DD-408)	1600 yards
U.S.S. MUGFORD (DD-389)	2900 yards
U.S.S. CONYNGHAM (DD-371)	3100 yards
U.S.S. MAYRANT (DD-402)	3600 yards

The stable elements nearest to the point of detonation of the nuclear fission bomb were not affected by the shock or blast. This phenomenon could be easily attributed to the sheltered location and sturdy construction of their positions in the forward plotting rooms of the battleships. One Stable Element, Mark 6, Mod. 1, was about 400 yards distant from the blast on the U.S.S. ARKANSAS (BB-33), and a Stable Element, Mark 6, Mod. 1, and Stable Element, Mark 1, Mod. 0, were located about 600 yards distance from the blast on the U.S.S. NEVADA (BB-36). None of these stable elements was affected by the test. The U.S.S. PENSACOLA (CA-24), which was located at approximately the same distance as the U.S.S. NEVADA (BB-36), had minor damage to the Stable Element, Mark 2, Mod. 4, in the after Gun Director, Mark 33. This damage consisted of an open in the circuit which supplies current to the filaments of the type C6A power tubes controlling the level follow-up motor. In the forward Gun Director, Mark 33, the Stable Element, Mark 2, Mod. 4, was rendered inoperable when the top front sections of the glass envelopes of six power tubes, type C6A, were shattered. This casualty was directly attributable to the excessive freedom of motion of the flexible tube mounting which allowed the tubes to strike the control panel door under the violent action of the blast. In the Stable Element, Mark 3, Mod. 0, located in the forward Gun Director, Mark 35, it was found that one power tube, type C5B, had an open filament. No damage was incurred in the Stable Element, Mark 3, Mod. 1, located in the after Gun Director, Mark 35.

It is interesting to note that the Stable Element, Mark 6, Mod. 5, located in the sheltered area of the I.C. room of the U.S.S. HUGHES (DD-410), about 800 yards distant from the center of the blast, received no damage while those stable elements located in topside directors, approximately 1000 yards distant, in the U.S.S. SALT LAKE CITY (CA-25), received severe damage. On the Salt Lake City the Stable Element, Mark 2, Mod. 13, located

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

STABLE ELEMENTS (Cont'd)

in the forward Gun Director, Mark 33, bore the brunt of the blast. Two power tubes, type C5B, were damaged when their glass envelopes were fractured because the excessive freedom of motion of their flexible mounting allowed the top front section of the tubes to strike the control panel door. The most serious damage occurred to the sensitive element assembly when a seemingly lateral force caused a gyro gimbal bearing and a pivot stud to be forced out through the opening of the inner arm, stripping the threads of the inner arm recess for the securing screw. The opposite gyro gimbal bearing was forced partially out of its recess. It appears that the inertia of the gyro wheel, when the wheel was violently displaced laterally, caused a spreading of the inner arm and allowed the gyro gimbal bearings to be partially displaced from their recesses. When the lateral force was dissipated and the inner arm and the gyro gimbal bearings attempted to return to their original positions, the gyro gimbal bearings became canted in their recesses, causing the inner arm to remain in a spread position and forcing the pivot stud out through the opening of the inner arm. This casualty caused the protruding stud to contact the outer gimbal ring thus preventing rotation of the inner gimbal system. The damage sustained by the same type of stable element on the after Gun Director, Mark 33, was not so severe as that in the forward gun director although it was made inoperable by a similar casualty to its power tubes. The sensitive element was undamaged except that an excessive amount of end-play was noted in the inner gimbal bearings. It was also noted that the electrical connections to the two lower left-hand resistors, located in the crosslevel resistor unit, were broken at their soldered joints. This condition is shown in photograph No. AACR 86-2542-6.

The U.S.S. RHIND (DD-404) which was about the same distance from the center of the blast as the U.S.S. SALT LAKE CITY (CA-25) (approximately 1000 yards) received much more damage to the same type stable element. This could possibly be attributed to the susceptibility of the lighter ship to the effects of the explosion of the atomic bomb. In this Stable Element, Mark 2, Mod. 1, six power tubes, type C6A, were broken in the manner previously described. The sensitive element system also received severe damage. One gyro gimbal bearing pivot stud was forced out through the opening of the inner arm stripping the threads of the inner arm recess for the securing screw.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

STABLE ELEMENTS (Cont'd)

The protruding stud limited the rotation of the inner gimbal system. The opposite gyro gimbal stud was broken at a point between the gyro gimbal bearing and the gyro gimbal bearing retaining nut, allowing the nut to drop and the gyro gimbal stud to be free of the bearing. This casualty allowed the gyro gimbal and the gyro to drop and come to rest on the base of the inner arm.

The Stable Elements, Mark 2, Mod. 1, in the Gun Director, Mark 33, on both the U.S.S. STACK (DD-406) and the U.S.S. RALPH TALBOT (DD-390), were approximately 1200 yards distant and on bearings differing by about 120 degrees from the center of the blast. Although more damage was evident in the U.S.S. RALPH TALBOT (DD-390), it was not so severe as that which was sustained in the U.S.S. STACK (DD-406), where two power tubes, type C6A, were broken in the same characteristic fashion as previously described. The sensitive element on the latter vessel had its gyro gimbal bearings dislodged, the inner arm spread, and the pivot stud protruding, with consequent blocking of gimbal rotation in the same manner as that described on the U.S.S. RHIND (DD-404) and the U.S.S. SALT LAKE CITY (CA-25). It is interesting to note at this time that damage to the sensitive element occurred only on those ships which did not have the gyro of the stable element energized. The U.S.S. RALPH TALBOT (DD-390) at 1200 yards (approximately the same distance as the U.S.S. STACK (DD-406)), and the U.S.S. PENSACOLA (CA-24) which was at about one half that distance, from the point of burst, had their stable elements energized and no casualties occured to these sensitive elements. It is possible that when such equipment is energized the damage will be kept to a minimum, but further investigation of this premise would be necessary in order to come to an accurate conclusion.

On the U.S.S. RALPH TALBOT (DD-390), the sensitive element withstood the effects of the blast, but various units of the stable element sustained heavy damage. A measure of the intensity of the shock may be inferred from the fact that four power tubes, type C6A, were broken as previously described. (See Photograph No. AACR 234-1984-11). One amplifier tube, type 47, was partially out of its socket despite the action of the retaining spring to hold it in place. The crosslevel box bracket was separated from the stable element case by a distance of 7/8 inch causing the crosslevel input shaft

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TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

STABLE ELEMENTS (Cont'd)

gearing to become disengaged at this point. Nine of the twelve hexagonal securing nuts were stripped from their securing studs and the remaining three securing studs were partially stripped from the stable element case at the junction of the case cover and the crosslevel bracket. This casualty occurred when the director shield was dished inward by the blast. The crosslevel box bracket was in contact with the shield and the inward motion of the shield carried the bracket along with it. This casualty stresses the importance, in future design, of the need for stronger blast-resisting director shields and ample clearance between the shield and interior instruments. (See Photograph Nos. AACR 234-1984-8 and AACR 234-1992-2).

All stable elements located over approximately 1600 yards from the center of the blast and those located in below-decks spaces were undamaged. No inspection of the stable element could be made on the U.S.S. ANDERSON (DD-411), at about 500 yards, or the U.S.S. LAMSON (DD-367), at about 900 yards from the point of explosion, because the vessels were sunk.

GUN DIRECTORS (Dual Purpose)

The dual purpose gun directors subjected to the effects of the atomic bomb explosion in Test "A" were located on the following named ships at the approximate distances from the point of burst as listed below:

1.	U.S.S. ARKANSAS	(BB-33)	400 yards
2.	U.S.S. NEVADA	(BB-36)	600 yards
3.	U.S.S. PENSACOLA	(CA-24)	600 yards
4.	U.S.S. ANDERSON	(DD-411)	600 yards
5.	U.S.S. HUGHES	(DD-410)	800 yards
6.	U.S.S. LAMSON	(DD-367)	900 yards
7.	U.S.S. SALT LAKE CITY	(CA-25)	1000 yards
8.	U.S.S. RHIND	(DD-404)	1000 yards
9.	U.S.S. RALPH TALBOT	(DD-390)	1200 yards
10.	U.S.S. STACK	(DD-406)	1200 yards
11.	U.S.S. WILSON	(DD-408)	1600 yards
12.	U.S.S. PENNSYLVANIA	(BB-38)	1800 yards

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS (Dual Purpose) (Cont'd)

13.	U.S.S. NEW YORK	(BB-34)	1900 yards
14.	U.S.S. WAINWRIGHT	(DD-419)	2200 yards
15.	U.S.S. MUSTIN	(DD-413)	2400 yards
16.	U.S.S. SARATOGA	(CV-3)	2700 yards
17.	U.S.S. MUGFORD	(DD-389)	2900 yards
18.	U.S.S. CONYNGHAM	(DD-371)	3100 yards
19.	U.S.S. MAYRANT	(DD-402)	3600 yards

The two dual purpose Gun Directors, Mk. 50, located on the U.S.S. ARKANSAS (BB-33), at a distance of approximately 400 yards from the center of the burst, were inoperative prior to Test "A", but the damage they sustained from the effects of the explosion was sufficient to have rendered them inoperable. The Gun Director, Mark 50, Mod. 4, located in the forward Sky Control station of the U.S.S. ARKANSAS (BB-33) was seriously damaged when the left half of the entrance door was blown partially into the director and the shield and the director internal stations were blistered and burned, while the level and crosslevel drives were jammed and would not operate in mamual control. (See photograph AACR 60-144-6). The Gun Director, Mark 50, Mod. 4, located in the after Sky Control station, in the U.S.S. ARKANSAS (BB-33) was forced out of alignment when the tripod structure of the mainmast on which the director was mounted was bent forward. The director was heavily scorched and the main cover-plate had been blown off and was missing. (See photographs AACR 50-134-6, AACR 50-134-7 and AACR 60-150-3). The directors had been secured on relative bearings of 000 degrees and 180 degrees respectively.

The Gun Director, Mark 37, Mod. 35, located in Sky 1 on the forward superstructure of the U.S.S. NEVADA (BB-36), about 600 yards distant from the center of the explosion, was secured on a relative bearing of 000 degrees and sustained only minor damage in that the canvas bloomers were blown off the rangefinder. (See photographs AACR 60-147-1). The Gun Director, Mark 37, Mod. 37, located in Sky 4 in the U.S.S. NEVADA (BB-36), and secured on a bearing of 180 degrees relative, suffered moderate damage and was inoperable. The end-boxes on the rangefinder were scorched and the canvas bloomers were blown off the rangefinder. Motion of the director in train was prevented by a binding gas-seal which was buckled and ruptured. The slewing sight, mounted on the top left front corner of the director, was broken from the director and was suspended by its electrical cable.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS (Dual Purpose) (Cont'd)

Since the director had been rendered inoperable in train and elevation by portions of the mainmast, radar and guy wires which had fallen on its top and sides and prevented any motion, it was concluded that falling debris had broken the slewing sight from the director. (See photographs AACR 60-150-6,8,9, and 10 AACR 234-1992-5).

The U.S.S. ANDERSON (DD-411) located at a distance of about 600 yards from the burst, was sunk, making it impossible to inspect the Gun Director, Mark 37, Mod. 0.

The Gun Director, Mark 33, Mod. 16, located above the pilot house in the forward superstructure, on the U.S.S. PENSACOLA (CA-24), approximately 600 yards distant from the center of the explosion, was operating in full automatic on a bearing of 141 degrees true during Test "A". The director was moderately damaged but operable at a reduced efficiency. The power relay contacts in the magnetic starter and controller unit were displaced, rendering the director train motor inoperative. A casualty to the Stable Element, Mark 2, caused a loss of level and crosslevel drive to the gun director and as a result the director could only be operated in manual. The rear side of the director shield was dished inward, the right side-door was blown into the director and a ruptured shield on the front side prevented motion of the rangefinder in crosslevel. The director was binding in train, probably because the director shield was distorted. (See photographs AACR 60-145-1, AACR 59-1567-6 and 7). The Gun Director, Mark 33, Mod. 16, located in the after superstructure of the U.S.S. PENSACOLA (CA-24) and secured on a bearing of 180 degrees relative, was moderately damaged. The paint on the director shield was scorched and the hydraulic oil lines at the trainer's handwheel bracket were leaking. (See photograph AACR 59-1567-1)

The Gun Director, Mark 37, Mod. 0, located atop the forward superstructure in the U.S.S. HUGHES (DD-410), approximately 800 yards distant from the center of the explosion, was secured on a bearing of 000 degrees relative and sustained only minor damage. The after and port sides of the director were burned and the canvas bloomers were blown off the rangefinder, but the director operated normally.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS (Dual Purpose) (Cont'd)

The Gun Director, Mark 33, on the U.S.S. LAMSON (DD-367) was not inspected because the vessel was sunk.

The Gun Director, Mark 33, Mod. 16, located above the pilot house in the forward superstructure on the U.S.S. SALT LAKE CITY (CA-25), approximately 1000 yards distant from the center of the explosion, was moderately damaged and was inoperable. Six plexiglas windows were broken out of the director shield. The doors and hatches of the director were sprung and the lagging was blown from the end-boxes of the rangefinder. The end-cover on the train power-motor was bent inward, preventing rotation of the motor. On one electrical relay in the magnetic starter and controller of the train power-motor the contacts were bent, having been displaced and then jammed in the open position. The damaged radar and damaged rangefinder gearing caused the elevation drive of the director to bind. The operation of the crosslevel drive was prevented by the distorted front side of the director shield and the damaged radar. The director had been trained on a bearing of approximately 280 degrees relative during the test. (See photographs Nos. AACR 87-2541-12 and AACR 60-136-8.)

The Gun Director, Mark 33, Mod. 16, located on the after superstructure of the U.S.S. SALT LAKE CITY (CA-25) and trained on a bearing of approximately 290 degrees relative, was moderately damaged. Five plexiglas windows in the director shield were broken and the lagging was blown off the end-boxes of the rangefinder. The left side-door was blown into the director and the right side-door was sprung, while the director tended to bind in train on a bearing of 290 degrees relative. The train power-motor controller unit which was not shock-mounted sustained major damage to its electrical relays. Three of the four relays in this unit were damaged beyond repair. (See photographs Nos. AACR 87-2542-4 and 5)

The Gun Director, Mark 33, Mod. 9, located atop the forward superstructure in the U.S.S. RHIND (DD-404), approximately 1000 yards distant from the center of the explosion, was secured on a bearing 000 degrees relative and sustained only moderate damage. The director shield was dished inward on the right side, the right side door was bent, and the knife-edges of the right door frame were torn from the shield. The front side of the shield was bent

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS (Dual Purpose) (Cont'd)

inward and the paint charred. All plexiglas windows were broken from the shield and the right end-box of the rangefinder was scorched. (See photographs AACR 60-136-1 and AACR 60-1555-11).

The Gun Director, Mark 33, Mod. 8, located atop the forward superstructure on the U.S.S. RALPH TALBOT (DD 390), approximately 1200 yards distant from the center of the explosion, was operating in automatic on a bearing 000 degrees relative at 30 degrees elevation during the test, and was seriously damaged and rendered inoperative by the effects of the explosion. The rear side of the director shield was distorted and the rear of the director deck was bent upward, causing the weather seal and the director deck around the training circle to prevent motion of the director in train. The port side door was blown into the director and two plexiglas windows were broken. The director pedestal was partially broken loose from the supporting deck. The train power-motor starter and controller unit was torn from its supports and the number three contact of the starting relay was found to have jumped from the spring-loaded retainer. The director elevation drive tended to bind. (See photograph Nos. AACR 234-1984-7, 8, 9, and 12 and AACR 234-1992-1 and 2).

The Gun Director, Mark 33, Mod. 9, located atop the forward superstructure on the U.S.S. STACK (DD 406), approximately 1200 yards distant from the center of the explosion, was secured on a bearing of 000 degrees relative during the test. The director sustained moderate damage, but suffered a very small loss in efficiency. The right side of the director shield was dished inward, the right side-door was sprung, and the securing rivets and knife edges of the right side-door frame were partially torn from the director shield. The overhead access hatches were sprung and the two left front plexiglas windows were broken. The access plate under the rangefinder was blown off. Two of the three fuses in the power-motor control panel were jarred out of their clips, and the optical cap window of the leveler's telescope was broken, while the director tended to bind intermittently in train due to the distorted shield's binding on the weather seal. (See photograph Nos. AACR 234-1984-5 and 6).

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS (Dual Purpose) (Cont'd)

The Gun Director, Mark 33, Mod. 9, located atop the forward superstructure in the U.S.S. WILSON (DD-408), approximately 1600 yards distant from the center of the explosion, was secured on a bearing of 000 degrees relative. The director was moderately damaged by the effects of the burst, but the operational efficiency was not reduced. The shield was ruptured on the forward, lower right corner and on the right side at the lower forward corner. The shield was scorched on the forward and right sides and the lagging on the rangefinder was burned. The leveler's telescope window and the pointer's telescope window in the optical cap were cracked.

The Gun Director, Mark 50, Mod. 4, located in forward secondary control in the U.S.S. NEW YORK (BB-34) approximately 1900 yards distant from the center of the explosion, was secured on a bearing of 000 degrees relative during the test and sustained moderate damage when the crosslevel drive became jammed and the crosslevel handcrank slipped.

The Gun Director, Mark 37, Mod. 0, located atop the forward superstructure on the U.S.S. WAINWRIGHT (DD-419), approximately 2200 yards distant from the center of the explosion, was operating in full automatic on bearing 045 degrees relative at 45 degrees elevation during the test. The director sustained moderate damage when a 0.1 microfarad condenser in the pilot-motor circuit of the train receiver shorted, causing the director to drive in one direction until it reached its mechanical limit. The 5SN synchro motor, which receives change of bearing transmission from the plotting room, was rendered inoperative by internally generated heat, which caused the windings to fail.

The Gun Director, Mark 33, Mod. 8, located atop the forward superstructure on the U.S.S. MUGFORD (DD-389) at a distance of approximately 2900 yards from the center of the explosion, sustained moderate damage with no reduction in efficiency. The trainer's end-window in the optical cap was chipped, the external paint was scorched and the crosswire illumination system of the leveler's telescope was damaged and inoperative.

On the Gun Director, Mark 33, Mod. 9, located atop the superstructure in the U.S.S. MAYRANT (DD-402), about 3600 yards distant from the center of the explosion, one window in the director shield was found to be broken.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS (Surface)

All the surface gun directors in Test "A" were located in the following named ships at the approximate distances from the center of the blast as shown below:

1.	U.S.S. ARKANSAS	(BB 33)	400 yards
2.	U.S.S. NEVADA	(BB 36)	600 yards
3.	U.S.S. PENSACOLA	(CA 24)	600 yards
4.	U.S.S. SALT LAKE CITY	(CA 25)	1000 yards
5.	U.S.S. PENNSYLVANIA	(BB 38)	1800 yards
6.	U.S.S. NEW YORK	(BB 34)	1900 yards

The Gun Director, Mark 7, Mod. 3, located in secondary forward on the starboard side in the U.S.S. ARKANSAS (BB 33) at a distance of about 400 yards from the point of explosion of the nuclear fission bomb and secured on a bearing 000 degrees relative, was damaged beyond repair by the effects of the explosion. The director turntable was broken into several pieces and was tilted at an angle of about 30 degrees from the pedestal. It was found that the electric cables were parted, hand cranks disconnected and the train and elevation gearing was locked. The Gun Director, Mark 7, Mod. 3, located in secondary forward, port side, was similarly damaged. (See Photographs AACR 125-2036-7 and AACR 60-144-11). This gun director also had been secured on a relative bearing of 000 degrees.

The Gun Director, Mark21, Mod. 1, located in the fire control tower, on the U.S.S. NEVADA (BB 36), at a distance of approximately 600 yards from the center of the explosion, was seriously damaged by the effects of the explosion when the coupling connecting the electrical director correction transmitter to the director elevation mechanical gearing was disengaged resulting in a loss of elevation signal transmission. The Gun Director, Mark 20, Mod. 2, located in the foretop, was found to be heavily damaged. The roller path was distorted, and one holding-down clip was broken off. (See photograph No. AACR 60-149-10). Gun Director, Mark 20, Mod. 3, located in the main top was damaged beyond economical repair as the director pedestal was broken, and the director blown off its roller path, coming to rest against the splinter shield. (See photograph Nos. AACR 60-149-3 and AACR 60-149-4). The Gun Director, Mark 32, Mod. 5, located in the main battery plotting room, sustained minor damage in that the director correction follow-up did not operate in automatic.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS (Surface) (Cont'd)

The U.S.S. PENSACOLA (CA-24), located at a distance of approximately 600 yards from the center of the explosion, sustained moderate damage to both surface Gun Directors, Mark 35, Mod. 0. The forward Gun Director, Mark 35, Mod. 0, located atop the forward superstructure and secured on a bearing of 000 degrees relative, was moderately damaged when the rear left side of the director shield was dished-in, one holding-down clip was loosened, and one leveling screw displaced. The after Gun Director, Mark 35, Mod. 0, located in the maintop and secured on a bearing of 180 degrees relative, was moderately damaged when the exterior paint was scorched, the train and elevation supply circuits were grounded, and all windows were broken from the director shield. (See photographs Nos. AACR 60-147-10 and AACR 59-1566-11)

The forward Gun Director, Mark 22, Mod. 2, located in the foretop, on the U.S.S. SALT LAKE CITY (CA-25), approximately 1000 yards distant from the center of the burst, and secured on a bearing of 000 degrees relative, was seriously damaged when the director trainer's elevation prism was broken loose from the elevation shafting, and the crosslevel indicator bracket was broken. The shafting to the crosslevel indicator was broken and the cross-leveler's handwheels tended to bind while the exterior paint was scorched.

The Gun Director, Mark 34, Mod. 13, located in Spot 2 in the U.S.S. PENNSYLVANIA (BB-38) at a distance of about 1800 yards from the center of the explosion, was damaged by the effects of the explosion, but the operating efficiency was not reduced when the oil line in the rangefinder stabilizer was ruptured. The director was energized, operating, and oscillating about a bearing of 141 degrees true during Test "A".

The Gun Director, Mark 20, Mod. 1, located in Spot 2 on the U.S.S. NEW YORK (BB-34) at a distance of about 1900 yards from the center of the blast and secured on a bearing of 000 degrees relative, was damaged but the operating efficiency was not reduced when the cradle-strap of the trainer's telescope was broken.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS, MARK 51 and MODS.

The damage to the Gun Directors, Mark 51, (Mods. 2 and 3) on the U.S.S. GILLIAM (APA-61), which was approximately 150 yards from the point of origin of the Test "A" burst, and the U.S.S. CARLISLE (APA-69), which was approximately 300 yards from the point of origin, was not observed because the ships were sunk.

The U.S.S. ARKANSAS (BB-33) which was 400 yards from the point of burst was equipped with six Gun Directors, Mk. 51. The starboard Gun Director, Mark 51, Mod. 3, located in the after air defense station, was not damaged but could not be operated due to a bent shield, preventing movement of the director in both train and elevation. (See photographs AACR 125-2036-10 and 11). A counterbalance weight was broken from the port Gun Director, Mark 51, Mod. 3, in the after air defense station. (See photographs AACR 60-134-1 and 2 also AACR 60-138-11 and 12). The remaining four Gun Directors, Mark 51, (Mods. 2 and 3) located on the boat deck and in the forward air defense station suffered slight damage to their locking pins.

The U.S.S. CRITTENDEN (APA-77), located approximately 500 yards from the point of origin of the explosion, was equipped with three Gun Directors, Mark 51, (Mods. 2 and 3). Two of the Gun Directors operated normally after being subjected to the effects of the explosion, but the gears to the elevation synchro of the third director were damaged causing jerky operation. In addition the director shield of the third director was damaged to the extent that it prevented operation of the director in train and elevation.

The U.S.S. ANDERSON (DD-411), U.S.S. PENSACOLA (CA-24), and the U.S.S. NEVADA (BB-36) were approximately 600 yards from the point of burst of the atomic bomb. The U.S.S. ANDERSON (DD-411) was sunk by the effects of the burst. The U.S.S. PENSACOLA's (CA-24) Gun Directors, Mk. 51, (Mods. 1 and 2) sustained no damage and four of the Gun Directors, Mark 51, Mod. 3, in the U.S.S. NEVADA (BB-36) also remained undamaged; but one Gun Director, Mark 51, Mod. 2, in the NEVADA suffered breakage of the train locking-pin (see photograph No. AACR 60-149-6) while another Gun Director, Mark 51, Mod. 2, was damaged and rendered inoperable by falling debris from the stack (see photograph AACR 60-149-7).

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS, MARK 51 and MODS. (Cont'd)

The U.S.S. INDEPENDENCE (CVL-22), located approximately 700 yards from the point of origin of the blast was equipped with four Gun Directors, Mark 51, (Mods. 1 and 2), of which three suffered no damage while the locking-pins of one Gun Director, Mark 51, Mod. 2, located on the port side forward, were sheared, the director and sponson tilted at an angle of about 45 degrees and the counterbalance weight hangers bent. (See photographs AACR 92-1781-3, 6 and 12).

The U.S.S. HUGHES (DD-410), located approximately 800 yards from the burst, was equipped with two Gun Directors, Mark 51, Mod. 2. The handle-bar of one of the directors was bent.

The U.S.S. LAMSON (DD-367) was sunk by the effects of the explosion, while the U.S.S. DAWSON (APA-79), which was at the same distance of about 900 yards from the burst, was equipped with two Gun Directors, Mark 51, Mod. 2, that were undamaged and one Gun Director, Mark 51, Mod. 3, that sustained a frozen elevation locking-pin and a broken-off counterbalance weight.

The U.S.S. SALT LAKE CITY (CA-25) was equipped with one Gun Director, Mark 51, Mod. 2, that remained undamaged while both Gun Directors, Mark 51, in the U.S.S. RHIND (DD-404) which was at the same distance of approximately 1000 yards from the burst were damaged. The forward Gun Director, Mark 51, Mod. 2, was the most heavily damaged. The right handle-bar was bent so that it prevented movement of the director in elevation, and the shield was jammed against the director. One counterbalance weight on the Gun Director, Mk. 51, Mod. 1, was found to be loose.

The U.S.S. RALPH TALBOT (DD-390) which was about 1200 yards distant from the point of origin of the blast was equipped with one Gun Director, Mark 51, Mod. 2, that was not damaged and one Gun Director, Mark 51, Mod. 1, that was damaged. The right trunnion of the elevating bracket of the damaged director was found to be out of its bearing. (See photograph AACR 234-1992-3) On the U.S.S. STACK (DD-406), which was also at a distance of 1200 yards from the blast, one Gun Director, Mark 51, Mod. 1, suffered a broken train locking-pin; but the other Gun Director, Mark 51, Mod. 2, in the U.S.S. STACK (DD-406) was undamaged.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS, MARK 51 and MODS. (Cont'd)

The U.S.S. BARROW (APA 61) which was at about 1200 yards distance from the burst was equipped with two Gun Directors, Mark 51, (Mods. 2 and 3) that were not damaged and one Gun Director, Mark 51, Mod. 2, that was damaged. The covers were blown off the damaged director and the electrical circuits were found to be faulty.

The U.S.S. FALLON (APA 81) and the U.S.S. BANNER (APA 60) were about 1400 yards distant from the point of explosion of the nuclear fission bomb. The U.S.S. FALLON (APA 81) suffered no damage to its Gun Directors, Mark 51, (Mods. 2 and 3) while the U.S.S. BANNER (APA 60) was equipped with two Gun Directors, Mark 51, Mod. 2, that were undamaged and one Gun Director, Mark 51, Mod. 3, that was damaged. Two holding-down screws on the elevation locking-pin slide carrier on the damaged director were sheared and the carrier was loose.

The U.S.S. WILSON (DD 408), located approximately 1600 yards from the burst, was equipped with one Gun Director, Mark 51, Mod. 2, that was not damaged and one Gun Director, Mark 51, Mod. 2, that suffered a broken train locking-pin.

The Gun Directors, Mark 51, and Mods. in the U.S.S. PENNSYLVANIA (BB 38), U.S.S. NEW YORK (BB 34), U.S.S. CARTERET (APA 70), U.S.S. BRACKEN (APA 64), U.S.S. WAINWRIGHT (DD 419), U.S.S. MUSTIN (DD 413), U.S.S. SARATOGA (CV 3), U.S.S. GASCONADE (APA 85), U.S.S. CATRON (APA 71), U.S.S. MUGFORD (DD 389), U.S.S. CONYNGHAM (DD 371), U.S.S. CORTLAND (APA 75), U.S.S. MAYRANT (DD 402), and U.S.S. NIAGARA (APA 87) were not damaged by the effects of the air explosion of the atomic bomb.

An examination of all available data reveals that the effects of the explosion did not damage Gun Directors, Mark 51, on ships that were over 1600 yards from the point of origin of the blast.

GUN FIRE CONTROL SYSTEM, MARK 57

The only two Gun Fire Control System's, Mark 57, exposed to the effects of the Atomic Bomb explosion in Test "A", were installed in the U.S.S. PENNSYLVANIA (BB 38) which was located at a distance of approximately 1800 yards from the

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN FIRE CONTROL SYSTEM, MARK 57 (Cont'd)

center of the blast. These two systems were mounted one on the port and one on the starboard side of the boat deck.

The port Gun Fire Control System, Mark 57, was found to be inoperative after Test "A". Practically all of the damage to this system was caused by secondary effects of the explosion. The Computer, Mark 16, Amplifier, Mark 1, and Power Unit, Mark 4, were damaged by heat produced by burning army equipment stowed on the deck outside the compartments. V230, a type 6SL7 vacuum tube functioning as a phase inverter, was found to have interelectrode shorts. This condition may be ascribed either to the effects of shock or to the effects of the excessive heat produced by burning army stores. With the exception of the cross-roll amplifier, the port system was repaired and placed in operation before Test "B". There was insufficient time available for determining the casualty in the cross-roll amplifier but after making a visual inspection it was concluded that the amplifier could easily have been repaired by the normal ship's force.

The starboard Gun Fire Control System, Mark 57, was only lightly damaged by the effects of the explosion. V101, a tube in the Power Supply Unit, Mark 4, was found to be loose in its base, causing intermittent lowering of the plate voltage. It could not be determined whether the tube was damaged by the effects of the explosion of the atomic bomb or whether it was defective prior to the test but overlooked during the initial inspections.

GUN FIRE CONTROL SYSTEM, MARK 63

The Gun Fire Control System, Mark 63, installed in the after starboard signal station in the U.S.S. PENSACOLA (CA-24) located at a distance of approximately 600 yards from the point of explosion of the nuclear fission bomb during Test "A", was rendered inoperable by the effects of the explosion. The system had been operating and was energized during Test "A". A major portion of the elevation tracking head was blown off the Gun Director, Mark 51, Mod. 6. The sight carriage was broken and the carriage, together with the Gun Sight, Mark 15, Mod. 12, the gear box, the Range Receiver, Mark 2, and

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN FIRE CONTROL SYSTEM, MARK 63 (Cont'd)

the elevation counterbalance weights, were suspended over the side of the director shield by the cables attached to the gun sight. The cables were partially pulled out of the gun sight, and the connections had parted at the terminal boards. The cast-aluminum case of the Range Receiver, Mark 2, was broken and the internal mechanism was distorted and broken (See photographs Nos. AACR 59-1566-1,2,3,4,6, and 7). The Gun Sight, Mark 15, Mod. 12, was sent to the New York Naval Shipyard for analysis. The gun sight was mounted on a test stand and tested for static balance and sensitivity. It was found that a loose train lever-arm on the gimbal shaft was causing a 30 mil bore-sighting error. The set-screw that had formerly secured the lever-arm had worked loose, but it is believed that the casualty was not a result of the effects of the explosion of the atomic bomb. It was also found that improper damping weights on the gyro studs were causing an excessive reticle vibration. The director platform was tilted at an angle of about five degrees from the deck-plane, and the cast-aluminum housing of the radar antenna elevation drive-motor was cracked while the train locking-pin and the train buffer-stops were bent.

The Gun Fire Control System, Mark 63, installed in the after port signal station in the U.S.S. PENSACOLA (CA-24) located at a distance of about 600 yards from the point of burst was not so heavily damaged as was the system on the starboard side, probably because of the sheltering effect of the ship's superstructure. The associated Gun Sight, Mark 15, Mod. 12, was found to have shifted alignment five mils to the left and 15 mils downward relative to the line-up of the director. The maximum error was exceeded in the characteristic time tests. Failure of this test by the Gun Sight, Mark 15, is a common occurrence and is not here considered significant inasmuch as it may have been caused by the sight's being left idle for a long period of time prior to testing. The train locking-pin and the buffer-stop on the Radar Antenna Mount, Mark 19, were bent.

The Gun Fire Control System, Mark 63, installed in the port forward position in the U.S.S. PENNSYLVANIA (BB-38), located at a distance of approximately 1800 yards from the point of burst, was lightly damaged by the effects of the explosion. The associated Gun Sight, Mark 15, Mod. 12, was energized after the test, and it was found that the train and elevation mirrors did not move when a tracking rate was applied to the sight.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN FIRE CONTROL SYSTEM, MARK 63 (Cont'd)

The Gun Fire Control System, Mark 63, located in the port after position in the U.S.S. PENNSYLVANIA (BB-38) at a distance of about 1800 yards from the point of origin of the explosion, was not seriously damaged by the effects of the explosion. It was found that the locking-pin on the Antenna Mount, Mark 19, was bent and the Gun Sight, Mark 15, Mod. 12, was damaged. The gun sight was shipped to the New York Naval Shipyard for further examination. It was found that the safety-glass of the objective window was blurred, probably because the plastic filler between the glass laminations had been damaged by the effects of the explosion. The focussing key was sheared and the first eyelens was chipped. The sight was then mounted on a test stand and given a static balance check and it was found that the sight checked 15 mils dead zero in train and failed to move the reticle in elevation. The dead zero error was found to be the result of dirty pivots and bearings in the train and elevation mirror linkages.

The elevation gyro was removed and it was found that the thermo-switch had failed causing the sight to become overheated. It was also found that the gyro bearings had seized, and the wiring was burned and charred, while the rubber hose was hard and inflexible. The range hub bearing was frozen and the slide rods and needle bearing were corroded. The rubber diaphragm of the caging unit had become hardened, rendering the unit inoperable. The damping fluid had leaked out of the rear damping assembly and the rotor and gimbal assembly were not in balance. The internal damage to the sight, however was probably not a result of the direct effects of the explosion of the atomic bomb.

The two Gun Fire Control Systems, Mark 63, installed on the starboard side of the U.S.S. PENNSYLVANIA (BB-38) approximately 1800 yards distant from the point of burst, were found to be relatively unaffected by the explosion except that the two associated Gun Sights, Mark 15, Mod. 12, were found to be inoperable. The gun sights were shipped to the New York Naval Shipyard for further examination, but one sight was either lost or long-delayed in transit. The other sight was mounted on a test stand and subjected to static balance and sensitivity checks. It was found that the unbalanced elevation gyro and mirrors caused the sight to produce static balance readings in excess of tolerance. The balance-nuts on the mirrors and the elevation gyro had been improperly installed singly instead of properly locked in pairs. It is believed that the vibration resulting from operation of the sight caused the nuts to

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

GUN FIRE CONTROL SYSTEM, MARK 63 (Cont'd)

move out of position. Because the elevation characteristic time did not settle to a satisfactory interval, it was assumed that the thermo-switch had become inoperative. The sensitivity check revealed that the operation of the elevation gyro was faulty and the gyro was removed from the sight, tested, and was found to produce an 18 mil range shift. It was found that the range unit had shifted, causing the range shift.

The other gun sight, which was installed on the forward starboard Gun Fire Control System, Mark 63, had been tested in the Bikini area. It was found that the sight did not develop a lead angle in elevation and that the reticle tended not to return to the dead zero position after a train lead had been developed. After the sight had been operating continuously for a period of about two hours, it was observed that a sharp, shrill sound was emitted from the sight, and operation ceased. It is believed that the thermo-switch failed to operate allowing the internal temperature of the sight to rise to an excessive value thus causing the gyro bearings to seize.

TORPEDO DIRECTORS, MARK 27

Torpedo directors were installed in the following named vessels at the approximate distances from the point of burst of the atomic bomb as listed below:

1.	U.S.S. ANDERSON	(DD-411)	600 yards
2.	U.S.S. HUGHES	(DD-410)	800 yards
3.	U.S.S. LAMSON	(DD-367)	900 yards
4.	U.S.S. RHIND	(DD-404)	1000 yards
5.	U.S.S. RALPH TALBOT	(DD-390)	1200 yards
6.	U.S.S. STACK	(DD-406)	1200 yards
7.	U.S.S. WILSON	(DD-409)	1600 yards
8.	U.S.S. WAINWRIGHT	(DD-419)	2200 yards
9.	U.S.S. MUSTIN	(DD-413)	2400 yards
10.	U.S.S. MAYFORD	(DD-389)	2900 yards
11.	U.S.S. CONYNGHAM	(DD-371)	3100 yards
12.	U.S.S. MAYRANT	(DD-402)	3600 yards

TEST "A" (Cont'd)

FIRE CONTROL

TORPEDO DIRECTORS, MARK 27 (Cont'd)

An examination of the data reveals that very little damage to the torpedo directors resulted from the effects of the Test "A" explosion.

The Torpedo Director, Mark 27, Mod. 1, Serial No. 1986, located on the U.S.S. RHIND (DD-404) at a distance of approximately 1000 yards from the burst, sustained a broken glass over the ship-and-target-dial group.

On the Torpedo Director, Mark 27, Mod. 1, Serial No. 1886, installed in the U.S.S. CONYNGHAM (DD-371) approximately 3100 yards distant from the point of origin of the explosion, the glass over the ship-and-target-dial group was broken.

TORPEDO COURSE INDICATOR

Torpedo Course Indicators were installed in the following named ships at the approximate distances from the point of the air-burst of the atomic bomb as listed below:

1.	U.S.S. ANDERSON (DD-411)	600 yards
2.	U.S.S. HUGHES (DD-410)	800 yards
3.	U.S.S. LANSON (DD-367)	900 yards
4.	U.S.S. RHIND (DD-404)	1000 yards
5.	U.S.S. RALPH TALBOT (DD-390)	1200 yards
6.	U.S.S. STACK (DD-406)	1200 yards
7.	U.S.S. WILSON (DD-409)	1600 yards
8.	U.S.S. WAINWRIGHT (DD-419)	2200 yards
9.	U.S.S. MUSTIN (DD-413)	2400 yards
10.	U.S.S. MUGFORD (DD-389)	2900 yards
11.	U.S.S. CONYNGHAM (DD-371)	3100 yards
12.	U.S.S. MAYRANT (DD-402)	3600 yards

After Test "A" the Torpedo Course Indicator, Mk. 1, Mod. 2, Serial No. 178, located in the U.S.S. STACK (DD-406), approximately 1200 yards distant from the point of burst, was energized, and it was found that the rotor revolved clockwise at a high angular velocity.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

FUZE SETTERS

The only Fuze Setters found to be damaged in Test "A" were one Fuze Setter, Mk. 2, Mod. 1, located in the U.S.S. ARKANSAS (BB 33) at a distance of about 400 yards from the point of burst of the atomic bomb, was found to have been rendered inoperable by the effects of secondary fires which damaged the electrical wiring; and on one Fuze Setter, Mk. 8, Mod. 1, located in the U.S.S. MAYRANT (DD-402) at a distance of approximately 3600 yards from the point of explosion, the window was found to be broken.

MISCELLANEOUS

On the U.S.S. ARKANSAS (BB 33), approximately 400 yards distant from the point of the air-burst of the nuclear fission bomb, the following miscellaneous items of fire control equipment were found to be damaged as is described below.

(a) On Target Bearing Transmitter, Mk. 10, Mod. 5, Serial No. 35, the telescope mounting was broken and the stand could not be operated in train.

(b) On Target Designation Transmitter, Mk. 9, Mod. 0, Serial No. 63, the electrical supply leads had parted and the transmitter was inoperable.

(c) Target Designation Transmitter, Mk. 9, Mod. 0, Serial No. 85, installed in air defense aft, parted the rotor electrical supply leads when its brackets were broken.

(d) The Target Designation Transmitter, Mk. 9, Mod. 0, Serial No. 95, installed in the air defense forward, was rendered inoperative when the electrical supply leads parted.

(e) On Gun Train Indicator, Mk. 23, Mod. 8, Serial No. 384, located on No. 1 three-inch mount, the dials were so deeply scorched that the dial markings were illegible.

(f) The Train Receiver, Mk. 1, Mod. 1, Serial 197, located on the port 5"/51 mount, was demolished by the gun shutter, which was blown-in by the effects of the explosion.

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

MISCELLANEOUS (Cont'd)

(g) The Train Receiver Regulator, Mk. 1, Mod. 1, Serial No. 6, located on the starboard 5"/51 gun mount was demolished by the gun shutter, which was blown-in by the effects of the explosion.

On the U.S.S. NEVADA (BB-36), which was located at a distance of approximately 600 yards from the point of explosion of the atomic bomb in Test "A", the following miscellaneous items of fire control equipment were found to be damaged as described below.

(a) The Train Indicator Regulator, Mk. 46, Mod. 31, Serial No. 19, was damaged by the high velocity stream of oil from the gears which impinged on the surface of windows, causing the glass to shutter. The Indicator functioned when the mount was operated in manual, but failed to operate correctly when signals were received from the computer.

On the U.S.S. PENSACOLA (CA-24) approximately 600 yards distant from the point of burst, the following miscellaneous items of fire control equipment were found to be damaged as described below.

(a) A Train Indicator, Mk. 14, Mod. 1, Serial No. 122, was torn from the starboard searchlight when the searchlight was blasted from its platform.

(b) On the Elevation Indicator, Mk. 7, Mod. 1, Serial No. 287, mounted on the port searchlight, the windows were broken and the dial covers were damaged when the searchlight was blasted from its platform and fell to the deck.

SUBMARINE FIRE CONTROL

The target submarines were located at the following approximate distances from the point of burst of the atomic bomb in Test "A":

U.S.S. SKATE (SS-305)	400 yards
U.S.S. APOGON (SS-308)	1000 yards
U.S.S. DENTUDA (SS-335)	2100 yards
U.S.S. PARCHE (SS-384)	1200 yards
U.S.S. PILOTFISH (SS-386)	2400 yards

TEST "A" (Cont'd)

FIRE CONTROL (Cont'd)

SUBMARINE FIRE CONTROL (Cont'd)

In Test "A" only one submarine, the U.S.S. SKATE (SS-305), sustained any damage to fire control equipment from the effects of the burst. The Target Bearing Transmitter, Mark 8, located on the cigarette deck was blown over the side.

On the Target Bearing Transmitter, Mark 9, located on the bridge, the glass window of the repeater was tinted an amber color. The azimuth securing pin was bent, the cables were broken, the locking mechanism of the binoculars was missing and the bridge upon which the transmitter was mounted was wrecked, but there was no internal damage to the instrument. (See photographs AACR 79-1978-4 and 5)

~~S-E-C-R-E-T~~

TEST "A"

FIRE CONTROL RADAR

The Fire Control Radar Equipment, Mark 3, Mod. 1, Serial #49, located in Spot 1 of the U.S.S. ARKANSAS (BB 33) at a distance of approximately 400 yards from the point of explosion of the atomic bomb, suffered severe damage from the effects of the explosion. The cast light-metal alloy mounting brackets which supported the Antenna Assembly, CW66AAB, on the pedestal were broken and the Antenna Assembly was blown off the pedestal and over the side. The Train Indicator unit, CW55AAC, and the Control and Indicator Unit, CW55AAB, were dislodged from their mountings by the deformation of the mast structure. Three of the shock-mounts on the side of the Train Indicator Unit were broken and all of the shock mounts were scorched. A J-clamp on an oil-filled condenser in the Control and Indicator Unit, CW55AAB, was broken. The equipment required Navy Yard repair. (See Photographs AACR-175-2036-6 & 60-150-2).

The Fire Control Radar Equipment, Mark 10, Mod. 5, Serial #69, located on the after Gun Director, Mark 50, in the U.S.S. ARKANSAS (BB 33) at a distance of approximately 400 yards from the point of origin of the blast was severely damaged by the effects of the explosion of the atomic bomb. The cast light-metal alloy structure supporting the cross-level yoke of the CW43ABH Transmitter-Antenna Assembly failed, and the assembly fell to the after main deck. The parabolic reflector and the conical scan feed were broken and bent. Some of the vacuum tubes were broken, and the CW55 ABN Modulator Unit was loosened from its mountings. (See Photographs AACR-60-150-3 and AACR-175-2036-8 and 9).

The Fire Control Radar Equipment, Mark 10, Mod. 5, Serial #205, located on the forward Gun Director, Mark 50, in the U.S.S. ARKANSAS (BB 33) at a distance of approximately 400 yards from the point of origin of the blast, was greatly damaged by the effects of the atomic bomb explosion. The Antenna Reflector was twisted and bulged, and the conical scan feed was broken. The cast light-metal alloy structure supporting the cross-level yoke of the CW43ABH Transmitter Antenna Assembly failed and the assembly fell forward, but was retained on the director by cables and the elevation drive-shaft. (See Photographs AACR-175-2036-1, 2, and 3).

The Fire Control Radar Equipment, Mark 3, Mod. 2, Serial #72, located in Spot 2 in the U.S.S. NEVADA (BB-36) at a distance of approximately 600 yards from the point of origin of the blast was heavily damaged by the effects of the explosion of the nuclear fission (atomic) bomb. The intermediate frequency transmission line was disconnected from the CW55AAB Control and Indicator Unit. The CW66AAB Antenna Assembly was missing except for a small portion of the base and reflector and the coaxial transmission line was dented by a falling object. (See Photographs AACR-234-1992-8 and 9).

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

The Fire Control Radar Equipment, Mark 12, Mod. 0, Serial #115, located on the forward Gun Director, Mark 37, in the U.S.S. NEVADA (BB-36) at a distance of approximately 600 yards from the point of the explosion of the atomic bomb was heavily damaged by the effects of the explosion. The left-hand level-trunnion support-beam of the CW66AFT Antenna Assembly failed in tension and the left side of the upper parabola was smashed. The dipoles and the coaxial transmission line interconnections appeared to be undamaged but the top of the antenna was crushed by the falling mast structure of the ship. The cross-level main support beam was distorted. The pressure of the blast on the antenna structure apparently forced the cross-level trunnion partially out of the after bearing and bent the bearing support forward. (See Photographs AACR 60-149-11 and AACR 234-1992-11).

The Fire Control Radar Equipment, Mark 12, Mod. 0, Serial #232, located on the after Gun Director, Mark 37, in the U.S.S. NEVADA (BB-36) at a distance of about 600 yards from the point of the explosion of the atomic bomb was severely damaged by the effects of the explosion. The CW66AFT Antenna Assembly was torn from its mount. All the interconnecting coaxial transmission lines were twisted and broken beyond repair. The plastic dipole covers were burned severely and many were broken. The frame of the antenna assembly was twisted. The entire antenna reflector was missing. (See Photographs AACR 60-149-5; AACR 60-150-6; AACR 234-1992-4 and 5).

The Fire Control Radar Equipment, Mark 22, Mod. 0, Serial #227, located on the forward Gun Director, Mark 37, in the U.S.S. NEVADA (BB-36) at a distance of about 600 yards from the point of explosion of the atomic bomb was only slightly damaged by the effects of the explosion. The cables to the CW66AGT Antenna and the CW22ACM Antenna Drive parted when the associated CW66AFT Antenna Assembly of the Mark 12 Radar was displaced. (See Photographs AACR 60-149-11 and AACR 234-1992-11).

The Fire Control Radar Equipment, Mark 22, Mod. 0, Serial #228, located on the Gun Director, Mark 37, in the U.S.S. NEVADA (BB-36) at a distance of about 600 yards from the point of origin of the blast of the atomic bomb was only slightly damaged by the effects of the bomb's explosion, but the CW66AGT Antenna and the CW22ACM Antenna Assembly were damaged when the Antenna Assembly of the associated Mark 12 Radar was torn from its mount. The cast reflector was broken in half, the drive-arm was broken, but the wave guide horn and cover were undamaged. It is believed that the reflector was broken when it struck the deck in falling rather than by the direct effects of the air blast of the atomic bomb. (See Photograph AACR 234-1992-6).

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #632, located in Spot 1 in the U.S.S. NEVADA (BB 36) at a distance of about 600 yards from the point of origin of the blast of the atomic bomb, was severely damaged by the effects of the explosion. The left side of the reflector of the CW43ACK Transmitter-Antenna Unit was ripped from the supporting spider and folded into the coaxial scan feed. The plastic protective cover for the antenna feed was cracked in two places. It is estimated that nine man-hours of work by the ship's force would be required to repair the damage. A type 6AC7 vacuum tube was damaged. (See Photographs AACR 234-1992-12).

The Fire Control Radar Equipment, Mark 28, Mod. 2, Serial #356, located on the port Gun Fire Control System, Mark 63, in the U.S.S. PENSACOLA (CA 24) at a distance of approximately 600 yards from the point of the explosion of the atomic bomb, was heavily damaged by the effects of the explosion. The reflector of the CW66AJQ Antenna Assembly was badly torn and wrapped around the conical scan feed, causing damage to the feed. Exposed cables were scorched and melted. (See Photographs AACR 59-1566-2 and 8; AACR 60-147-9).

The Fire Control Radar Equipment, Mark 28, Mod. 2, Serial #357, located on the starboard Gun Fire Control System, Mark 63, in the U.S.S. PENSACOLA (CA 24), at a distance of approximately 600 yards from the point of the burst of the nuclear fission bomb, was severely damaged by the effects of the bomb's explosion. The reflector of the CW66AJQ Antenna Assembly was completely torn from its supporting spider and was missing. The conical scan feed was mechanically damaged, probably by the antenna reflector as it was blasted from the mount. The CW43AFV Transmitter Receiver Unit was damaged internally, and the interconnecting cables were heavily scorched. (See Photographs AACR 59-1566-3, 5, and 6; AACR 98-1966-12).

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #559, located on the after Gun Director, Mark 33, U.S.S. PENSACOLA (CA 24) at a distance of approximately 600 yards from the point of burst of the atomic bomb, was rendered inoperative by the effects of the burst. The reflector of the CW43ACK Transmitter-Antenna Assembly was bulged slightly backwards, a fuse, F101, was blown, and two type 330 vacuum tubes were broken at their bases. This radar was operating and the antenna was equipped with a dummy load. The small degree of damage to this reflector was unique inasmuch as the antenna was pointed toward the blast and was closer to the point of origin of the atomic detonation than the other antennae in the forward part of the ship which suffered much greater reflector damage. (See Photographs AACR 59-1566-1 and 12).

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #569, located on the forward Gun Director, Mark 35, of the U.S.S. PENSACOLA (CA-24) at a distance of about 600 yards from the point of explosion of the atomic bomb, was seriously damaged by the effects of the bomb's explosion. The reflector of the CW43ACK Transmitter and Antenna Assembly was bent forward on all sides. One arm of the reflector supporting-spider was broken at a bolt-hole. All external cables were scorched. Operating tests showed that the magnetron would not function, the T/R tube would not fire, and there was evidence of internal arcing in the Type 393A rectifier tubes, V1401, and V1402. (See Photographs AACR 59-1566-5).

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #571, located on the after Gun Director, Mark 35, in the U.S.S. PENSACOLA (CA-24) at a distance of about 600 yards from the point of detonation of the nuclear fission bomb, was severely damaged by the effects of the burst. The reflector of the CW43ACK Transmitter and Antenna Assembly was smashed back against the transmitter case. The plastic protective cover of the conical scan feed was fogged by the heat, and the paint was removed. Cables leading to the CW43ACK Transmitter and Antenna Assembly were scorched. Two vacuum tubes, V317, a type 3B24 vacuum tube, and V309, a type 6AF7 vacuum tube, were found to be defective. (See Photographs AACR 59-1566-11 and AACR 60-147-10).

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial 575, located on the forward Gun Director, Mark 33, in the U.S.S. PENSACOLA (CA-24) at a distance of approximately 600 yards from the point of the explosion of the atomic bomb, was heavily damaged by the effects of the explosion. The reflector of the CW43ACK Transmitter and Antenna Assembly was smashed by the blast from the starboard side and struck the conical scan feed which was in turn bent and damaged. The plastic protective cover of the conical scan feed was scorched and wrinkled by the heat effects. In the CW43ACK Transmitter Unit, the magnetron tube was broken, the T/R tube would not fire, and a capacitor, C3, in the modulation network was shorted internally. (See Photograph AACR 59-1566-4).

The Fire Control Radar Equipment, Mark 4, Mod. 0, Serial #1231, located on the Gun Director, Mark 37, in the U.S.S. HUGHES (DD-410) at a distance of approximately 800 yards from the point of burst, was severely damaged by the effects of the burst. The support for the forward bearing of the cross-level trunnion in the mount for the CW66AAF Antenna bent forward, releasing the CW 66AAF Antenna which was forced forward several feet and down onto the director, bending the lower reflector surface and breaking one dipole cover. Plates supporting the antenna "A" frame were bent slightly. The coaxial coupling in the forward cross-level bearing was sheared. Several vacuum tubes were jarred out of their sockets in the CW55AAB Control and Indicator Unit in the director.

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

(See Photographs AACR 71-2044-6 and 7).

The Fire Control Radar Equipment, Mark 25, Mod. 0, Serial #518, located on the Gun Director, Mark 37, on the U.S.S. HUGHES (DD-410), at a distance of about 800 yards from the point of the explosion of the atomic bomb, was only lightly damaged by the effects of the explosion. The crank-arm of the CW43ACJ Antenna Unit was broken. All of the external cables were scorched, but there were no breaks in continuity. The CW50ADS Modulator Unit was jarred loose from its mounting. (See Photographs AACR 71-2044-6 and 7).

The Fire Control Radar Equipment, Mark 3, Mod. 0, Serial #14, located on the forward Gun Director, Mark 22, of the U.S.S. SALT LAKE CITY (CA-25), at a distance of approximately 1000 yards from the point of origin of the blast of the atomic bomb, was seriously damaged by the effects of explosion. The entire CW66AAE Antenna Assembly was carried away, but the holding bolts were intact and several pieces of the antenna framework were left attached to the base. There was no evidence of weakening by corrosion. The chassis of the CW55AAB Control and Indicator Unit was bent. In the CW52AAF Transmitter Unit, VI, a type 701A vacuum tube, had a cracked glass envelope, and the glass envelope of V7, a type 2X2 vacuum tube, was broken. Components of the CALD-50AEC duplexing panel were damaged. (See Photographs AACR 60-136-10 and 11).

The Fire Control Radar Equipment, Mark 3, Mod. 0, Serial #105, located on the after Gun Director, Mark 22, of the U.S.S. SALT LAKE CITY (CA-25) at a distance of approximately 1000 yards from the poin of burst of the nuclear fission bomb, was heavily damaged by the effects of the burst. The entire CW66AAE Antenna Assembly was torn from its pedestal and was missing, leaving only a few pieces of the bottom framework. Other units of the equipment were undamaged. (See Photographs AACR 60-136-5).

The Fire Control Radar Equipment, Mark 4, Mod. 0, Serial #206, located on the forward Gun Director, Mark 33, of the U.S.S. SALT LAKE CITY (CA-25) at a distance of approximately 1000 yards from the point of the "A" Test explosion, was severely damaged by the effects of the air explosion of the atomic bomb. The supports for the reflector of the CW66AAH Antenna were bent back towards the director and broken at their base and in several places along their length. All but one of the glass dipole covers were broken in the lower half of the antenna, and all the plastic centering washers on the ends of the dipoles were melted. There were several breaks in the interconnecting coaxial transmission lines at the back of the antenna, and the reflector surfaces were badly bulged. V3, a type 705A vacuum tube, in the CW52AAF Transmitter Unit had an open filament. (See Photographs AACR 60-136-8 and 9; AACR 63-1719-11).

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

The Fire Control Radar Equipment, Mark 28, Mod. 0, Serial #3, located on the after Gun Director, Mark 33, of the U.S.S SALT LAKE CITY (CA-25) at a distance of about 1000 yards from the point of the air-burst, was heavily damaged by the effects of the burst. The conical scan feed and the entire perforated metal reflector were torn from the CW43ACK Transmitter-Antenna Assembly. The reflector was folded and bent and was torn from the holding screws, leaving about one-inch diameter holes in the reflector where it had been fastened to its supporting spider. The conical scan antenna feed was torn from the transmitter at the base of the feed and the reflector supporting spider was broken into several pieces. The reflector surfaces were burned and rusty. The bolts holding the back cover of the CW43ACK Transmitter Antenna Assembly were drawn and reduced in diameter near the heads as though they had been subjected to excessive strain. It would have been possible for the ship's force to repair the damage, but with difficulty, from replacement spares. (See Photographs AACR 60-136-4 and 5).

The Fire Control Radar Equipment, Mark 28, Mod. 0, Serial #85, located on the Gun Director, Mark 33, in the U.S.S. RHIND (DD-404) at a distance of approximately 1100 yards from the center of the explosion of the atomic bomb, was severely damaged by the effects of the explosion. The reflector of the CW43ACK Transmitter Antenna Assembly was torn and bent. The end-cap of the plastic protective cover for the conical scan feed was blown from the cover and the dipole spinner was found lying on the deck. The protective cover was struck by the reflector. (See Photographs AACR 60-1556-11 and AACR 60-136-1).

The Fire Control Radar Equipment, Mark 4, Mod. 0, Serial #115, located on The Gun Director, Mark 33, in the U.S.S. RALPH TALBOT (DD-390) at a distance of about 1200 yards from the origin of the Test "A" blast, was only lightly damaged by the effects of the blast. The paint on the CW66AAH Antenna Assembly was scorched. The needle on the CW22AAD Train Meter was bent so that it could not move freely and the sensitivity of the CW46AAC Receiver Unit was considerably below normal. It is estimated that the damage could be repaired by the ship's force in a short time.

The Fire Control Radar Equipment, Mark 4, Mod. 0, Serial #296, located on the Gun Director, Mark 33, in the U.S.S. STACK (DD-406) at a distance of about 1300 yards from the point of explosion in Test "A", was slightly damaged by the effects of the air explosion of the atomic bomb. The paint on the surfaces of the CW66AAH Antenna Assembly was scorched. Three pyrex dipole-covers were broken and the dipoles contained were bent or broken. Many of the plastic washers which positioned the ends of the dipoles in the centers of the pyrex covers

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

were melted so that the dipoles were free to vibrate within the pyrex tubes. The CW46AAC Receiver Unit was detuned and the sensitivity was found to be considerably below normal. The operation of the CW55AAC Train and Elevation Indicators was very broad and insensitive. The range-crank of the CW23AAE Range Unit was binding and the range zero-set reading was shifted. Repair of damage is estimated to require approximately one and one-half man-days of work by the ship's force. (See Photographs AACR 234-1984-4).

The Fire Control Radar Equipment, Mark 8, Mod. 5, Serial #125, located on the Gun Director, Mark 34, of the U.S.S. PENNSYLVANIA (BB 38) at a distance of about 1800 yards from the point of origin of the blast, was found to be operating at reduced efficiency after the "A" Test. It was found that the conversion efficiency of the type 1N23 crystal in the CW43ACU Transmitter Receiver Unit was considerably reduced. It is believed that the injury to the crystal assembly was caused by the shock effects of the explosion of the nuclear fission bomb. The equipment was repaired and placed in good operating condition in a few minutes time.

The Fire Control Radar Equipment, Mark 10, Mod. 5, Serial #87, located on the port Gun Fire Control System, Mark 57, in the U.S.S. PENNSYLVANIA (BB 38) at a distance of approximately 1800 yards from the point of explosion of the nuclear fission bomb, was only slightly damaged by the effects of the explosion. The plexiglas protective cover for the conical scan feed of the CW43ABH Transmitter Antenna Assembly was scorched and the cap was loosened, but the equipment was operative at full efficiency.

The Fire Control Radar Equipment, Mark 22, Mod. 0, Serial #445, located on the Forward Gun Director, Mark 37, in the U.S.S. PENNSYLVANIA (BB 38) at a distance of approximately 1800 yards from the point of burst of the atomic bomb, was found to be operating at reduced efficiency after the burst. It was found that the conversion efficiency of the type 1N23 crystal in the CW43ACJ Transmitter Receiver Unit was greatly reduced. It is believed that the damage to the crystal assembly was caused by the shock effects of the explosion of the nuclear fission bomb. The equipment was repaired and placed in good operating condition in a few minutes time.

The Fire Control Radar Equipment, Mark 28, Mod. 2, Serial #262, located in Sky 7, in the U.S.S. PENNSYLVANIA (BB 38) at a distance of approximately 1800 yards from the point of origin of the Test "A" explosion was found to be damaged by the effects of the explosion and was inoperable. The cap of the

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

plexiglas antenna cover on the CW66AJQ Antenna Assembly was found separated from the cover and lying on the deck. The surface of the cover was scratched and scorched and the threads of the cover fitted very loosely. (See Photograph AACR 60-1555-10).

The Fire Control Radar Equipment, Mark 28, Mod. 2, Serial #264, located on the after Gun Director, Mark 37, in the U.S.S. PENNSYLVANIA (BB-38) at a distance of approximately 1800 yards from the point of the explosion of the atomic bomb, was negligibly damaged by the effects of the explosion. The holding screws on the elevation lock of the CW66AJQ Antenna Assembly were broken, but the operation of the equipment was not impaired.

The Fire Control Radar Equipment, Mark 3, Mod. 1, Serial #29, located on the forward Gun Director, Mark 20, in the U.S.S. NEW YORK (BB-34) at a distance of about 1900 yards from the point of burst of the atomic bomb was lightly damaged by the effects of the burst. A black horizontal line ruled on the surface of the plastic screen over the face of the cathode-ray tube in the CW55AAB Control and Indicator Unit was burned into the surface of the plastic. The glass was broken in the CW22AAD Train Meter. (See Photograph AACR 79-1810-8).

The Fire Control Radar Equipment, Mark 3, Mod. 1, Serial #32, located on the after Gun Director, Mark 20, in the U.S.S. NEW YORK (BB-34) at a distance of about 1900 yards from the point of burst of the atomic bomb, was heavily damaged by the effects of the burst. The cast light-metal supporting brackets for the CW66AAE Antenna Unit failed, and the antenna fell to the main deck. The antenna itself was not seriously damaged by the effects of the explosion of the bomb. (See Photographs AACR 79-1811-5, AACR 71-2014-1 and 2).

The Fire Control Radar Equipment, Mark 4, Mod. 0, Serial #152, located on the forward Gun Director, Mark 37, in the U.S.S. SARATOGA (CV-3) at a distance of approximately 2800 yards from the point of the air burst of the atomic bomb, was slightly damaged but still operative after being subjected to the effects of the burst. The glass in the CW22AAD Train Meter was shattered. The shock mount frame for the CW55AAB Control and Indicator Unit was jarred loose from its mounting, and the ventilation air-hose to the blower was disconnected.

The Fire Control Radar Equipment, Mark 4, Mod. 0, Serial #153, located on the after Gun Director, Mark 37, in the U.S.S. SARATOGA (CV-3) at a distance of approximately 2800 yards from the point of origin of the blast of the nuclear

TEST "A" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

fission bomb, was slightly damaged but still fully operative after being exposed to the effects of the explosion. The exposed cables on the starboard side of the antenna mount were blistered. The glass in the CW22AAD Train Meter was broken. The mounting bracket of the CW55AAB Control and Indicator Unit was loosened from its mounting.

The Fire Control Radar Equipment, Mark 28, Mod. 0, Serial #79, located on the Gun Director, Mark 33, in the U.S.S. MUGFORD (DD 389) at a distance of approximately 2900 yards from the point of explosion of the atomic bomb was rendered inoperative by the effects of the explosion, but was not severely damaged. The glass envelope of V(7)2, a type 836 vacuum tube, in the CW20280 High Voltage Rectifier was cracked. The elevation alignment of the CW43ACK Transmitter Antenna Assembly was changed by plus three degrees.

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #501, located on the Gun Director, Mark 33, in the U.S.S. MAYRANT (DD 402) at a distance of approximately 3600 yards from the point of the Test "A" atomic bomb explosion was found to have its radar-line-of-sight shifted 1 degree, 11 minutes to the left of the optical-line-of-sight after the test. The efficiency of operation of the equipment was not seriously reduced and no repair other than antenna alignment was found to be necessary.

TEST "B"

OPTICAL

GUNSIGHTS, Mark 14

The U.S.S. ARKANSAS (BB-33) was approximately 300 yards distant from the center of the explosion and was sunk.

The U.S.S. FALLON (APA-81) was located at a distance of about 500 yards from the center of the explosion. On the Gun Sight, Mark 14, Mod. 6, located on the port after 20MM machine gun, the rear window was broken and there was moisture on the optical surfaces.

The U.S.S. SARATOGA (CV-3) was located at a distance of approximately 500 yards from the center of the explosion and was sunk.

The U.S.S. PENSACOLA (CA-24) was located at a distance of about 700 yards from the center of the explosion. On the Gun Sight, Mark 14, Mod. 6, located on the after port 20MM machine gun, the ray filter mechanism was jammed in the "IN" position. The Gun Sight, Mark 14, Mod. 6, located on the starboard searchlight platform was removed prior to Test "B".

The U.S.S. HUGHES (DD-410) was located at a distance of approximately 700 yards from the center of the underwater explosion. The Gun Sight, Mark 14, Mod. 8, located on the after Gun Director, Mark 51, was blown from the director. (Photographs ABCR 66-151-4; ABCR 66-151-5). The case was broken from the securing rod bearing and the ray filter mechanism was frozen in the "IN" position. On Gun Sight, Mark 14, Mod. 8, located on the after port Gun Director, Mark 51, the ray filter mechanism was jammed. The ray filter mechanism was also jammed or Gun Sight, Mark 14, Mod. 6, located on the after 20MM gun, and on Gun Sight, Mark 14, Mod. 6, located on the forward 20MM gun. There was moisture on the elevation mirror of the Gun Sight, Mark 14, Mod. 6, located on the port forward 20MM machine gun and portions of silver reflecting surface were found to have peeled from the mirror. All the jammed ray filter mechanisms were found to be in the "IN" position.

The U.S.S. MAYRANT (DD-402) was located at a distance of approximately 800 yards from the center of the explosion. Moisture was found on the interior mechanism of the Gun Sight, Mark 14, Mod. 8, located on the after Gun Director, Mark 51.

The U.S.S. GASCONADE (APA-85) was located at a distan e of approximately 800 yards from the center of the explosion. The Gun Sight, Mark 14, Mod. 8, was found to be undamaged.

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TEST "B" (continued)

OPTICAL (continued)

GUNSIGHTS, Mark 14 (continued)

The U.S.S. BRULE (APA 66) was located at a distance of about 800 yards from the center of the burst. Although there was no power available for energizing the Gun Sights, Mark 14, a thorough visual inspection was made, and the sights were found to be undamaged.

The U.S.S. NEVADA (BB 36) was located at a distance of approximately 1000 yards from the center of the explosion. The only two gun sights, Mark 14, Mod. 6, which had remained operable after the Test "A" explosion were found to have sustained no damage from the effects of Test "B".

The U.S.S. TRIPPE (DD 403) was located at a distance of approximately 1100 yards from the center of the burst. The Gun Sight, Mark 14, Mod. 6, located on the 20MM machine gun amidships, starboard side, was rendered inoperative by moisture which condensed on the optical surfaces.

The U.S.S. BRISCOE (APA 65) was located at a distance of about 1200 yards from the center of the explosion. Power was available and visual and operational checks were performed on the Gun Sights, Mark 14, which were installed aboard. On Gun Sights, Mark 14, Mod. 6, on the signal bridge #2 and #4 mounts, the ray filter mechanisms were frozen in the "IN" position. The other two Gun Sights, Mark 14, Mod. 6, installed in the U.S.S. BRISCOE (APA 65) were found to be undamaged, but it was not possible to perform checks on one of these sights because it had been blown loose from its cradle.

The U.S.S. NEW YORK (BB 34) was located at a distance of approximately 1200 yards from the center of the burst. As power was made available, visual and operational checks were made on the Gun Sights, Mark 14, installed aboard. The ray filter mechanism was jammed in the "IN" position on the Gun Sight, Mark 14, Mod. 6, located on #1 20MM machine gun. The Gun Sight, Mark 14, Mod. 8, located on #9 Gun Director, Mark 51, was found to contain a considerable amount of moisture in the interior on the optical system. The range shift was 10 mils above tolerance, probably because of a shift in the range unit. The Gun Sight, Mark 14, Mod. 8, located on #2 Gun Director, Mark 51, was rendered inoperable by moisture that condensed on the optical system. In Gun Sight, Mark 14, Mod. 6, located on #3 20MM mount, the movement of the reticle in elevation was erratic, the dead zero was excessive (40 mils) and the sight would not generate super-elevation.

The U.S.S. SALT LAKE CITY (CA 25) was located at a distance of about 1200 yards from the center of the explosion. The aluminum protective cover for the

TEST "B" (continued)

OPTICAL (continued)

GUNSIGHTS, Mark 14 (continued)

electrical connector plug on Gun Sight, Mark 14, Mod. 2, located on #2 20MM machine gun was badly corroded. On Gun Sight, Mark 14, Mod. 2, located on #8 20MM machine gun, the elevation thermo-switch was not operating properly, the ray filter was cracked, and the sight bracket was broken. All other sights were given an operational check and were found to be in operating condition.

The U.S.S. DAWSON (APA 79) was located at a distance of approximately 1300 yards from the center of the explosion. As no power was available only a visual inspection was made. Moisture was found on the interior optical surfaces of the Gun Sight, Mark 14, Mod. 6, located on the 20MM machine gun forward.

The Gun Sights, Mark 14, installed in the U.S.S. MUSTIN (DD 413), located at a distance of about 1300 yards from the center of the burst, were given a thorough visual inspection but were not energized because power was not available. The sights were found to be undamaged by the effects of the explosion.

Operational checks were made on all Gun Sights, Mark 14, installed in the U.S.S. PENNSYLVANIA (BB 38) which was located at a distance of approximately 1400 yards from the center of the explosion. The sights were found to be operable at normal efficiency. However, Gun Sight, Mark 14, Mod. 8, located on Gun Director, Mark 51, was not calibrated because the calibrating fixture could not be mounted due to the frozen support rod bushing.

As power was not available, only visual inspections were made on Gun Sights, Mark 14, installed in the U.S.S. WILSON (DD 408), which was located at a distance of about 1400 yards from the center of the burst. It was found that although the sight mechanisms were undamaged, moisture had condensed on the optical surfaces.

As no power was available, only visual inspections were made on the Gun Sights, Mark 14, installed in the U.S.S. CRITTENDEN (APA 77), which was located at a distance of about 1500 yards from the burst. On the Gun Sight, Mark 14, Mod. 6, located on the 20MM machine gun (starboard amidships) the ray filter lever was found to be broken off its shaft, but the ray filter mechanism was still operative. All other Gun Sights, Mark 14, were found to have sustained no additional damage from the effects of Test "B".

No power was available in the U.S.S. BRACKEN (APA 64) which was located at a distance of approximately 1800 yards from the burst, but a thorough visual inspection revealed that moisture had collected in the interior of the case and on the optical surfaces of all the Gun Sights, Mark 14.

TEST "B" (continued)

OPTICAL (continued)

GUNSIGHTS, Mark 14 (continued)

As there was no power available, only visual inspections were made on Gun Sights, Mark 14, installed in the U.S.S. RALPH TALBOT (DD 390) which was located at a distance of about 1800 yards from the center of the burst. The range and deflection spot mechanisms were frozen on the Gun Sight, Mark 14, Mod. 6, located on the port 20MM machine gun amidships. Condensed moisture was present in the interior of the sight and on its optical surfaces.

Because of lack of power for energizing the Gun Sights, Mark 14, installed in the U.S.S. STACK (DD 406), which was located at a distance of approximately 1800 yards from the center of the burst, only visual inspections were performed. Condensed moisture was found on the front and rear windows of the Gun Sight, Mark 14, Mod. 8, located on the Gun Director, Mark 51. On the Gun Sight, Mark 14, Mod. 6, located on #3 20MM machine gun, moisture was found to have collected on the front and rear windows and on the interior optical surfaces. On Gun Sight, Mark 14, Mod. 8, located on #4 20MM machine gun, the front window was found to be cracked and moisture was found in the interior of the sight. On Gun Sight, Mark 14, Mod. 6, located on the 20MM machine gun, port amidships, it was found that the elevation spot mechanism was broken and that the reticle did not move when the elevation spot mechanism was operated. Condensed moisture was found inside of the Gun Sight, Mark 14, Mod. 6, located on 20MM machine gun (forward, port side).

Because of lack of power, only visual inspections were made on the Gun Sight, Mark 14, Mod. 6, located on the after port 20MM gun mount in the U.S.S. BARROW (APA 61) which was located at a distance of about 1900 yards from the center of the burst. It was found that moisture had collected on the interior optical surfaces of the sight.

The two Gun Sights, Mark 14, installed in the U.S.S. FILLMORE (APA 83, located at a distance of about 2100 yards from the center of the explosion, were found to be undamaged.

As there was no power available, only visual inspections were performed on the Gun Sights, Mark 14, installed in the U.S.S. RHIND (DD 404) which was located at a distance of about 2200 yards from the center of the burst. The ray filter mechanism was frozen and moisture had collected in the interior of the Gun Sight, Mark 14, Mod. 6, located on the forward starboard 20MM gun. The ray filter mechanism was frozen on the Gun Sight, Mark 14, Mod. 6, located on the 20MM gun, amidships starboard side. The deflection spot mechanism and the range mechanism were frozen on the Gun Sight, Mark 14, Mod. 6, located on the 20MM gun amidships port.

Since power was not available, only visual inspections were accomplished on

TEST "B" (continued)

OPTICAL (continued)

GUNSIGHTS Mark 14 (continued)

Gun Sights, Mark 14, installed in the U.S.S. BANNER (APA-60), which was located at a distance of approximately 2300 yards from the point of explosion of the atomic bomb. It was found that the condition of the sights had not changed since the Test "A" inspection.

No power was available, but a thorough visual inspection was made on the Gun Sights, Mark 14, located in the U.S.S. BLADEN (APA-63), at a distance of about 2400 yards from the burst, and it was found that the sights were not damaged by the effects of the explosion.

The Gun Sights, Mark 14, located in the U.S.S. MUGFORD (DD-389), at a distance of about 2500 yards from the center of the explosion were given operational checks and were found to be undamaged by the effects of the burst.

The Gun Sights, Mark 14, located in the U.S.S. BUTTE (APA-68), at a distance of approximately 2700 yards from the center of the explosion were given operational checks. It was found that the sights had sustained no damage from the effects of the explosion.

Operational checks performed on the Gun Sights, Mark 14, located in the U.S.S. GENEVA (APA-86), at a distance of about 2700 yards from the point of burst, revealed that the sights were not damaged by the effects of the burst.

The U.S.S. WAINWRIGHT (DD-419), was located at a distance of approximately 2900 yards from the center of the burst. The Gun Sight, Mark 14, Mod. 6, located on Gun Director, Mark 51, was found to exhibit excessive dead-zero in train. The Gun Sight, Mark 14, Mod. 6, on the 20MM machine gun aft was found to be full of moisture and consequently inoperable. The Gun Sight, Mark 14, Mod. 6, on the 20MM machine gun forward was found to be inoperable because the optical system was covered with moisture.

The U.S.S. CARTERET (APA-70), was located at a distance of approximately 3000 yards from the center of the explosion. Operational checks made on the Gun Sights revealed that the Gun Sight, Mark 14, Mod. 6, located on the 20MM machine gun, starboard side, had been rendered inoperable by moisture which collected on the optical system. On the Gun Sight, Mark 14, Mod. 6, mounted on the after 20MM machine gun, a grease-film had collected on the train mirror but the sight was found to be operable.

Operational checks made on the Gun Sights, Mark 14, located in the U.S.S.

TEST "B" (continued)

OPTICAL (continued)

GUNSIGHTS, Mark 14 (continued)

NIAGARA (APA 87), at a distance of about 3200 yards from the center of the explosion, revealed that the Gun Sight, Mark 14, Mod. 6, located on the signal bridge, generated an excessive range shift, indicating that a displacement of the range unit had occurred.

The U.S.S. CONYNGHAM (DD 371), was located at a distance of approximately 3400 yards from the center of the explosion. Power was available and operational checks of all Gun Sights, Mark 14, except the Gun Sight, Mark 14, Mod. 6, located on 20MM gun, amidships, port side for which power could not be obtained, revealed that the sight operation was normal.

Operational checks were made on the Gun Sights, Mark 14, installed in the U.S.S. CORTLAND (APA 75) which was located at a distance of about 3600 yards from the center of the burst. On Gun Sight, Mark 14, Mod. 6, on the 20MM gun aft it was found that the ray filter had deteriorated around the edges.

GUNSIGHTS, Mark 15

The Gun Sights, Mark 15, installed in the target vessels for Test "B" withstood the effects of the underwater explosion of the atomic bomb without casualty. It was observed that moisture was present in the interior of several of the gun sights, but this condition was probably due to methods employed in the decontamination processes and to the fact that a considerable period of time had elapsed preceding Test "B", during which period the gun sights had not been energized. No information is available concerning the Gun Sights, Mark 15, installed in the U.S.S. ARKANSAS (BB 33), which was located at a distance of approximately 300 yards from the explosion and was sunk.

The ship in which Gun Sights, Mark 15, were installed next-closest to the point of explosion was the U.S.S. FALLON (APA 81), about 500 yards distant from the point of explosion. Although power was not available, the Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, was given a thorough visual inspection. The sight was found lying on the deck with the securing bolts missing, but the sight itself was found to be undamaged.

Because no power was available, the two Gun Sights, Mark 15, Mod. 12, mounted on Gun Directors, Mark 51, in the U.S.S. PENSACOLA (CA 24), about 700 yards distant from the point of the underwater explosion, were given only a visual inspection and were found to be undamaged.

TEST "B" (continued)

OPTICAL (continued)

GUNSIGHTS, Mark 15 (continued)

Because no power was available, the Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, in the U.S.S. GASCONADE (APA-85) which was located at a distance of approximately 800 yards from the center of the burst, was given only a visual inspection and was found to be undamaged.

As no power was available in the U.S.S. NEVADA (BB-36) which was approximately 1000 yards distant from the center of the burst, only visual inspections were made on the Gun Sights, Mark 15, installed aboard. One Gun Sight, Mark 15, Mod. 3, mounted on the forward starboard Gun Director, Mark 51, was found to have been rendered inoperable by moisture which condensed on the optical surfaces.

Power was not available on the following named ships located at the approximate distances from the center of the explosion as listed below, but the Gun Sights, Mark 15, mounted on Gun Directors, Mark 51, were given a thorough visual inspection and were found not to be damaged by the effect of the explosion:

U.S.S. DAWSON (APA-79)	1300 yards.
U.S.S. CATRON (APA-71)	1400 yards.
U.S.S. CRITTENDEN (APA-77)	1500 yards.
U.S.S. BRACKEN (APA-64)	1800 yards.

Although no power was available, a thorough visual inspection of the Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, in the U.S.S. BARROW (APA-61), about 1900 yards distant from the point of explosion, revealed that the sight had been rendered inoperable by moisture which had condensed on all the optical surfaces.

Because of lack of power on the U.S.S. BANNER (APA-60), located at a distance of approximately 2300 yards from the center of the explosion, only a visual inspection was made of Gun Sight, Mark 15, Mod. 3, which was mounted on a Gun Director, Mark 51. The sight was found to be undamaged.

On the U.S.S. CARTERET (APA-70), located at a distance of approximately 3000 yards from the center of the burst, a complete visual and operational inspection revealed that the Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, was not damaged by the effects of the explosion.

TEST "B" (Cont'd)

OPTICAL (Cont'd)

GUNSIGHTS, Mark 15 (Cont'd)

The Gun Sight, Mark 15, Mod. 3, located on a Gun Director, Mark 51, in the U.S.S. NIAGARA (APA-87), approximately 3200 yards distant from the center of the explosion, was given a complete visual and operational inspection and was found to be undamaged by the effects of the underwater explosion.

On the U.S.S. CORTLAND (APA-75), located at a distance of approximately 3600 yards from the center of the burst, a complete visual and operational inspection of the Gun Sight, Mark 15, Mod. 3, mounted on a Gun Director, Mark 51, revealed that the sight was not damaged by the effects of the test.

RANGEFINDERS

Rangefinders, Marks 10, 33, 35, 36, 41, 42, 43, 55, 58, 63, and 65, were subjected to the effects of the explosion of the nuclear fission bomb during Test "B". Of a total of 49 rangefinders included in the various ships, 37 were in excellent condition prior to the test. Of these 37, five were damaged by the effects of the underwater explosion and two were rendered inoperable by the entrance of moisture.

The U.S.S. ARKANSAS (BB-33) located at a distance of about 300 yards from the point of the explosion was sunk.

The U.S.S. SARATOGA (CV-3) located at a distance of approximately 500 yards from the center of the explosion was sunk.

The U.S.S. FALLON (APA-81) located at a distance of about 500 yards from the center of the explosion was equipped with a Rangefinder, Mark 65, Mod. 0, Serial #468, mounted on the bridge. The weather-shield was carried away and the counterweight was broken from the rangefinder, breaking the illumination housing of the internal adjustment system. Dirt and moisture had collected in the eyepiece system. A visual inspection indicated that the rangefinder was inoperable. (See Photograph ABCR 62-4166-12).

The U.S.S. PENSACOLA (CA-24) was located at a distance of approximately 700 yards from the point of explosion of the atomic bomb. The Rangefinder, Mark 42, Mod. 0, Serial #14, located in the after Gun Director, Mark 35, was seriously damaged by shock. The right and left end reflectors were shattered and the cast-aluminum rangefinder support pedestals were fractured. It was not possible to turn the adjuster knob to its full normal limits of throw, probably because of internal mechanical damage in the end boxes.

TEST "B" (continued)

OPTICAL (continued)

RANGEFINDERS

The Rangefinder, Mark 42, Mod. 2, Serial #156, mounted in a Mark 37 Director in the U.S.S. HUGHES (DD-410) at a distance of approximately 700 yards from the center of the explosion was lightly damaged by the effects of the explosion. The range mechanism tended to bind when the range dial read 16,800 yards, indicating damage to the range input mechanism.

The U.S.S. MAYRANT (DD-402) was located at a distance of about 800 yards from the center of the explosion. The Rangefinder, Mark 41, Mod. 3, Serial #54, was not given a complete inspection because the end window covers were frozen and the inspection time was so limited by radioactivity that it was not practicable to remove the covers. However, a visual inspection of the external parts revealed no damage.

The Rangefinder, Mark 65, Mod. 0, Serial #484, located on the U.S.S. GASCONADE (APA-85) at a distance of approximately 800 yards from the point of the explosion, was not damaged by the effects of the explosion but the rangefinder was inoperable because of damage to the mount. The bearing saddles were bent outward, jamming the rangefinder in elevation, and the saddle supporting arms were cracked. The head shield was badly distorted. (See Photograph ABCR 100-4210-10)

The Rangefinder, Mark 63, Mod. 0, Serial #131, installed in the U.S.S. BRULE (APA-86) about 800 yards distant from the center of the explosion, was found to be undamaged.

On the U.S.S. NEW YORK (BB-34), located at a distance of approximately 1200 yards from the center of the explosion, the doors on the two Rangefinder Mounts, Mark 35, (Port and Starboard Navigating Bridge) were found to be buckled and jammed so that they could not be opened. Consequently, the Rangefinders, Mark 54, in the mounts could not be inspected although their external appearance indicated that they were not damaged by the effects of the explosion.

The Rangefinder, Mark 42, Mod. 13, Serial #739, installed in the forward Gun Director, Mark 33, in the U.S.S. SALT LAKE CITY (CA-25) and approximately 1200 yards distant from the center of the Test "B" explosion, was not given a complete inspection because the left-end window cover was frozen in place due to salt-water corrosion, but no damage was discovered when the complete inspection was performed.

Beyond a radius of approximately 1400 yards from the point of explosion of the Test "B" atomic bomb all rangefinders and associated equipments were found to be undamaged and operable at normal efficiency.

TEST "B" (Cont'd)

OPTICAL (Cont'd)

TELESCOPES

Only three telescopes sustained damage from the direct effects of the Test "B" nuclear fission bomb explosion. On one Telescope, Mark 61, Mod. 0, located on #1 5"/38 gun mount in the U.S.S. HUGHES (DD-410) at a distance of approximately 700 yards from the center of the explosion, the checker's eyepiece and the ray filter assembly were found to have been shocked loose at the base of the housing. The other two telescopes were located in the U.S.S. SALT LAKE CITY (CA-25) at a distance of about 1200 yards from the point of origin of the explosion. One, a Director Telescope, Mark 28, located in the after Gun Director, Mark 33, sustained a cracked objective window; on the other, a Telescope, Mark 36, Mod. 3, located on the #7 5"/25 gun mount, the eyepiece and ray filter assembly were missing for reasons which were not determined.

A great number of telescopes on all of the ships in the target array were rendered inoperable by moisture which had collected in the eyepiece and ray filter housings. In some cases moisture was probably introduced during the processes used in decontaminating the ships, but the majority of the moisture is believed to have been introduced when the heavy column of water descended on the ships after the explosion.

PERISCOPES

The only periscope damaged in Test "B" was the Periscope, Mark 7, Mod. 2, located in # 2 turret of the U.S.S. NEW YORK (BB-34) at a distance of approximately 1200 yards from the point of the underwater explosion of the nuclear fission bomb; the head-prism was found to have been cracked by the effects of the explosion.

TEST "B"

FIRE CONTROL

RANGEKEEPERS AND COMPUTERS

During Test "B" rangekeepers or computers were mounted in topside stations in the following named ships located at the approximate distances as listed below:

U.S.S. ARKANSAS (BB-33)	300 yards
U.S.S. SARATOGA (CV-3)	500 yards
U.S.S. MAYRANT (DD-402)	800 yards
U.S.S. TRIPPE (DD-403)	1100 yards
U.S.S. NEW YORK (BB-34)	1200 yards
U.S.S. MUSTIN (DD-413)	1300 yards
U.S.S. WILSON (DD-408)	1400 yards
U.S.S. RALPH TALBOT (DD-390)	1800 yards
U.S.S. STACK (DD-406)	1800 yards
U.S.S. RHIND (DD-404)	2200 yards
U.S.S. MUGFORD (DD-389)	2500 yards
U.S.S. CONYNGHAM (DD-371)	3500 yards

During Test "B" rangekeepers or computers were mounted below-decks in the following named ships located at the approximate distances as listed below:

U.S.S. ARKANSAS (BB-33)	300 yards
U.S.S. HUGHES (DD-410)	700 yards
U.S.S. NEVADA (BB-36)	1000 yards
U.S.S. NEW YORK (BB-34)	1)0 yards
U.S.S. MUSTIN (DD-413)	1300 yards
U.S.S. PENNSYLVANIA (BB-38)	1400 yards

From an examination of all available data it may be observed that no rangekeeper or computer mounted in a topside location sustained any damage from the direct effects of the underwater explosion of the nuclear fission bomb. However, the decontamination processes caused extensive sticking of knob and crank assemblies.

No power was available to run the "A" and "B" tests on the computer, Mark 1, Mod. 0, Serial #2, which was located on the U.S.S. HUGHES (DD-410) at a distance of approximately 700 yards from the point of the explosion but all covers were removed from the computer, and it was found that the water which had flooded the compartment had entered the computer and was standing to a depth of about two feet. It was found that shock had caused disengagement of the OLDHAM couplings on the ends of shafts 49-S-3 (the Wrh input to the elevation wind

TEST "B" (Continued)

FIRE CONTROL (Continued)

RANGEKEEPERS AND COMPUTERS (Continued)

component solver), 44-S63 (R to the 1/cr integrator). 49-S-22 (xo to differential D-53, where it combines with xw to make wd), and 49-S-31 (Us line going to the Corrector Section). These shafts had dropped to the bottom of the case and it was noted that the couplings were not equipped with lock-springs which might have prevented the casualty. (See Photograph ABCR 66-151-8). It was also observed that the units in the lower portion of the computer were severely corroded as a result of flooding. (See Photographs ABCR 66-151-11 and 12).

STABLE ELEMENTS

The stable elements that were exposed to the effects of the underwater explosion of the atomic bomb in below-decks locations were installed in the following ships at the approximate distances from the point of explosion as listed:

1.	U.S.S. ARKANSAS	(BB-33)	300 yards
2.	U.S.S. SARATOGA	(CV-3)	500 yards
3.	U.S.S. HUGHES	(DD-410)	700 yards
4.	U.S.S. NEVADA	(BB-36)	1000 yards
5.	U.S.S. NEW YORK	(BB-34)	1200 yards
6.	U.S.S. MUSTIN	(DD-413)	1300 yards
7.	U.S.S. PENNSYLVANIA	(BB-38)	1400 yards
8.	U.S.S. WAINWRIGHT	(DD-419)	2800 yards

The stable elements that were subjected to the effects of the underwater explosion of the nuclear fission bomb in top side locations on a Gun Director, Mark 33, or a Gun Director, Mark 35, were installed in the following ships at the approximate distances from the point of explosion as listed below:

1.	U.S.S. PENSACOLA	(CA-24)	700 yards
2.	U.S.S. MAYRANT	(DD-402)	800 yards
3.	U.S.S. TRIPPE	(DD-403)	1100 yards
4.	U.S.S. SALT LAKE CITY	(CA-25)	1200 yards
5.	U.S.S. WILSON	(DD-408)	1400 yards
6.	U.S.S. RALPH TALBOT	(DD-390)	1800 yards
7.	U.S.S. STACK	(DD-406)	1800 yards
8.	U.S.S. RHIND	(DD-404)	2200 yards
9.	U.S.S. MUGFORD	(DD-389)	2500 yards
10.	U.S.S. CONYNGHAM	(DD-371)	3500 yards

TEST "B" (continued)

FIRE CONTROL (continued)

STABLE ELEMENTS (continued)

The Stable Element, Mark 6, Mod. 5, located in the Internal Communications room of the U.S.S. HUGHES (DD-410) at a distance of approximately 700 yards from the point of explosion of the nuclear fission bomb, was heavily damaged by the effects of the explosion. The stable element was apparently subjected to a severe upward vertical shock as a result of the explosion. The inertia of the heavy sensitive element caused shearing of the tapered pin in the collar at the base of the rotating fork. The follow-up magnet was forced against the umbrella, fracturing the umbrella and injuring the follow-up coil. The gimbal rotating pinion became unmeshed from the rotating fork gear. The top of the upper fork-bearing forced the idler gear to the 1DG Synchro out of mesh with the synchro drive gear. When the rotating fork assembly started to return to its original position the idler gear did not remesh with the synchro drive gear. The idler gear was canted to one side and the rotating fork assembly remained about 3/16 inch above its normal position. Rotation of the inner gimbal system was prevented by the distorted and jammed gears in the rotating fork drive. Water, which entered the stable element from the flooded Internal Communications Room, caused heavy corrosion of all parts of the equipment to the height of the umbrella. See Photographs ABCR 82-4224-12, ABCR 82-4225-1 and ABCR 82-4225-2).

Three stable elements in the U.S.S. PENSACOLA (CA-24) located at the same distance of approximately 700 yards from the explosion as the U.S.S. HUGHES, were heavily damaged. The Stable Element, Mark 2, Mod. 4, located in the forward Gun Director, Mark 33, was damaged beyond economical repair. The base plate, which is a part of the stable element case and which mounts the level and crosslevel follow-up motors, clutches, and numerous shafts and gears, was broken loose and dropped about one inch. The position-angle-plus-level-output shaft's lower mounting bracket was broken. Several small fragments were broken from the bottom front section of the stable element case and the main rear cover of the case was broken into three pieces. The level output shaft was disengaged at the first gear-mesh outside the stable element case, and its housing and bracket was broken in several places. The Oldham coupling in the level hand-input shafting inside the main cover at the lower left side and the coupling in the position angle input shaft were both found to be disconnected. There was excessive end-play in the inner gimbal system, and the level and crosslevel drives were jammed. (See Photographs ABCR 100-4203-6, ABCR 100-4203-7 and ABCR 100-4203-8). The Stable Element, Mark 2, Mod. 4, located in the after Gun Director, Mark 33, sustained damage very similar to that of the forward stable element described above and could have been rebuilt only at excessive cost. On the left side of the stable element case a vertical break extended from the crosslevel follow-up switch to the lower access cover and base plate.

TEST "B" (Continued)

FIRE CONTROL (Continued)

STABLE ELEMENTS (Continued)

On the right side of the case a diagonal break extended from the lower forward corner to a point about 18 inches above the base plate at the right rear. On the rear side of the case a diagonal break extended from the level output shaft to a point about 18 inches above the base plate at the right rear. The base plate, which mounts the level and cross-level follow-up motors, clutches and numerous shafts and gears, had broken loose and had dropped about four inches. The level output shaft was disengaged at the first gear-mesh outside the stable element case and its housing and bracket were broken in numerous places. The Oldham coupling in the level hand-input shafting, located inside the stable element case at the lower left, and the coupling in the position-angle input shaft were found to be disconnected. The level and cross-level drives and the gimbal rotation system were binding because of the distorted gearing and the broken case. The follow-up panel cover was blown out of its case and its hinges were broken. The follow-up panel was blown out of the panel and its hinges were broken. Seven power tubes, type C6A, were broken. (See Photographs ABCR 78-1683-4, ABCR 78-1683-5 and ABCR 78-1683-6). The Stable Element, Mark 3, Mod. 0, located in the forward Gun Director, Mark 35, sustained one broken power tube, type C5B. The Stable Element, Mark 3, Mod. 0, located in the after Gun Director, Mark 35, was severely damaged by a vertical shock. This upward thrust, applied to the heavy gyro case assembly, broke the gyro gimbal ring and the inner arm, and caused the gyro case assembly to strike the under side of the follow-up coil and the follow-up coil support. The blow broke the follow-up coil, follow-up coil support, follow-up magnet and the East-West level bubble. The gyro case and the gyro gimbal ring were dislodged from their pivot studs and the gyro case dropped to the cross-level frame. The level and cross-level follow-up panels were demolished, with all amplifier and power tubes broken, the electrical wiring torn loose and broken, and resistors, condensers, and electrical connection blocks torn loose and broken. (See Photographs ABCR 78-1683-12 and ABCR 78-1715-1.

The Stable Element, Mark 2, Mod. 13, located in the forward Gun Director, Mark 33, on the U.S.S. SALT LAKE CITY (CA 25), about 1200 yards distant from the explosion was severely damaged in Test "B". The level output gear bracket and housing, located on the lower front side of the stable element case, was broken and bent by contact with the underside of the training circle weather-stripping. In the cross-level preamplifier unit an electrical connection-block and a support plate for resistors and condensers were broken. The most serious damage occurred to the sensitive element when a lateral movement caused a gyro gimbal bearing and a pivot stud to be forced out through the opening of the inner arm. The opposite gyro gimbal bearing was forced partially out of its recess. This casualty caused the protruding stud to touch the outer gimbal ring, preventing rotation of the inner gimbal system.

TEST "B" (continued)

FIRE CONTROL (continued)

STABLE ELEMENTS (continued)

All stable element electrical circuits were grounded when the after gyro room containing the stable element control panels was flooded to a depth of three feet.

The Stable Element, Mark 2, Mod. 1, located in the Gun Director, Mark 33, on the U.S.S. RHIND (DD-404) at a distance of about 2200 yards from the center of the explosion was severely damaged by a lateral motion which caused a gyro gimbal bearing and a pivot stud to be forced out through the opening of the inner arm. The protruding stud touching the outer gimbal ring prevented rotation of the inner gimbal system. The opposite gyro gimbal bearing and pivot stud separated because of a missing gyro gimbal bearing retainer nut which had been broken off and removed after Test "A". The separation allowed the gyro gimbal ring and the gyro to drop and come to rest on the base of the rotating fork.

It is well to note that very similar casualties occurred during Test "A" to stable elements in the U.S.S. STACK (DD-406), U.S.S. RHIND (DD-404) and the U.S.S. SALT LAKE CITY (CA-25). During Test "A" the tapped threads were stripped in the inner arm recess for the securing screw which holds the pivot stud and the pivot stud sleeve in their proper position, and it is considered probable that had it been possible to repair properly the stripped threads, the stable elements of the U.S.S. RHIND (DD-404) and the U.S.S. SALT LAKE CITY (CA-25) would have withstood the effects of the underwater blast.

After Test "A" in certain equipments the spring steel tube-retainer on the type C6A power tubes # 1 and #4 in the level and crosslevel follow-up panel was removed and a new hold for the securing screw was drilled in the retainer about two inches below the original hole. The retainers secured in the new position gripped the tubes closer to the top. The motion of the tube was limited, preventing contact with the follow-up panel. During Test "B" no power tubes, type C6A, were broken on equipments so altered.

The alteration described above was performed on the level and crosslevel follow-up panels of the U.S.S. WILSON (DD-408), U.S.S. RALPH TALBOT (DD-390), U.S.S. STACK (DD-406) and the U.S.S. RHIND (DD-404).

GUN DIRECTORS DUAL PURPOSE

The dual purpose gun directors subjected to the effects of the underwater explosion were located on the following named ships at the approximate distances from the point of the explosion listed below:

1.	U.S.S. ARKANSAS	(BB-33)	300 yards

TEST "B" (continued)

FIRE CONTROL (continued)

GUN DIRECTORS ... PURPOSE (continued)

2.	U.S.S. SARATOGA	(CV-3)	500 yards
3.	U.S.S. HUGHES	(DD-410)	700 yards
4.	U.S.S. PENSACOLA	(CA-24)	700 yards
5.	U.S.S. MAYRANT	(DD-402)	800 yards
6.	U.S.S. NEVADA	(BB-36)	1000 yards
7.	U.S.S. TRIPPE	(DD-403)	1000 yards
8.	U.S.S. NEW YORK	(BB-34)	1200 yards
9.	U.S.S. SALT LAKE CITY	(CA-25)	1200 yards
10.	U.S.S. MUSTIN	(DD-413)	1300 yards
11.	U.S.S. PENNSYLVANIA	(BB-38)	1400 yards
12.	U.S.S. WILSON	(DD-408)	1400 yards
13.	U.S.S. RALPH TALBOT	(DD-390)	1800 yards
14.	U.S.S. STACK	(DD-406)	1800 yards
15.	U.S.S. RHIND	(DD-404)	2200 yards
16.	U.S.S. MUGFORD	(DD-389)	2500 yards
17.	U.S.S. WAINWRIGHT	(DD-419)	2800 yards
18.	U.S.S. CONYNGHAM	(DD-371)	3500 yards

No inspection was made of the gun directors in the U.S.S. ARKANSAS (BB-33) and the U.S.S. SARATOGA (CV-3) because the ships were sunk by the effects of the explosion.

The Gun Director, Mark 37, Mod. 0, Serial #2, on the U.S.S. HUGHES (DD-410) at a distance of approximately 700 yards from the underwater explosion sustained the following damage: The gas seal was ruptured and distorted causing the Director to bind in train. Five of the twelve bolts securing the rangefinder to the deck on the after side were missing causing the director to bind in elevation. The crosslevel controller had been full of water which caused rust and corrosion, and all the fuzes had been shocked out of their retaining clips. The damper assembly of the Train Receiver Regulator was shocked off the pilot motor. A broken friction assembly, two screws, and two springs were found lying in the bottom cover. The contact head and synchro of the Elevation Receiver Regulator was jarred loose, and the train gear housing for the train pinion was full of water.

The Gun Director, Mark 33, Mod. 16, Serial #99, and the Gun Director, Mark 33, Mod. 16, Serial 98, located in the U.S.S. PENSACOLA (CA-24), at a distance of approximately 700 yards from the point of origin of the underwater explosion sustained the following damage: The Gun Director, Mark 33, Mod. 16, Serial 99,

TEST "B" (Cont'd)

FIRE CONTROL (Cont'd)

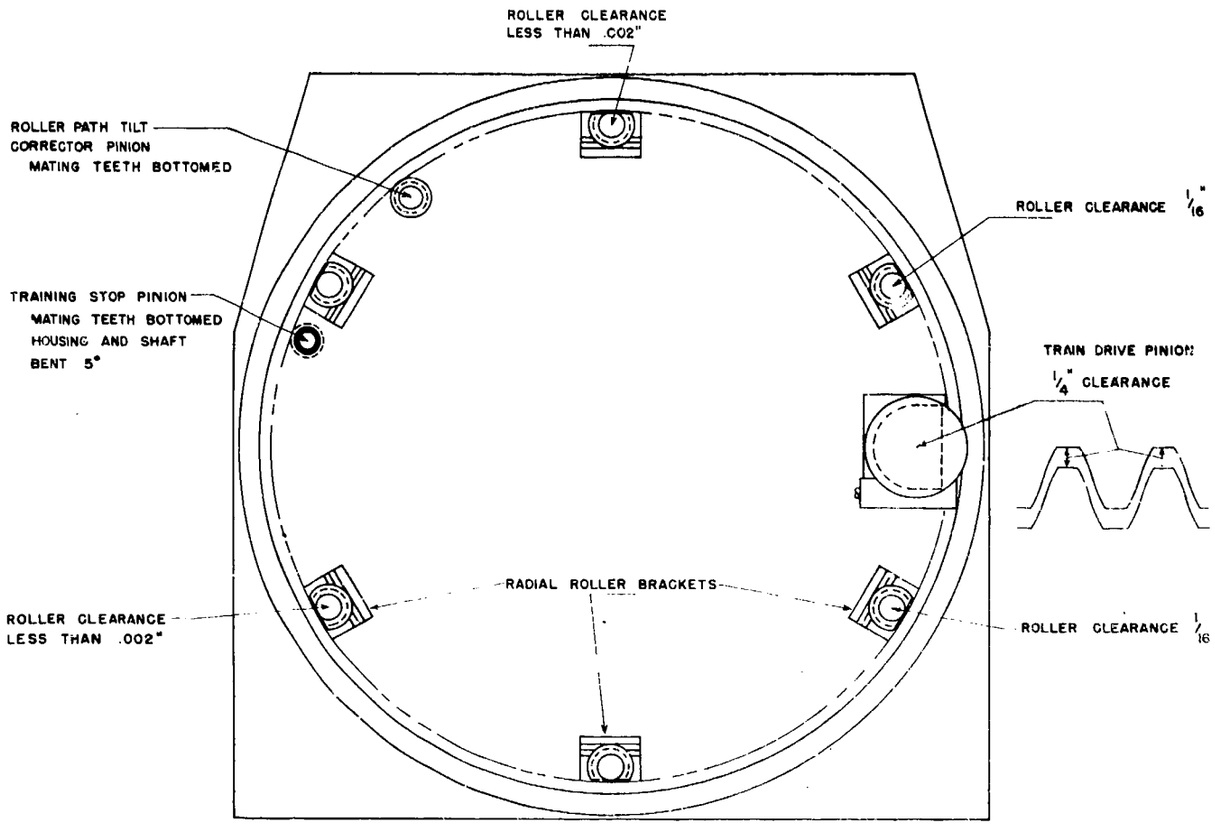
GUN DIRECTORS DUAL PURPOSE (Cont'd)

located in the after superstructure was titled to starboard at an angle of about 10 degrees from its normal position and several ball rollers were lying about the deck. (See Photographs ABCR 78-1683-3 and ABCR 78-1683-7). The training worm gear was unmeshed (See Photograph ABCR 78-1683-1). Two holding-down clips were broken and the weather-seal was broken and distorted. The Gun Director, Mark 33, Mod. 16, Serial #98, in the forward superstructure sustained the following damage: The director was canted to starboard (See Photographs ABCR 100-4203-2, ABCR 100-4203-3, ABCR 100-4203-4 and ABCR 100-4203-5). The after port corner was found to be 47 inches from the deck and the after starboard corner was found to be 30 inches from the deck. (See Photograph ABCR 97-1684-1). The weather-seal was ruptured and broken. (See Photographs ABCR 100-4203-9 and 4203-10).

The Gun Director, Mark 33, Mod. 9, Serial #68, located on the U.S.S. MAYRANT (DD-402), at a distance of approximately 800 yards from the center of the underwater explosion was not damaged by the effects of the explosion.

The Gun Directors, Mark 37, located in the U.S.S. NEVADA (BB-36) at a distance of approximately 1400 yards from the point of origin of the underwater explosion, sustained the following damage: Gun Director, Mark 37, Mod. 37, Serial #221 (port) was found to be frozen in train. Pressure applied to the train hand wheels would not produce any movement of the director. An investigation revealed that the director had been subjected to a very heavy lateral shock on the radial rollers. The clearance of the rollers indicated that the training rack had been distorted by the spot-pressure of the vertical rollers. The pinion gear shaft of the training stop was bent so that the tops of the addenda of the pinion gear were touching and jammed hard against the tops of the addenda of the training gear rack. The pinion gear shaft of the Roller Path Tilt Corrector was bent so that the tops of the addenda of the pinion gear made contact with the training gear rack at the pitch circle. After the Roller Path Tilt Corrector pinion gear and the training stop pinion gear were removed it was then possible to move the director about five degrees in train. By moving the director back and forth it was found that the vertical roller located at 30 degrees (see illustration on the following page) would bind on the vertical roller path, preventing movement of the director in train. The clearances of the other rollers were found to be as shown in the illustration on the following page.

The Gun Director, Mark 37, Mod. 37, Serial #181, (Starboard) installed in the U.S.S. NEVADA (BB-36) sustained the following damage: Movement of the director in train was found to be limited to about 20 minutes of arc. Upon application of excessive torque the director moved about one degree before it froze.

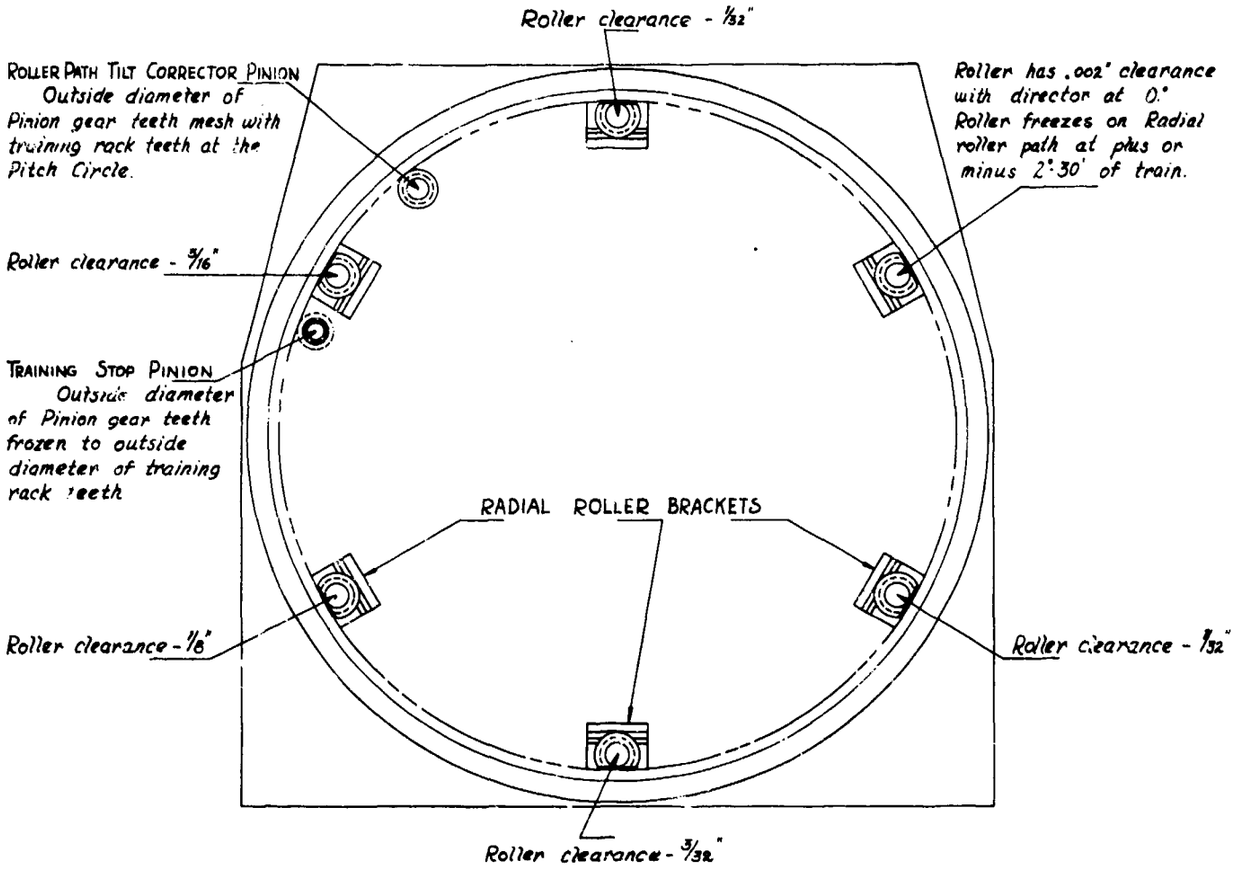


GUN DIRECTOR MK. 37

MOD. 35 SER. NO. 181

U.S.S. NEVADA (BB36)

SKY FWD.



GUN DIRECTOR MK 37
Mod. 37 Ser. No. 221
U.S.S. NEVADA (BB-36)
SKY AFT

TEST "B" (continued)

FIRE CONTROL (Continued)

GUN DIRECTORS DUAL PURPOSE(Continued)

Further attempts to move the director failed. An investigation revealed that the training pinion had a clearance of about 1/4 inch from the top of the tooth to the bottom of the training rack mating tooth. The radial rollers on either side of the training pinion had a clearance in excess of 1/16 inch of an inch. The two radial rollers directly opposite on the port side would not pass a 0.002 inch feeler gauge, the smallest available at that time. The train limit-stop pinion and the inclination compensator pinion, both located between the two jammed radial rollers, were forced against the training rack so violently that the mating teeth were broken. The shaft and housing supporting the limit-stop pinion were bent about five degrees out of line. The train securing-pin was locked in the "OUT" position. The holding-down clips were found to be undamaged, with a clearance of about 0.015 inch. It was concluded that the Director was shifted to the port side by shock, causing the response gearing to jam and bending a shaft, preventing movement of the director in train.

The Gun Director, Mark 33, Mod. 9, Serial #70, located on the U.S.S. TRIPPE (DD 403) at a distance of approximately 1000 yards from the point of origin of the underwater explosion sustained no damage from the effects of the explosion.

The Gun Directors, Mark 50, located in the U.S.S. NEW YORK (BB 34) at a distance of approximately 1200 yards from the underwater explosion sustained the following damage. The Gun Director, Mark 50, Mod. 4, Serial #14, located in sky control aft sustained no damage from the effects of the explosion. On the Gun Director, Mark 50, Mod. 4, Serial #14, located in sky control forward, the crosslevel throw-out clutch was rendered inoperative by corrosion and the level drive was jammed and inoperable.

The Gun Directors, Mark 33, Mod. 16, Serial #102, located on the U.S.S. SALT LAKE CITY (CA 25) at approximately 1200 yards distance from the underwater explosion sustained the following damage: It was found that the Gun Director, Mark 33, Mod. 16, Serial #102, located in the forward superstructure in the U.S.S. SALT LAKE CITY (CA 25) at a distance of approximately 1200 yards from the point of origin of the explosion could be moved in train through about only twenty five minutes of arc. It was observed that the securing pin had been left in the "OUT" position during the test. The clearance around the weather seal indicated that the entire director had shifted to starboard about 3/8 inch. The port rear holding-down clip was sheared and part of the clip was missing. It was impossible to inspect the remaining holding-down clips without cutting away parts of the Gun Director's structure. The Gun Director, Mark 33, Mod. 16, Serial #103 located in the after superstructure sustained no damage.

TEST "B" (Continued)

FIRE CONTROL (Continued)

GUN DIRECTOR DUAL PURPOSE (Continued)

The Gun Director, Mark 37, Mod. 0, Serial #5, located in the U.S.S. MUSTIN (DD-413) approximately 1300 yards distant from the center of the underwater explosion sustained no damage from the effects of the explosion.

The Gun Director, Mark 37, Mod. 36, Serial #209, and Mark 37, Mod. 36, Serial #210 located on the U.S.S. PENNSYLVANIA (BB-38), at approximately 1400 yards distance from the point of the underwater explosion sustained the following damage. Both Gun Directors were frozen in train, the Gun Director, Mark 37, Mod. 9, Serial #209, located on the sky lookout platform starboard was chosen for investigation and it was found that the train locking pin was frozen in the "IN" position. The train locking pin knob and switch assembly were removed and found to be in perfect working order. Pressure was then applied by means of a 14 inch pipe wrench to the shaft extending from the locking-pin knob and switch assembly to the level gears that drive the screw in the locking pin. By application of all the force that one man could apply to the wrench, the locking pin was gradually jacked back to a position where the locking pin teeth cleared the training rack teeth. The Gun Director was then found to operate perfectly clear in train. The remaining sections of the train locking gear were then removed and taken to the U.S.S. WHARTON (AF-7) for further inspection. It was concluded that the director had been subjected to a torque in train, bending the guide-bar and swedging the two teeth of the locking pin slightly. This small amount of swedge prevented retraction of the locking pin. The Port Gun Director, Mark 37, Mod. 36, Serial #210, was locked in train, but was not investigated due to the restriction on time imposed because of radioactivity. However, it is believed that the damage sustained by this gun director was similar to that described above.

The Gun Director, Mark 33, Mod. 9, Serial #65, located on the U.S.S. WILSON (DD-408) at a distance of approximately 1400 yards from the underwater explosion, sustained only moderate damage with no reduction in efficiency. At the time of the inspection no power was available for testing, but it was observed that it was necessary to apply an excessive torque to the pointer's handwheels (about 125 pound-inches) in order to train the director. A visual inspection failed to reveal the exact nature of the casualty.

TEST "B" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTOR DUAL PURPOSE (Cont'd)

The Gun Director, Mark 33, Mod. 8, Serial #46, located on the U.S.S. RALPH TALBOT (DD 390) at a distance of approximately 1800 yards from the center of the underwater explosion was not damaged by the effects of the explosion.

On the Gun Director, Mark 33, Mod. 7, Serial #71, located on the U.S.S. STACK (DD 406), approximately 1800 yards distant from the underwater explosion, the director securing pin was frozen in the locked position.

The Gun Director, Mark 33, Mod. 9, Serial #6, located on the U.S.S. RHIND (DD 404) at a distance of approximately 2200 yards from the point of origin of the underwater explosion sustained no damage.

On the Gun Director, Mark 33, Mod. 8, Serial #45, located on the U.S.S. MUGFORD (DD 389) at a distance of approximately 2500 yards from the center of the underwater explosion, the plexiglas windows on the front and right side of the director had become translucent.

On the Gun Director, Mark 37, Mod. 0, Serial 11, located on the U.S.S. WAINWRIGHT (DD 419) approximately 2800 yards distant from the point of origin of the underwater explosion, the 0.1 mfd. condenser on the increasing side of the contact head in the train receiver regulator was found to be shorted. The two 0.1 mfd. condensers that are connected in parallel on the decreasing side of the contact head in the elevation receiver regulator were shorted and there was an oil leak in the gear housing of the Slew Sight, Mark 2, which was caused by a damaged oil seal.

On the Gun Director, Mark 33, Mod. 7, Serial #30, located on the U.S.S. CONYNGHAM (DD 371) at a distance of approximately 3500 yards from the center of the underwater explosion, it was found that excessive torque was needed to move the pointer's handwheels, and it was observed that the director's line of sight was plus 5 minutes off the bench-mark.

GUN DIRECTORS (SURFACE)

All the surface gun directors exposed to the effects of Test "B" were located in the following named ships at approximate distances from the center of the explosion as shown below:

1. U.S.S. ARKANSAS (BB 33)	300 yards
2. U.S.S. PENSACOLA (CA 24)	700 yards
3. U.S.S. NEVADA (BB 36)	1000 yards
4. U.S.S. NEW YORK (BB 34)	1200 yards
5. U.S.S. SALT LAKE CITY (CA 25)	1200 yards
6. U.S.S. PENNSYLVANIA (BB 38)	1400 yards

TEST "B" (Cont'd)

GUN DIRECTORS (SURFACE) (Cont'd)

The forward Gun Director, Mark 35, Mod. 0, located atop the forward superstructure in the U.S.S. PENSACOLA (CA 24), approximately 700 yards distant from the center of the burst and secured on a bearing of 000 degrees relative, was moderately damaged with no reduction in efficiency when the weather seal was ruptured and parted on the rear side between bearings 140 and 180 degrees relative. The after Gun Director, Mark 35, Mod. 0, located in the maintop and secured on a bearing of 180 degrees relative, sustained very serious damage from the effects of Test "B". The base of the trainer's stand was completely broken through at its flange but remained upright because it was supported by the train gears and shafting. Both legs of the rangefinder stand were broken, the weather seal was ruptured and there was severe binding in the elevation and cross-level drives from the handwheels. (See Photographs No's. ABCR 78-1683-9, 10 and 11).

The U.S.S. NEW YORK (BB 34), located at a distance of about 1200 yards from the center of the blast, sustained serious damage to the after Gun Director, Mark 20, and moderate damage to the forward Gun Director, Mark 20, although the same type gun director on the U.S.S. NEVADA (BB 36) about 200 yards nearer the point of burst sustained no damage from the effects of Test "B".

The Gun Director, Mark 20, Mod. 0, located in the foretop of the U.S.S. NEW YORK (BB 34) secured on a bearing of 000 degrees relative sustained moderate damage but remained operable. The radial thrust-rollers showed excessive clearances, exceeding 3/4 inch at one roller. The after Gun Director, Mark 20, Mod. 1, located in Spot 2 and secured on a bearing of 000 degrees relative, sustained very serious damage. One leveling screw was bent and the holding-down clip broken, permitting the director to tilt aft at an angle of about 30 degrees from its normal position. The upper half of the left saddle-bearing was broken and the spotting glass had been forced from its left bearing. The starboard broadside Gun Director, Mark 6, Mod. 4, located in secondary aft and secured on a bearing of 180 degrees relative, was completely demolished during Test "B", and the turntable was broken into several pieces (See Photographs ABCR 82-4221-8 and 9). The port broadside Gun Director, Mark 6, Mod. 4, located in secondary aft and secured on a bearing of 180 degrees relative, was demolished in the same manner. Pieces of the turntable were scattered about the deck or remained suspended from the director pedestal. (See Photographs ABCR 82-4221-10 and 11).

The U.S.S. SALT LAKE CITY (CA 25) at about 1200 yards distance from the center of explosion and the U.S.S. PENNSYLVANIA (BB 38) at about 1400 yards distance, sustained no damage to their main battery gun directors.

It may be noted that most of the damage to the surface gun directors involved the failure of cast-aluminum parts.

GUN DIRECTORS, MARK 51

Damage to Gun Directors, Mark 51, and modifications: The U.S.S. FALLON (APA 81)

TEST "B" (Cont'd)

FIRE CONTROL (Cont'd)

GUN DIRECTORS, MARK 51 (Cont'd)

which was approximately 500 yards distant from the center of the explosion and the U.S.S. PENSACOLA (CA 24) which was approximately 700 yards distant from the center of the explosion sustained no damage to their Gun Directors, Mark 51, from the effects of the explosion while on the Gun Director, Mark 51, Mod. 2, in the U.S.S. HUGHES (DD 410) which was approximately 700 yards distant from the point of burst the counterbalance weight was missing and the left trunnion had sheared off. (See Photographs No's ABCR 66-151-4 and 5). On the U.S.S. MAYRANT (DD 402) at approximately 800 yards distance from the center of the explosion, the two Gun Directors, Mark 51, (Mods. 1 and 2) were undamaged, while on the U.S.S. GASCONADE (APA 89) at the same distance from the burst, a bent ring-sight was found on the Gun Director, Mark 51, Mod. 3.

On the U.S.S. NEVADA (BB 36), which was approximately 1000 yards distant from the center of the explosion, two out of six Gun Directors, Mark 51, were damaged by the effects of the explosion. On one Gun Director, Mark 51, Mod. 3, the elevation locking-pin was frozen and on the other Gun Director, Mark 51, Mod. 3, the elevation locking-pin assembly was missing.

The Gun Directors, Mark 51, located on the following named target vessels at the approximate distances from the center of the explosion as listed below, were not damaged by the effects of the explosion:

U.S.S. TRIPPE (DD 403)	1100 yards
U.S.S. NEW YORK (BB 34)	1200 yards
U.S.S. SALT LAKE CITY (CA 25)	1200 yards
U.S.S. DAWSON (APA 79)	1300 yards
U.S.S. MUSTIN (DD 413)	1300 yards
U.S.S. PENNSYLVANIA (BB 38).	1400 yards
U.S.S. INDEPENDENCE (CVL 22)	1400 yards
U.S.S. CATRON (APA 71)	1400 yards

On the U.S.S. WILSON (DD 408) located at a distance of about 1400 yards from the point of burst, the left limit-stop was broken on one Gun Director, Mark 51, Mod. 1.

The Gun Directors, Mark 51, on the U.S.S. CRITTENDEN (APA 77), 1500 yards distant, and the U.S.S. BRACKEN (APA 64) and the U.S.S. STACK (DD 406), 1800 yards distant from the center of the explosion, were not damaged by the effects of the explosion.

On the U.S.S. RALPH TALBOT (DD 390), the right counterbalance weight was broken from the Gun Director, Mark 51, Mod. 1, and the right trunnion was broken.

On the U.S.S. BARROW (APA 61), U.S.S. RHIND (DD 404), and U.S.S. BANNER (APA 60), located at respective distances of approximately 1900 yards, 2200 yards, and 2300 yards from the center of the explosion, the Gun Directors, Mark 51, (and Mods.) were not damaged by the effects of the explosion.

TEST "B" (continued)

FIRE CONTROL (continued)

GUN DIRECTOR, Mark 51 (continued)

On the U.S.S. MUGFORD (DD-389), about 2500 yards distant from the point of origin of the explosion, the Gun Director, Mark 51, Mod. 1, sustained no damage, while on the Gun Director, Mark 51, Mod. 2, the elevation locking-pin was found to be broken.

The Gun Directors, Mark 51 (and Mods) installed in the U.S.S. WAINWRIGHT (DD-419), U.S.S. CARTERET (APA-70), U.S.S. NIAGARA (AFA-87), U.S.S. CONYNGHAM (DD-371) and U.S.S. CORTLAND (APA-75) were at approximate distances of over 2500 yards from the center of the explosion and sustained no damage from the effects of the explosion.

GUN FIRE CONTROL SYSTEM Mark 57

Two Gun Fire Control Systems, Mark 57, were mounted on the port and starboard sides of the boat deck in the U.S.S. PENNSYLVANIA (BB-38) which was located at a distance of approximately 1400 yards from the center of the blast, but the systems were not damaged by the effects of the underwater explosion of the nuclear fission bomb.

GUN FIRE CONTROL SYSTEM, Mark 63

Two Gun Fire Control Systems, Mark 63, were mounted in the U.S.S. PENSACOLA (CA-24) at a distance of approximately 700 yards from the center of the underwater explosion of the atomic bomb.

The starboard system had been demolished during Test "A", but the port system sustained no damage attributable to the effects of Test "B".

Four Gun Fire Control Systems, Mark 63, were mounted in the U.S.S. PENNSYLVANIA (BB-38), approximately 1400 yards distant from the center of the explosion. The four Gun Sights, Mark 15, Mod. 12, used in these systems had been removed after Test "A", but a new sight had been installed and aligned in the port forward system prior to Test "B". The systems were not damaged by the effects of the underwater explosion of the nuclear fission bomb.

TORPEDO DIRECTORS, Mark 27

The only damage to the Torpedo Director, Mark 27, Mod. 1, Serial #6984 starboard, located in the U.S.S. MAYRANT (DD-402) at a distance of approximately

TEST "B" (continued)

FIRE CONTROL (continued)

TORPEDO DIRECTORS, Mark 27 (continued)

800 yards from the point of the underwater explosion of the atomic bomb, where the window over the own ship and target dial group was found to have been broken, probably by falling debris; and five input knob mechanisms were frozen by corrosion, rendering the director inoperable.

TORPEDO COURSE INDICATOR

Torpedo course indicators were installed on the following named ships at the approximate distances from the point of the underwater explosion of the nuclear fission bomb as listed below:

1.	U.S.S. HUGHES (DD-410)	700 yards
2.	U.S.S. MAYRANT (DD-402)	800 yards
3.	U.S.S. TRIPPE (DD-403)	1100 yards
4.	U.S.S. MUSTIN (DD-413)	1300 yards
5.	U.S.S. WILSON (DD-409)	1400 yards
6.	U.S.S. RALPH TALBOT (DD-390)	1800 yards
7.	U.S.S. STACK (DD-406)	1800 yards
8.	U.S.S RHIND (DD-404)	2200 yards
9.	U.S.S. MUGFORD (DD-389)	2500 yards
10.	U.S.S. WAINWRIGHT (DD-419)	2800 yards
11.	U.S.S. CONYNGHAM (DD-371)	3500 yards

After Test "B" condensed moisture was observed inside the case of the Torpedo Course Indicator, Mark 1, Mod. 1, Serial #6218, located in the U.S.S. WILSON (DD-409) at a distance of about 1400 yards from the center of the explosion.

FUZE SETTERS

The only Fuze Setter damaged in Test "B" was the Fuze Setter, Mark 8, Mod. 5, located in the U.S.S. MUGFORD (DD-389) at a distance of approximately 2500 yards from the point of explosion of the nuclear fission bomb, was energized and it was found that operation of the selector switch lever to "manual" position allowed the pilot and power motors to continue in operation. The operation of the fuze setter with the selector lever in "Auto" position was normal.

TEST "B" (Cont'd)

FIRE CONTROL (Cont'd)

SUBMARINE FIRE CONTROL (Cont'd)

The Target submarines having fire control installations were located at the following approximate distances from the center of the underwater explosion of the nuclear fission bomb:

U.S.S. PILOTFISH (SS-386)	300 yards
U.S.S. APOGON (SS-308)	800 yards
U.S.S. DENTUDA (SS-335)	1300 yards
U.S.S. PARCHE (SS-384)	1500 yards
U.S.S. SKATE (SS-305)	1500 yards

The U.S.S. SKATE and the U.S.S. PARCHE were on the surface and the U.S.S. APOGON, U.S.S. DENTUDA and U.S.S. PILOTFISH were submerged at various depths during the test. The Test "B" explosion sank the U.S.S. PILOTFISH and the U.S.S. APOGON, but there was no material damage to fire control installations on any of the submarines inspected.

TEST "B"

FIRE CONTROL RADAR

The Fire Control Radar Equipment, Mark 4, Mod. 0, Serial #1231, located in the U.S.S. HUGHES (DD-410) at a distance of about 700 yards from the point of the underwater explosion of the nuclear fission bomb, was severely damaged by the effects of the explosion, but the CW66AAH Antenna Assembly had been so heavily damaged by the "A" Test that it was not possible to make a complete assessment of "B" damage to the antenna structure. No additional dipoles were broken by the effects of the underwater blast. The CW50ABH Automatic Gain Control Unit was shocked from its shelf and was left supported only by the attached cables. The glass in meter M-1 was broken. The CW20AAE Regulated Rectifier Unit was found shocked out of its cabinet. Many of the glass envelopes of this unit's vacuum tubes were shattered. The left side-cover of the CW43AAC Main Frame was hanging by one bolt. The corner of the cover had been driven through the bulkhead of the compartment. The lower right-hand door giving access to the CALD50EC Duplexing Panel was frozen shut. The glass was broken in meter M-2 of the CW35AAD Modulation Unit. The wiring and components of the modulation unit were damaged by corrosion caused by the decontamination procedures. The green plastic receiver-tune dial of the CW46AAC Receiver was broken. The wiring and component parts of the receiver were damaged by corrosion caused by the decontamination procedures. In the CW52AAF Transmitter, the magnetron supporting yoke was torn from the chassis and was shifted forward about one inch. The metal-to-glass seals on the filament and output leads of the magnetron (V4), a type CWE700 vacuum tube, were broken. The glass envelopes of V1 and V2, type 705A vacuum tubes, were shattered and the elements were considerably damaged. In the CW20AAF High Voltage Rectifier, V1 and V2, the two type 705A rectifier tubes suffered shattered envelopes. The units in the director suffered no apparent damage from shock, but were all corroded by the action of the water, chemicals, and detergents used in the decontamination process. (See photograph No. ABCR 76-1932-4).

The Fire Control Radar Equipment, Mark 22, Mod. 0, Serial #518, located in the U.S.S. HUGHES (DD-410) at a distance of about 700 yards from the point of the explosion in the "B" test, did not appear to be damaged by the effects of the explosion; but the damage incurred in Test "A" and the additional corrosion caused by the water, chemicals, and detergents used in decontamination procedures combined to render any assessment of Test "B" damage unreliable.

The Fire Control Radar Equipment, Mark 28, Mod. 2, Serial #356, located on the port Gun Fire Control System, Mark 63, in the U.S.S. PENSACOLA (CA-24) at a distance of about 700 yards from the point of origin of the underwater explosion of the nuclear fission bomb, was not significantly damaged by the effects of the explosion. The CW66AJK Antenna Assembly was removed prior to the test. The equipment was not energized, but the other units appeared to

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

remain undamaged although the socket of the cathode-ray tube in the CW23ADK Train and Elevation Indicator Control was separated from the tube protective cover-shield.

The Fire Control Radar Equipment, Mark 28, Mod. 2, Serial #357, located on the starboard Gun Fire Control System, Mark 63, in the U.S.S. PENSACOLA (CA 24) at a distance of about 700 yards from the point of explosion, was not damaged by the effects of the explosion. The CW66AJK Antenna Assembly was severely damaged in Test "A", but no additional damage attributable to Test "B" was observed. The framework containing the below-decks units was shocked loose from its shock mountings and came to rest four feet away from its original position, however, the associated cables were all intact and a thorough visual inspection failed to reveal any further damage.

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #559, located on the after Gun Director, Mark 33, in the U.S.S. PENSACOLA (CA 24) at a distance of about 700 yards from the point of origin of the underwater burst was not seriously damaged by the effects of the burst. The paraboloidal reflector of the CW43ACK Transmitter Antenna Assembly was slightly bulged by effects of Test "A" but no additional damage due to Test "B" was observed. The sighting periscope of the CW55AFA Elevation Indicator Unit was missing. The three securing-bolts of the periscope were broken at the surface of the indicator unit. A thorough visual inspection failed to reveal any further damage.

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #569, located on the forward Gun Director, Mark 35, in the U.S.S. PENSACOLA (CA 24) at a distance of approximately 700 yards from the Test "B" explosion was not damaged during Test "B". The paraboloidal reflector of the CW43ACK Antenna-Transmitter Unit had been damaged in Test "A", but no additional damage caused by the effects of the Test "B" was noted. The shock-mounts of the framework holding the below-decks units failed, but a thorough visual examination of the equipment failed to reveal any further damage.

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #571, located on the after Gun Director, Mark 35, in the U.S.S. PENSACOLA (CA 24) at a distance of about 700 yards from the point of origin of the explosion was rendered inoperative by the effects of the explosion. The paraboloidal reflector and the antenna and feed assembly of the CW43ACK Antenna-Transmitter Unit were removed by the blast in Test "A" and were not replaced prior to Test "B". The connection to the plate-cap of V2, the type 705A charging diode in the CW43ACK Transmitter Unit, was shocked loose from the plate cap. The three holding-bolts of the CW55AFA Elevation Indicator and those of the CW55AFA Train Indicator were loosened by the shock. The framework holding the below-decks units was completely shocked loose from its shock-mountings. The framework came to rest about 1½ feet from its original location and remained in an upright position.

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

All cabling was intact and no vacuum tubes appeared to be broken. The equipment was not energized because of lack of power.

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #575, located in the forward Gun Director, Mark 33, in the U.S.S. PENSACOLA (CA 24) at a distance of about 700 yards from the point of explosion was made inoperative by the effects of the explosion. The paraboloidal reflector and the antenna and feed assembly of the CW43ACK Antenna-Transmitter Unit were damaged during Test "A" but were replaced by spares prior to Test "B". After Test "B" it was found that the antenna trunnion support-beams were cracked near the base where they were secured to the director. Both beams had longitudinal cracks about four inches long on the outer face of the beam near the lower side. The left-hand beam also had a transverse crack between the top and second securing bolts on the flat inside portion next to the director. In the CW83AAA automatic Frequency Control Unit, V4, a type 6SQ7 vacuum tube, and V1 and V2, type 6AC7 vacuum tubes, suffered fractured glass envelopes. The periscope on the CW55AEA Train Indicator Unit was found separated from the indicator unit. The shock caused by the underwater explosion caused the three small periscope securing-screws to fail. The screws holding the periscope on the CW55AFA Elevation Indicator Unit also failed. No power was available to energize the equipment, but a thorough visual check failed to reveal any further damage. (See Photographs ABCR-78-1715-3 and 4).

The Fire Control Radar Equipment, Mark 28, Mod. 3, Serial #501, located on the Gun Director, Mark 33, Mod. 9, in the U.S.S. MAYRANT (DD 402) at a distance of approximately 800 yards from the point of origin of the explosion, was undamaged by the effects of the explosion. A thorough visual inspection of the equipment was made although the equipment was not energized because of lack of power.

The Fire Control Radar Equipment, Mark 3, Mod. 2, Serial #72, located on Spot 2 in the U.S.S. NEVADA (BB 36) at a distance of about 1000 yards from the point of explosion, was rendered inoperative by the effects of the explosion. The CW66AAE Antenna Unit had been destroyed by the blast during Test "A" and had not been replaced prior to Test "B". The glass envelope of V-2, a type 701A vacuum tube in the keyer circuit of the CW52AAF Transmitter, was broken, and its companion vacuum tube, V1, was forced out of its socket by the shock. The shaft of the "intensity" control of the CW55AAB Control and Indicator Unit was broken at the universal joint and the wiring of the unit was disordered. The director carrying the CW55AAC Train and Elevation Indicator Units was broken at the base, but the units themselves exhibited no physical damage.

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

The Fire Control Radar Equipment, Mk. 12, Mod. 0, Serial # 115, mounted on the forward Gun Director, Mk. 37, in the U.S.S. NEVADA (BB-36), approximately 1000 yards distant from the point of explosion, was only lightly damaged by the effects of the explosion. The CW66AFF Antenna Assembly was heavily damaged during Test "A" and was removed from the ship prior to Test "B", therefore no estimate could be made of the effect of Test "B" on the condition of the antenna structure or on the overall operational efficiency. There was no evidence of damage to units in the director except for a slight amount of salt-water corrosion in the improperly-secured CW43AB4 Radar Transmitter-Receiver Assembly. The range knob of the below-decks CW23AFB Range Unit was found to have been forced loose from the shaft. The blower motor, KS-5856, in the CW-10213 Blower-Filter Assembly was defective and drew sufficient current to cause failure of the associated fuses. No other defects appeared when power was applied.

The Fire Control Radar Equipment, Mk. 12, Mod. 0, Serial # 232, located on the after Gun Director, Mk. 37, in the U.S.S. NEVADA (BB-36), at a distance of about 1000 yards from the point of origin of the explosion, was rendered inoperative by the effects of the explosion. The CW66AFF Antenna Assembly was heavily damaged during Test "A" and was removed from the ship prior to Test "B", therefore no estimate could be made of the effect of Test "B" on the condition of the antenna structure or on the overall operational efficiency. A type 313C vacuum tube, V2, in the CW23ADP Power Control Unit was broken at the base. In the CW46ACP Receiver Unit, three vacuum tubes had envelopes loose from the base although the glass was unbroken. The three vacuum tubes were V11, a type 6SN7GT vacuum tube, V12, a type 6SL7GT vacuum tube, and V17, a type 6K6GT vacuum tube. In the CW50ACQ Indicator Circuit Unit, V7, a type 6L6G vacuum tube, and V8, a type 6SA7 vacuum tube were also loosened from their bases, and a similar condition was observed in five vacuum tubes in the CW50ACR Range Correction Unit.

The Fire Control Radar Equipment, Mk. 22, Mod. 0, Serial # 227, located on the forward Gun Director, Mk. 37, in the U.S.S. NEVADA (BB-36) at a distance of approximately 1000 yards from the center of the explosion, was lightly damaged by the direct effects of the explosion. The CW66AGT Antenna Assembly, the 21AGM Antenna Drive Unit, and the CW-43ACJ Transmitter-Receiver Unit had been damaged by the blast of Test "A" and were removed prior to Test "B", therefore no estimate could be made of the overall operational efficiency, or of the condition of the antenna structure. The CW50ADQ Amplifier-Power Assembly in the director had been improperly secured, allowing the salt-water used in decontamination procedures to leak in around the gaskets. Corrosion and damage to the insulation was so extensive that the entire unit required replacement. It is believed

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

that the unit would have been only slightly damaged if it had been tightly dogged-down. The shock jarred the CW50ADS Modulator Unit from its mounting, but the loosened unit did not seriously damage the adjacent equipment.

The Fire Control Radar Equipment, Mk. 22, Mod. 0, Serial 228, mounted on the after Gun Director, Mk. 37, in the U.S.S. NEVADA (BB-36) located at a distance of about 1000 yards from the center of the explosion, was rendered inoperative by the effects of the explosion. The CW66AGT Antenna Assembly, the 21ACM Antenna Drive Unit, and the CW-42ACJ Transmitter-Receiver Unit had been damaged by the blast of Test "A" and were removed prior to Test "B", therefore no estimate could be made of the overall operational efficiency, or of the condition of the antenna structure. In the CW50AIQ Amplifier-Power Assembly, switch S906, and resistor R924, located on the inside of the door were broken by being struck by units adrift inside the cabinet. The CW50ADS Modulator Unit was dented on its front top edge and was forced out of its track. The type 705A vacuum tube in the lower right-hand side of the modulator unit was forced out of its socket, but the glass envelope was unbroken. Terminal strips TS1007 and TS1008 were smashed by the modulator unit. The CW55AEN Indicator Circuit Unit was damaged by the corrosive chemicals used in the decontamination procedures.

The Fire Control Radar Equipment, Mk. 28, Mod. 3, Serial 532, located in Spot I in the U.S.S. NEVADA (BB-36), about 1000 yards distant from the point of origin of the underwater explosion, was rendered inoperative by the effects of the explosion. The paraboloidal perforated metallic reflector of the CW-43ACK Radar Transmitter and Antenna Assembly had been distorted by the blast in Test "A", but the structure was restored as well as possible to normal condition prior to Test "B" and no further damage was observed as due to the effects of the underwater explosion. One filament-lead seal of the magnetron was broken by the shock in Test "B", and the dipole spinner did not operate freely. The magnetron was replaced, power was applied, and echoes were obtained.

The Fire Control Radar Equipment, Mk. 3, Mod. 1, Serial 27, located in Spot 1 of the U.S.S. NEW YORK (BB-34) at a distance of approximately 1200 yards from the center of the explosion, was severely damaged by the effects of the explosion. The CW66AAE Antenna was shocked from its mount and fell about twenty feet to a 20 MM Machine Gun platform. The Antenna was thrown over the side by the ship's force before a complete inspection could be made, but observations through binoculars from the main deck while the antenna was still in the ship, revealed that the antenna structure had suffered little damage except for the broken mounting brackets. All but one of the holding bolts in the mounting bracket were missing. A small fragment of the cast-aluminum-alloy antenna supporting bracket remained fastened by the single bolt. Broken insulation was

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

discovered in the female coaxial fitting to the intermediate frequency line of the CAOS-50AEY Video Converter. In the CW52AAF Transmitter, the rear type 701A vacuum tube had a shattered glass envelope, and the metal-to-glass seal of one of the filament leads of the type 700 magnetron tube was broken. All the fuses in the CW23AAB Control Panel were shocked out of their holding clips. The broken vacuum tubes were then replaced by intact ones, the fuses were replaced, and the equipment was energized. It was found that the plate voltage safety relay, S1, on the CW50AAF Duplexing Panel (D-150270) would not close electrically, and that it was necessary to close the contacts manually. Once closed, the contacts remained made. Normal operation was obtained insofar as it was possible to determine in the absence of the antenna.

The Fire Control Radar Equipment, Mk. 3, Mod. 1, Serial 32, located in Spot 3 of the U.S.S. NEW YORK (BB 34) at a distance of approximately 1200 yards from the point of origin of the explosion probably was not damaged by the effects of the explosion. The CW66AAE Antenna had been broken from its mounting by the shock and blast of Test "A", and was not replaced prior to Test "B". The CW55AAC Train Indicator Unit and the CW55AAB Control and Indicator Unit were found to be damaged, but it was not possible to determine whether this damage was due to shock or to the impact of other fire control equipment that was broken from its mountings. A thorough visual inspection revealed no damage in the units in the CW43AAC Main Frame, although the main frame was installed in a considerably lower level of the ship than that of the forward Fire Control Radar Equipment, Mk. 3. The equipment was energized and normal operation was obtained insofar as could be determined in the absence of the antenna.

The Fire Control Radar Equipment, Mk. 3, Mod. 0, Serial 14, located in Spot I of the U.S.S. SALT LAKE CITY (CA-25) at a distance of approximately 1200 yards from the center of the explosion was not energized after Test "B", but a thorough visual inspection revealed that the equipment had been rendered inoperative by the effects of the underwater explosion. The CW66AAE Antenna had been demolished by the blast of Test "A" and was not replaced prior to Test "B". In the CW52AAF Transmitter, V1, a type 701-A vacuum tube, had a broken glass envelope, V2, a type 701-A vacuum tube, was shocked from its socket, and V3, a type 705A vacuum tube, was also shocked from its socket. The coaxial output lead from V4, a type 700 magnetron tube, was loosened from the tube, but the magnetron was not damaged.

The Fire Control Radar Equipment, Mk. 3, Mod. 0, Serial 105, located in Spot 2, in the U.S.S. SALT LAKE CITY (CA-25), approximately 1200 yards distant from the center of the explosion, was not energized after Test "B", but a thorough visual inspection revealed that the equipment had been rendered inoperable by the effects of the test. The CW66AAE Antenna had been demolished

TEST "A" (Cont'd)

Fire CONTROL RADAR (Cont'd)

by the blast of Test "A" and was not replaced prior to Test "B". In the CW52AAF Transmitter, V2, a type 701-A vacuum tube, had a shattered glass envelope, and the metal-to-glass seal of one filament lead of V4, a type 700 magnetron tube, was broken.

The Fire Control Radar Equipment, Mk. 4, Mod. 0, Serial 206, located on the forward Gun Director, Mk. 33 in the U.S.S. SALT LAKE CITY (CA-25) at a distance of about 1200 yards from the center of the explosion, was not energized after Test "B", but a thorough visual inspection revealed that the equipment was rendered inoperative by the effects of the explosion. The CW66AAH Antenna had been damaged during Test "A" and was removed prior to Test "B". In the CW52AAF Transmitter, V1 and V2, type 701A vacuum tubes, had shattered glass envelopes, while V3, a type 705A vacuum tube, was shocked from its socket. In the CW20AAF High Voltage Rectifier, V1 and V2, type 705A vacuum tubes, were shocked from their sockets. The shock loosened the knurled screws holding the CW43AAC Main Frame side covers. The shock-mounts on the top of the CW35AAB Control and Indicator Unit failed in tension.

The Fire Control Radar Equipment, Mk. 10, Mod. 5, Serial 27, located on the forward Gun Director, Mk. 50, in the U.S.S. NEW YORK (BB 34) at a distance of about 1200 yards from the point of origin of the explosion, was rendered inoperative by the effects of the explosion. The two stuffing-tubes in the director pedestal on the starboard side which carried the cables to the 46ABH Transmitter and Antenna were broken and salt-water used in the decontamination processes ran down onto the terminal strips. The cast aluminum-alloy antenna pedestal was cracked at the base along the after edges of the after flanges. The equipment was inoperative when energized, but a visual inspection of the units failed to reveal any signs of further damage. The cross-level input had about three degrees of play, while the level input to the antenna had about five degrees of play.

On the Fire Control Radar Equipment, Mk. 28, Mod. 0, Serial 3, located on the Gun Director, Mk. 33, in the U.S.S. SALT LAKE CITY (CA-25) at a distance of approximately 1200 yards from the center of the explosion, the paraboloidal reflector and the antenna scan assembly of the CW43ACK Antenna-Transmitter Assembly were damaged during Test "A", but were replaced by undamaged units prior to Test "B". It was found that the CW43ACK Antenna Assembly was not damaged by the effects of the underwater explosion except that a small dent, apparently made by some missle, had appeared in the surface of the paraboloidal reflector. The decontamination procedures caused slight corrosion of some of the parts of the antenna and the main frame units. The equipment was not energized after Test "B", but the results of a thorough visual inspection indicated that it was in operating condition.

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

The Fire Control Radar Equipment, Mk. 12, Mod. 1, Serial 499, installed in the port Gun Director, Mk. 37, located in the U.S.S. PENNSYLVANIA (BB 38) at a distance of about 1400 yards from the point of origin of the underwater explosion of the nuclear fission bomb, was heavily damaged by the effects of the explosion. The journal of the antenna cross-level bearing was forced forward and out of the rear bearing. The forward cross-level bearing support was bent forward and the bearing was jammed. The left-hand cantilever level trunnion support beam was cracked in the vertical web at the end next to the main cross-level beam. The elevation trunnion bearing on the forward end of the left-hand cantilever beam was cracked along the after side of the weld holding the bearing to the beam. The weld on the right-hand elevation trunnion bearing was cracked in a similar manner. The test oscilloscope at the main frame was shocked off its shelf to the deck. The equipment received good echoes of ships to 4,000 yards despite the damage to the antenna structure. (See Photographs ABCR-76-1934-12 and ABCR-76-2076-2 and 3).

The Fire Control Radar Equipment, Mk. 12, Mod. 1, Serial 500, located in the starboard Gun Director, Mk. 37, in the U.S.S. PENNSYLVANIA (BB 38), approximately 1400 yards distant from the point of explosion, was seriously damaged by the effects of the explosion. The antenna cross-level main supporting beam was twisted near the left end. The bottom side, front side, and the end of the beam were split from the main body of the beam along the edges. Part of this damage was apparently caused by the inertial resistance to the thrust of the vertical cross-level input rod. The coaxial transmission line was severely dented at the bend at the point where it enters the center of the cross-level trunnion support beam. The left cantilever trunnion support beam was cracked across the top near the after section of the beam. The right-hand side of the main cross-level support beam showed a small crack near the bottom outboard end. The forward face of the beam was slightly distorted in the vicinity of the cut-out portion of the beam-face. The top connecting-brace between the forward and after cross-level trunnion bearings probably prevented the bearings from spreading apart. This brace was not present on the antenna mount of the Radar Equipment, Mk. 12, on the port dual purpose Gun Director, Mk. 37, and the torque produced by the shock caused the bearings to spread. It is probable that any additional shock would entirely dislodge the antenna structure. It was impossible to receive echoes when the equipment was energized, but no damage other than that to the antenna was evident. (See Photograph ABCR-76-2075-3).

The Fire Control Radar Equipment, Mk. 22, Mod. 0, Serial 446, located in the starboard Gun Director, Mk. 37, in the U.S.S. PENNSYLVANIA (BB 38) at a distance of about 1400 yards from the center of the explosion, was lightly damaged by the effects of the explosion. The CW36A9T Antenna Assembly was not damaged, but the shock caused the CW60A/DS Modulator to break loose from its securing screws, and V102, a type 5829 vacuum tube, was loosened from its socket.

S-E-C-R-E-T

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

Vacuum tube V501-3, a type 6H6-GT/G vacuum tube in the D-151708 Automatic Frequency Control Unit of the 55AEN Indicator Circuit Unit, had bent prongs and a broken key in its octal base. No further damage was observed when the equipment was energized.

The Fire Control Radar Equipment, Mk. 22, Mod. 0, Serial 457, installed in the port Gun Director, Mk. 37, in the U.S.S. PENNSYLVANIA (BB-38), approximately 1400 yards distant from the point of origin of the explosion, exhibited no visible damage to the CW66AGT Assembly or in the CW50ADQ Amplifier-Power Assembly, but when the equipment was energized fuze J908 failed.

The Fire Control Radar Equipment, Mk. 28, Mod. 3, Serial 262, located on the after port Gun Fire Control System, Mk. 63, in the U.S.S. PENNSYLVANIA (BB-38) at a distance of about 1400 yards from the center of the explosion was lightly damaged by the effects of the explosion. The paraboloidal surface of the reflector of the CW66AJQ Antenna Assembly was slightly distorted around the supporting spider. The train locking mechanism was frozen because the shock had caused the antenna assembly to bend the locking-pin. The Equipment appeared to operate normally, but echoes could not be obtained because of damage to the antenna dipole spinner sustained in Test "A". The plexiglas antenna cover was broken by the shock in Test "B". (See Photograph ABCR 76-1934-11).

On the Fire Control Radar Equipment, Mk. 28, Mod. 2, Serial 263, installed on the after starboard Gun Fire Control System, Mk. 63, in the U.S.S. PENNSYLVANIA (BB-38), about 1400 yards distant from the point of origin of the explosion, the paraboloidal reflector of the CW66AJQ Antenna Assembly was slightly bulged in the vicinity of the arms of the supporting spider, but normal echoes were obtained in operation.

The Fire Control Radar Equipment, Mk. 29, Mod. 2, Serial 44, located on the port Gun Fire Control System, Mk. 57, in the U.S.S. PENNSYLVANIA (BB-38), about 1400 yards distant from the point of burst, had been damaged by fire in Test "A", and was inoperative prior to Test "B", but a careful inspection after Test "B" failed to disclose any additional damage except that V5, a type 6L6G vacuum tube in the CGH35AF Modulator Generator was shocked out of its socket. The glass envelope of the vacuum tube was unbroken.

The Fire Control Radar Equipment, Mk. 29, Mod. 2, Serial 61, located in the starboard Gun Fire Control System, Mk. 57, of the U.S.S. PENNSYLVANIA (BB-38) at a distance of approximately 1400 yards from the center of the explosion was rendered inoperative by the effects of the explosion. It was found that V203, the type 829-A vacuum tube in the CGH50AFG Modulator Unit, had sustained a cracked seal around pin four. This vacuum tube was replaced by an unbroken one, the equipment was energized, and apparently normal operation was obtained although no echoes were visible because the transmitter was coupled into a dummy antenna.

S-E-C-R-E-T

Enclosure (D) to Director Ship Material Serial 001500.

TEST "B" (Cont'd)

FIRE CONTROL RADAR (Cont'd)

On the Fire Control Radar Equipment, Mk. 4, Mod. 0, Serial 115, located on the Gun Director, Mk. 33 in the U.S.S. RALPH TALBOT (DD 390) at a distance of about 1800 yards from the center of the explosion, the dial-glass of the CW-22AAD Train Meter and that of the Elevation Meter were found to be broken. No power for energizing the equipment was available, but a thorough visual inspection failed to reveal any damage attributable to the effects of Test "B" other than that described above.

The Fire Control Radar Equipment, Mk. 28, Mod. 0, Serial 79, located on the Gun Director, Mk. 33, in the U.S.S. MUGFORD (DD 389) at a distance of approximately 2500 yards from the point of origin of the underwater explosion, was energized and normal grass and good echoes were received. It was found that the radar line-of-sight had shifted 0.3 degrees to the right from its former line-of-sight. The comparison was made against the optical line-of-sight of the Gun Director, Mk. 33. No other damage or misalignment was found.

The Fire Control Radar Equipment, Mk. 4, Mod. 1, Serial 87, located on the Gun Director, Mk. 33, in the U.S.S. CONYNGHAM (DD 371) about 3400 yards distant from the center of the explosion, was energized. Normal grass and good echoes appeared on the screens of the cathode-ray tubes, but the screen of V13, a type 1803-P1 cathode-ray tube in the CW55AAB Control and Indicator Unit, exhibited a double trace. The equipment was in aligrment with the optical equipment in both range and train.

TABLE OF DAMAGE TO FIRE CONTROL EQUIPMENT

TEST "A" AND "B"

KEY TO TABLE OF DAMAGE

* Did not operate prior to Test "A".

1. Operated at normal efficiency.

2. Operated at reduced efficiency.

3. Inoperable after test.

A. Undamaged.

B. Moderate damage.

C. Heavily damaged (wrecked).

P. Primary causes.

S. Secondary causes.

N. Natural or miscellaneous causes.

DAMAGE TO FIRE CONTROL EQUIPMENT

U.S.S. ARKANSAS (BB 33)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	6	45043	Port Foremast	3*	
Gunsight	14	6	45238	Port Signal Bridge	1A	
Gunsight	14	6	83568	Port Signal Bridge	3*	
Gunsight	14	6	94167	Stbd. Mainmast	1A	
Gunsight	14	6	94716	Port Mainmast	1A	
Gunsight	14	6	94926	Stbd. Signal Bridge	3CP*	
Gunsight	14	6	96122	Stbd. Signal Bridge	3BP	
Gunsight	14	6	96329	Stbd. Mainmast	3CP*	
Gunsight	14	8	104238	#4-51 Director	3BP	
Gunsight	14	8	159112	#3-51 Director	3CP	
Gunsight	15	2	215	Aft Stbd. 51 Director	3BP	
Gunsight	15	2	567	Aft Port 51 Director	3BP	
Gunsight	15	2	1910	Fwd. Port 51 Director	1A	
Gunsight	15	2	1912	Fwd. Stbd. 51 Director	3BP	
Rangefinder	10	1	3	#5 Turret	3CP	
Rangefinder	10	1	20	#2 Turret	3CP	
Rangefinder	54	0	6	Altimeter Plat. Port	3CPS	
Rangefinder	54	0	8	Altimeter Plat. Stbd.	1BS	
Rangefinder	58	0	81	Fwd. Mark 50 Dir.	3BPS	
Rangefinder	58	0	203	Aft Mark 50 Director	3*	

U.S.S. ARKANSAS (BB 33) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Periscope	6	2	79	#3 Turret	3CS	
Periscope	6	2	171	#4 Turret	1A	
Periscope	6	2	207	#5 Turret	3CS	
Periscope	6	2	309	#6 Turret	2BP	
Periscope	6	2	377	#2 Turret	1A	
Periscope	6	2	432	#1 Turret	1A	
Periscope	7	0	70	F.C. Tower	1A	
Periscope	7	0	93	#1 Observer	1A	
Periscope	7	2	146	#2 Observer	1A	
Periscope	7	2	147	#3 Turret	1A	
Periscope	7	2	175	#4 Turret	1A	
Periscope	7	2	194	Spot I	3CP	
Telescope	15	6	7	#6 Turret	1A	
Telescope	15	6	8	#2 Turret	1A	
Telescope	15	6	12	#1 Turret	1A	
Telescope	15	6	15	#5 Turret	1A	
Telescope	15	6	33	#6 Turret	1A	
Telescope	15	6	42	#1 Turret	1A	
Telescope	15	6	43	#4 Turret	1A	
Telescope	15	6	44	#3 Turret	1A	
Telescope	15	6	54	#4 Turret	1A	
Telescope	15	6	56	#3 Turret	1A	

U.S.S. ARKANSAS (BB 33) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After Test Able	Baker
Telescope	15	6	61	#5 Turret	1A	
Telescope	15	6	69	#2 Turret	1A	
Telescope	17	3	125	#6 Turret	1A	
Telescope	17	4	225	#4 Turret	1A	
Telescope	17	5	362	#1 Turret	1A	
Telescope	17	5	364	#2 Turret	1A	
Telescope	17	5	404	#3 Turret	1A	
Telescope	17	5	406	#5 Turret	1A	
Telescope	20	1	41	#13-5"/51	3BP	
Telescope	20	1	54	#9-5"/51	3BP	
Telescope	20	1	141	#14-5"/51	1A	
Telescope	20	1	145	#10-5"/51	3BP	
Telescope	20	1	177	#13-5"/51	1A	
Telescope	20	1	196	#12-5"/51	1A	
Telescope	20	2	228	#10-5"/51	3BP	
Telescope	20	2	233	#12-5"/51	1A	
Telescope	20	2	255	#14-5"/51	3BP	
Telescope	20	2	256	#11-5"/51	1A	
Telescope	20	3	305	#11-5"/51	1A	
Telescope	20	3	313	#9-5"/51	1A	
Telescope	27	7	1301	Dir. #1	1A	
Telescope	27	7	1706	Dir. #2	1A	

U.S.S. ARKANSAS (BB 33) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	27	7	2439	Spot I	3BP	
Telescope	28	7	2130	Director #2	1A	
Telescope	28	7	2929	Director #1	1A	
Telescope	74	0	2599	#3-3"	3CP	
Telescope	74	0	2602	#4-3"	1A	
Telescope	74	0	2626	#3-3"	1A	
Telescope	74	0	2628	#1-3"	1A	
Telescope	74	0	2652	#2-3"	1A	
Telescope	74	0	2657	#2-3"	1A	
Telescope	74	0	2723	#1-3"	1A	
Telescope	74	0	32176	#4-3"	1A	
Directorscope	2	4	168	Spot I	3BP	
Directorscope	4	1	35	F.C. Tower	1A	
Computer	10	1	16	Fwd.	1A	
Computer	10	1	18	Aft	2BS	
Rangekeeper	1	6	22	M.B. Plot	1A	
Rangekeeper	1	6	87	M.B. Plot	1A	
Rangekeeper	2	0	198	Fwd. Secondary	3CP	
Rangekeeper	2	0	216	Fwd. Secondary	3CP	
Gun Director	7	3	1	Fwd. Secondary	3CP	
Gun Director	7	3	2	Fwd. Secondary	3CP	

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gun Director	50	4	17	Fwd. Air Defense	3BP*	
Gun Director	50	4	19	Aft Air Defense	3BP*	
Gun Director	51	2	10611	Port Boat Deck	3BS	
Gun Director	51	2	15068	Stbd. Boat Deck	1BP	
Gun Director	51	3	5563	Fwd. Stbd. Air Defense	1A	
Gun Director	51	3	5570	Fwd. Port Air Defense	3BS	
Gun Director	51	3	11742	Aft Port Air Defense	3BPS	
Gun Director	51	3	11747	Aft Stbd. Air Defense	3BPS	
Fuzesetter	2	1	2399	#1-3"	1A	
Fuzesetter	2	1	2528	#2-3"	3BS	
Fuzesetter	2	1	8745	#9-3"	3BP	
Fuzesetter	2	1	8746	#10-3"	1A	
Target Designator Transmitter	9	0	63	CIC	3BP	
Target Designator Transmitter	9	0	85	Aft Air Defense	3BP	
Target Designator Transmitter	9	0	95	Fwd. Air Defense	3BP	
Target Bearing Transmitter	1	5	35	Spot I	3CP	
Target Bearing Transmitter	2	7	5	Conning Tower	1A	

U.S.S. ARKANSAS (BB 33) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Target Bearing Transmitter	2	7	9	Conning Tower	1A	
Gun Train Indicator	23	8	384	#1-3"	2BP	
Gun Train Indicator	23	8	389	#3-3"	1A	
Gun Train Indicator	23	8	401	#2-3"	1A	
Gun Train Indicator	23	8	2490	#4-3"	1A	
Gun Elevation Indicator	21	3	8	#1-3"	1A	
Gun Elevation Indicator	21	3	182	#2-3"	1A	
Gun Elevation Indicator	21	3	264	#3-3"	1A	
Gun Elevation Indicator	21	4	77	#4-3"	2AS	
Elevation Receiver	1	1	230	Air Castle Port	1A	
Elevation Receiver	1	1	236	Port-5"/51	1A	
Elevation Receiver	1	1	239	Port-5"/51	1A	
Elevation Receiver	1	1	247	Port-5"/51	1A	
Elevation Receiver	1	1	249	Stbd.-5"/51	1A	

U.S.S. ARKANSAS (BB 33) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Elevation Receiver	1	1	250	Stbd.-5"/51	1A	
Elevation Receiver	1	1	254	Stbd.-5"/51	3BS	
Train Receiver	1	1	68	Stbd.-5"/51	3CPS	
Train Receiver	1	1	74	Stbd.-5"/51	3BS	
Train Receiver	1	1	197	Port-5"/51	3CP	
Train Receiver	1	1	200	Stbd.-5"/51	1A	
Train Receiver	1	1	201	Port-5"/51	1A	
Train Receiver	1	1	202	Port-5"/51	1A	
Fuzesetter Transmitter	0	0	15	Air Defense Fwd.	2AS	
Fuzesetter Transmitter	0	0	16	Air Defense Aft	1A	
Fuzesetter Transmitter	0	0	17	Air Defense Aft	3BP	
Fuzesetter Transmitter	0	0	18	Air Defense Fwd.	1A	
Stable Element	6	1	680	M.B. Plot	1A	
Radar (Less Antenna)	3	1	49	Spot I	1A	
Radar (Less Antenna)	10	[illegible]	59	Sky 2	1A	
Radar (Less Antenna)	10	5	205	Sky I	2BS	
Radar (Antenna only)	3	1	49	Spot I	3CP	

U.S.S. ARKANSAS (BB 33) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test: Able	Baker
Radar (Antenna only)	10	5	59	Sky 2	3CP	
Radar (Antenna only)	10	5	205	Sky I	3CP	

U.S.S. PENNSYLVANIA (BB 38)

Gunsight	14	6	43479	#1-20MM	1A	
Gunsight	14	6	46155	#8-20MM	1A	
Gunsight	14	6	48386	#6-20MM	1A	
Gunsight	14	6	48664	#2-20MM	1A	
Gunsight	14	6	83278	#4-20MM	1A	
Gunsight	14	6	86093	#7-20MM	1A	
Gunsight	14	6	88052	#5-20MM	2A*	
Gunsight	14	6	99122	#3-20MM	1A	
Gunsight	14	8	159223	#1-51 Director	1A	2BS
Gunsight	15	12	4043	#8-63 Director	3BP	
Gunsight	15	12	4067	#2-63 Director	3BP	
Gunsight	15	12	4068	#1-63 Director	3BP	
Gunsight	15	12	4098	#7-63 Director	3BP	
Rangefinders	33	1	32	#1 Turret	3*	
Rangefinders	33	1	34	#3 Turret	1A	
Rangefinders	33	1	35	#4 Turret	1A	
Rangefinders	42	26	291	Stbd. 37 Director	1A	
Rangefinders	42	26	292	Port 37 Director	1A	
Rangefinders	45	0	16	Spot 2 - 34 Director	1A	

U.S.S. PENNSYLVANIA (BB 38) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After Test Able	Baker
Periscope	6	5	399	#1 Turret	1A	
Periscope	6	3	520	#1 Turret	1A	
Periscope	8	2	67	F.C. Tower	1A	
Periscope	8	2	81	F.C. Tower	1A	
Periscope	15	1	22	#2 Turret	1A	
Periscope	15	2	20	#3 Turret	2A*	
Periscope	17	2	17	#2 Turret	2A*	
Periscope	17	2	18	#3 Turret	1A	
Periscope	27	0	136	#7-5"/38	1A	
Periscope	27	0	204	#8-5"/38	1A	
Periscope	27	0	222	#1-5"/38	1A	
Periscope	27	0	233	#2-5"/38	1A	
Spotting Glass	4	0	100	Spot I	1A	3CP
Telescopes	22	0	124	#3 Turret	1A	
Telescopes	22	0	134	#1 Turret	1A	
Telescopes	22	0	135	#3 Turret	1A	
Telescopes	22	0	138	#4 Turret	1A	
Telescopes	22	0	139	#3 Turret	2A*	
Telescopes	22	0	142	#1 Turret	1A	
Telescopes	22	0	148	#2 Turret	1A	
Telescopes	22	0	149	#4 Turret	1A	
Telescopes	22	0	152	#3 Turret	1A	

U.S.S. PENNSYLVANIA (BB 38) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescopes	22	0	153	#2 Turret	1A	
Telescopes	22	0	157	#2 Turret	1A	
Telescopes	22	0	158	#2 Turret	1A	
Telescopes	22	0	159	#1 Turret	1A	
Telescopes	22	0	167	#1 Turret	1A	
Telescopes	22	0	246	#4 Turret	1A	
Telescopes	22	0	247	#4 Turret	1A	
Cross-Level Telescope	26	0	99	Spot 2	1A	
Telescope	26	2	12	Spot I	2B*	
Telescope	26	2	191	Spot I	2BP	
Telescope	60	0	785	Stbd. 37 Director	1A	
Telescope	60	0	809	Stbd. 37 Director	1A	
Telescope	60	0	810	Port 37 Director	1A	
Telescope	60	0	815	Stbd. 37 Director	1A	
Telescope	60	0	832	Port 37 Director	1A	
Telescope	60	0	1636	Mark 50 Director	1A	
Telescope	60	0	3109	Port 37 Director	1A	
Telescope	63	0	31	Spot 2	3A*	
Telescope	64	0	34	Spot 2	1A	
Telescope	67	0	251	#1-5"/38	1A	
Telescope	67	0	1506	#8-5"/38	1A	

U.S.S. PENNSYLVANIA (BB 38) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition after test Able	Baker
Telescope	67	0	1509	#8-5"/38	1A	
Telescope	67	0	1511	#2-5"/38	1A	
Telescope	67	0	1517	#7-5"/38	1A	
Telescope	67	0	1521	#2-5"/38	1A	
Telescope	67	0	1523	#1-5"/38	1A	
Telescope	67	0	1526	#7-5"/38	1A	
Telescope	68	0	782	#2-5"/38	1A	
Telescope	68	0	783	#8-5"/38	1A	
Telescope	68	0	786	#1-5"/38	1A	
Telescope	68	0	790	#7-5"/38	1A	
Computer	1	4	190	Sec. Batt. Plot	1A	
Computer	10			Aft Superstructure	1A	
Rangekeeper	8	63	138	Main Batt. Plot	1A	
Gun Director	20	4	10	Spot I	1A	
Gun Director	21	0	4	F.C. Tower.	1A	
Gun Director	23	1	5	#2 Turret	1A	
Gun Director	23	1	6	#3 Turret	3*	
Gun Director	34	1?	80	Spot 2	1RS	
Gun Director	37	36	209	Stbd.	1A	3BP
Gun Director	37	36	210	Port	1A	3BP
Gun Director	50	5	21	Port	3*	
Gun Director	51	2	10719	Group 2	1A	

U.S.S. PENNSYLVANIA (BB 38) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition after test Able	Baker
Gun Director	51	6	12588	#8 GFCS Mk. 63	1A	
Gun Director	51	6	12607	#7 GFCS Mk. 63	1A	
Gun Director	51	6	12686	#2 GFCS Mk. 63	1A	
Gun Director	51	6	12697	#1 GFCS Mk. 63	1A	
Gun Fire Control System	63			Fwd. Port	3BP	
Gun Fire Control System	63			Fwd. Stbd.	3BP	
Gun Fire Control System	63			Aft Port	3BP	
Gun Fire Control System	63			Aft Stbd.	3BP	
Gun Fire Control System	57	1	71	Starboard	1A	
Gun Fire Control System	57	1	75	Port	3BS	
Fuzesetter	9	0	249	#1-5"/38	1A	
Fuzesetter	9	0	251	#2-5"/38	1A	
Fuzesetter	9	0	253	#8-5"/38	1A	
Fuzesetter	9	0	255	#7-5"/38	1A	
Stable Element	6	1	449	Sec. Batt. Plotting Rm.	1A	
Stable Element	41	0	119	M.B. Plotting Room	1A	
Radar (Less antenna)	8	3	125	Spot 2	2BP	
Radar (Less antenna)	10	5	87	Mark 50 Dir. Mainmast	1A	

U.S.S. PENNSYLVANIA (BB 38) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition after test Able	Baker
Radar (Less antenna)	12	1	499	Port Director	1A	
Radar (Less antenna)	12	1	500	Starboard Director	1A	
Radar (Less antenna)	22	0	445	Starboard Director	3BP	
Radar (Less antenna)	22	0	457	Port Director	1A	
Radar (Less antenna)	28	2	262	Aft Port	1A	
Radar (Less antenna)	28	2	263	Aft Starboard	1A	
Radar (Less Antenna)	28	2	264	Fwd. Port	1A	
Radar (Less Antenna)	28	2	269	Fwd. Starboard	1A	
Radar (Less Antenna)	28	3	547	Spot I	1A	
Radar (Less Antenna)	29	2	44	Port	1A	
Radar (Less antenna)	29	2	61	Starboard	1A	
Radar (Antenna only)	8	3	125	Spot 2	1A	
Radar (Antenna only)	10	5	87	Mark 50 Dir. Mainmast	2BP	
Radar (Antenna only)	12	1	499	Port Director	1A	
Radar (Antenna only)	12	1	500	Starboard Director	1A	

U.S.S. PENNSYLVANIA (BB 38) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Radar (Antenna only)	22	0	445	Starboard Director	1A	
Radar (Antenna only)	22	0	457	Port Director	1A	
Radar (Antenna only)	28	2	262	Aft Port	1A	
Radar (Antenna only)	28	2	263	Aft Starboard	1A	
Radar (Antenna only)	28	2	264	Fwd. Port	1A	
Radar (Antenna only)	28	2	269	Fwd. Starboard	3BP	
Radar (Antenna only)	28	3	547	Spot I	1A	
Radar (Antenna only)	29	2	44	Port	1A	
Radar (Antenna only)	29	2	61	Starboard	1A	

U.S.S. NEVADA (BB 36)

Gunsight	14	6	91138	Stbd. Aft 20MM	3CP
Gunsight	14	6	95974	Port Aft 20MM	3CP
Gunsight	14	6	96490	Port Fwd. 20MM	1A
Gunsight	14	6	96642	Port Aft 20MM	3CP*
Gunsight	14	6	97200	Stbd. Fwd. 20MM	3BP
Gunsight	14	6	97902	Stbd. Aft 20MM	3CP*
Gunsight	14	6	98560	Stbd. Fwd. 20MM	3*
Gunsight	14	6	102526	Port Fwd. 20MM	1A

U.S.S. NEVADA (BB 36) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	8	103637	Port 51 Director	3CP	
Gunsight	14	8	106862	Starboard 51 Director	3CP	
Gunsight	15	3	2367	Port Aft 51 Director	3BP	
Gunsight	15	3	2475	Port Fwd. 51 Director	1A	
Gunsight	15	3	2776	Starboard Fwd. 51 Dir.	1B	2BS
Gunsight	15	3	2886	Starboard Aft. 51 Dir.	1A	
Rangefinder	33	0	3	#4 Turret	1A	
Rangefinder	36	0	4	#2 Turret	1BP	
Rangefinder	42	12	272	Fwd. 37 Director	1BP	
Rangefinder	42	12	273	Aft. 37 Director	1BP	
Periscope	6	0	58	#1 Turret	1A	
Periscope	6	0	62	#1 Turret	3BN	
Periscope	6	0	64	#4 Turret	1A	
Periscope	8	0	23	F.C. Tower	1A	
Periscope	8	0	31	F.C. Tower	1A	
Periscope	15		18	#2 Turret	1A	
Periscope	17	0	14	#3 Turret	2BP	
Periscope	17	5	8	#2 Turret	1A	
Periscope	18	1	13	F.C. Tower	1A	
Periscope	20	6	490	#3 Turret	1A	
Spotting Glass	4		45	Foretop	3BS	
Spotting Glass	4		46	Maintop	3CS	

U.S.S. NEVADA (BB 36) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	22		65	#3 Turret	1A	3CS
Telescope	22		73	#3 Turret	1A	
Telescope	22		76	#1 Turret	1A	
Telescope	22		77	#1 Turret	1A	
Telescope	22		104	#2 Turret	1A	
Telescope	22		105	#4 Turret	1A	
Telescope	22		113	#2 Turret	1A	
Telescope	22		114	#1 Turret	1A	3CS
Telescope	22		116	#3 Turret	1A	
Telescope	22		117	#4 Turret	3BS	
Telescope	22		119	#1 Turret	1A	
Telescope	22		121	#4 Turret	1A	
Telescope	22		122	#2 Turret	1A	
Telescope	22		132	#4 Turret	1A	
Telescope	22		140	#2 Turret	1A	
Telescope	22		154	#3 Turret	1A	3CS
Telescope	28	7	2590	Point Foretop	3BN	
Telescope	28	7	2593	Train Foretop	3BN	
Telescope	28	7	2600	Point Maintop	3CS	
Telescope	28	7	2606	Train Maintop	3CS	
Telescope	60	0	184	Fwd. 37 Director	1A	
Telescope	60	0	416	Aft 37 Director	1A	

U.S.S. NEVADA (BB 36) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After Test Able	Baker
Telescope	60	0	459	Aft 37 Director	1A	
Telescope	60	0	460	Fwd. 37 Director	1A	2BS
Telescope	60	0	469	Fwd. 37 Director	1A	2BS
Telescope	60	0	687	Aft 37 Director	1A	2BS
Telescope	67	0	141	#1-5"/38	1A	
Telescope	67	0	146	#2-5"/38	1A	
Telescope	67	0	257	#7-5"/38	1A	
Telescope	67	0	260	#8-5"/38	1A	
Telescope	67	0	265	#8-5"/38	1A	
Telescope	67	0	654	#7-5"/38	1A	
Telescope	67	1	805	#2-5"/38	1A	
Telescope	67	1	808	#1-5"/38	1A	
Telescope	68	0	69	#1-5"/38	1A	
Telescope	68	0	72	#2-5"/38	1A	
Telescope	68	0	135	#7-5"/38	1A	
Telescope	68	0	136	#8-5"/38	1A	
Computer	1	4	137	Air Plot	1A	
Rangekeeper	1	23	24	Aft Main Batt. Plot	1A	
Rangekeeper	1	23	42	Fwd. Main Batt. Plot	1A	
Director	17	0	14	#3 Turret	1A	
Director	17	0	38	#2 Turret	1A	
Director	20	2	5	Foretop	3CP	

U.S.S. NEVADA (BB 36) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Director	20	3	7	Maintop	3CP	
Director	21	1	3	F.C. Tower	2BP	
Director	32	5	5	Main Battery Plot.	2BP	
Director	37	35	181	Sky 1	1BP	3BP
Director	37	37	221	Sky 4	1BP	3BP
Director	51	2	14426	Stbd. Sky 3	2BP	2BP
Director	51	2	15064	Port Sky 2	3CS	
Director	51	3	11698	Stbd. Fwd. Boat Deck	1A	
Director	51	3	12081	Port. Fwd. Boat Deck	1A	3BP
Director	51	3	12091	Stbd. Aft Searchlight platform	1A	
Director	51	3	13343	Port. Aft Searchlight platform	1A	2BP
Fuzesetter	9		232	#1-5"/38	1A	
Fuzesetter	9		233	#2-5"/38	1A	
Fuzesetter	9		238	#7-5"/38	1A	
Fuzesetter	9		239	#8-5"/38	1A	
Dead Reckoning Tracer	6	4	641544	Main Battery Plot.	1A	
Range Deflection Transmitter	6	2		Main Battery Plot	1A	
Gun Train Order Transmitter	1	0	29	Main Battery Plot.	1A	
Gun Train Order Transmitter	1	0	30	Main Battery Plot.	1A	
Target Bearing Indicator	2	0	4	Main Battery Plot	1A	

U.S.S. NEVADA (BB 36) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Target Bearing Indicator	2	0	5	Main Battery Plot.	1A	
Range & Deflection Indicator	6	2	62	Main Battery Plot.	1A	
Range & Deflection Indicator	6	2	78	F.C. Tower	1A	
Range & Deflection Indicator	6	2	83	Main Battery Plot.	1A	
Range & Deflection Indicator	6	2	285	Foretop	1A	
Range & Deflection Indicator	6	2	364	F.C. Tower	1A	
Range & Deflection Indicator	6	2	369	Maintop	1A	
Double Turret Train Indicator	3	3	132335	#2 Turret	1A	
Double Turret Train Indicator	3	3	132341	Plot	1A	
Double Turret Train Indicator	3	3	132343	#4 Turret	1A	
Double Turret Train Indicator	3	3	132434	#3 Turret	1A	
Train Indicator Regulator	46	0	4	#1-5"/38	1A	
Train Indicator Regulator	46	28	17	#2-5"/38	1A	
Train Indicator Regulator	46	31	19	#3-5"/38	3BS	

U.S.S. NEVADA (BB 36) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Train Indicator Regulator	46	31	22	#7-5"/38	1A	
Elevation Indicator Regulator	47	0	4	#1-5"/38	1A	
Elevation Indicator Regulator	47	0	17	#2-5"/38	1A	
Elevation Indicator Regulator	47	0	19	#8-5"/38	1A	
Elevation Indicator Regulator	47	0	22	#7-5"/38	1A	
Stable Element	1	0	4	Main Battery Plot.	1A	
Stable Element	6	1	416	Air Plot	1A	
Radar (Less Antenna)	3	2	72	Spot 2	1A	
Radar (Less Antenna)	12	0	115	Sky I	1A	
Radar (Less Antenna)	12	0	232	Sky 4	1A	
Radar (Less Antenna)	22	0	227	Sky I	1A	
Radar (Less Antenna)	22	0	228	Sky 4	1A	
Radar (Less Antenna)	28	3	532	Spot I	2BP	
Radar (Antenna Only)	3	2	72	Spot 2	3CP	

U.S.S. NEVADA (BB 36) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Radar (Antenna Only)	12	0	115	Sky I	3CSP	
Radar (Antenna Only)	12	0	232	Sky 4	3CP	
Radar (Antenna Only)	22	0	227	Sky I	3CSP	
Radar (Antenna Only)	22	0	228	Sky 4	3CSP	
Radar (Antenna Only)	28	3	532	Spot I	3CP	

U.S.S. NEW YORK (BB 34)

Gunsight	14	6	42667	20MM #4-MM	1A	3CS
Gunsight	14	6	80633	20MM #2-FM	1A	
Gunsight	14	6	84360	20MM #6-MM	1A	
Gunsight	14	6	85618	20MM #1-FM	1A	3CP
Gunsight	14	6	91311	20MM #3-MM	3BP	3CP
Gunsight	14	6	93143	20MM #5-MM	1A	
Gunsight	14	8	28877	40MM #9 Director	1A	2BS
Gunsight	14	8	101212	40MM #2 Director	1A	3BS
Gunsight	14	12	58232	Sky Con. Port	1A	
Gunsight	14	12	59021	51 Dir. Main Port	1A	
Gunsight	14	12	59037	51 Dir. Main Stbd.	1A	
Gunsight	14	12	59048	Sky Coh. Stbd.	1A	
Rangefinder	10	3	71	Turret #2	1A	

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Rangefinder	35	2	20	Nav. Bridge Starboa:	1A	
Rangefinder	35	3	44	Nav. Bridge Port	1A	
Rangefinder	58	1	220	50 Director Aft	1A	
Rangefinder	58	1	307	50 Director Fwd.	1A	
Periscope	6	0	4	Storeroom	1A	
Periscope	6	0	17	Storeroom	1A	
Periscope	6	0	19	Storeroom	1A	
Periscope	6	0	44	Storeroom	1A	
Periscope	6	0	48	Storeroom	1A	
Periscope	6	0	88	Storeroom	1A	
Periscope	6	0	89	Storeroom	1A	
Periscope	6	0	91	Storeroom	1A	
Periscope	6	0	114	Storeroom	1A	
Periscope	6	0	290	Storeroom	1A	
Periscope	6	0	292	Storeroom	1A	
Periscope	6	0	301	Storeroom	1A	
Periscope	6	0	329	Storeroom	1A	
Periscope	6	2	170	Storeroom	1A	
Periscope	6	2	362	Storeroom	1A	
Periscope	7	2	118	#4 Turret	1A	
Periscope	7	2	148	#2 Turret	1A	3CP

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Periscope	8	0	25	Storeroom	1A	
Periscope	8	2	71	F.C. Tower	2B	
Periscope	8	2	78	F.C. Tower	1A	
Periscope	18	3	18	F.C. Tower	1A	
Telescope	11	0	121	Storeroom	1A	
Telescope	11	15	3230	Storeroom	1A	
Telescope	15	1	37	#5 Turret	1A	
Telescope	15	1	95	#2 Turret	1A	
Telescope	15	7	88	#3 Turret	1A	
Telescope	15	7	92	#1 Turret	2B	3CP
Telescope	15	7	94	#4 Turret	1A	
Telescope	15	7	96	#3 Turret	1A	
Telescope	15	7	100	#1 Turret	1A	3CP
Telescope	15	9	160	#5 Turret	1A	
Telescope	15	9	169	#4 Turret	1A	
Telescope	15	9	205	#2 Turret	1A	
Telescope	15	9	214	Storeroom	1A	
Telescope	15	9	215	Storeroom	1A	
Telescope	15	9	223	Storeroom	1A	
Telescope	15	9	229	Storeroom	1A	
Telescope	15	9	918	Storeroom	1A	
Telescope	16	1	152	Storeroom	1A	

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	17	1	56	#2 Turret	1A	
Telescope	17	1	58	#2 Turret	1A	
Telescope	17	3	107	#5 Turret	1A	
Telescope	17	3	110	#5 Turret	1A	
Telescope	17	3	113	Storeroom	1A	
Telescope	17	3	116	#3 Turret	1A	
Telescope	17	3	117	#4 Turret	1A	
Telescope	17	4	192	Storeroom	1A	
Telescope	17	4	237	Turret #3	1A	
Telescope	17	5	250	#4 Turret	1A	
Telescope	17	5	257	#1 Turret	1A	3CP
Telescope	17	5	258	#I Turret	1A	3CP
Telescope	17	5	378	Storeroom	1A	
Telescope	20	0	35	#3-5" Gun	1A	
Telescope	20	0	38	#2-5" Gun	1A	
Telescope	20	0	247	#5-5" Gun	1A	
Telescope	20	0	Pointer	#1-5" Gun	1A	
Telescope	20	0	Pointer	#2-5" Gun	1A	
Telescope	20	0	Pointer	#4-5" Gun	1A	
Telescope	20	0	Trainer	#4-5" Gun	1A	
Telescope	20	0	Pointer	#6-5" Gun	1A	
Telescope	20	0	Trainer	#6-5" Gun	1A	

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	20	1	111	Storeroom	1A	
Telescope	20	1	147	Storeroom	1A	
Telescope	20	3	73	#1-5" Gun	1A	
Telescope	20	3	344	Storeroom	1A	
Telescope	20	3	376	#5-5" Gun	1A	
Telescope	20	3	386	Storeroom	1A	
Telescope	20	3	1388	#3-5" Gun	1A	
Telescope	26	3	1345	Storeroom	1A	
Telescope	26	3	1612	Spot 2	3BP	
Telescope	26	3	3614	Storeroom	1A	
Telescope	27	0	2101	Spot 1	1A	
Telescope	27	0	2190	Storeroom	1A	
Telescope	27	0	2192	Storeroom	1A	
Telescope	27	1	1958	Storeroom	1A	
Telescope	27	1	2193	Spot 2	1A	
Telescope	27	1	2199	Storeroom	1A	
Telescope	27	1	2310	Secondary Fwd.	1A	
Telescope	27	1	2971	Storeroom	1A	
Telescope	27	7	2545	Secondary Fwd.	1A	
Telescope	28	0	2435	Secondary Fwd.	1A	
Telescope	28	1	2118	Spot 1	1A	
Telescope	28	1	2201	Storeroom	1A	

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	28	1	2203	Storeroom	1A	
Telescope	28	1	2204	Secondary Fwd.	1A	
Telescope	28	1	2788	Storeroom	1A	
Telescope	28	1	2888	Storeroom	1A	
Telescope	28	7	2403	Storeroom	1A	
Telescope	28	7	2459	Storeroom	1A	
Telescope	60	0	2071	Aft 50 Director	1A	
Telescope	60	0	2072	Fwd. 50 Director	1A	
Telescope	74	0	9436	#2-3" Gun	1A	2BS
Telescope	74	0	32461	Storeroom	1A	
Telescope	74	0	32845	#10-3" Gun	1A	
Telescope	74	0	32931	#8-3" Gun	1A	
Telescope	74	0	32993	Storeroom	1A	
Telescope	74	0	33027	#5-3" Gun	1A	2BS
Telescope	74	0	33029	#9-3" Gun	1A	
Telescope	74	0	33036	Storeroom	1A	
Telescope	74	0	33047	#6-3" Gun	1A	
Telescope	74	0	33072	#6-3" Gun	1A	
Telescope	74	0	33080	Storeroom	1A	
Telescope	74	0	33089	#9-3" Gun	1A	2BS
Telescope	74	0	33105	Storeroom	1A	
Telescope	74	0	33122	#4-3" Gun	1A	

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	74	0	33297	#8-3" Gun	1A	
Telescope	74	0	33469	#7-3" Gun	1A	
Telescope	74	0	33478	#5-3" Gun	1A	
Telescope	74	0	33481	Storeroom	1A	
Telescope	74	0	33499	#10-3" Gun	1A	
Telescope	74	0	33512	#2-3" Gun	1A	
Telescope	74	0	33556	#4-3" Gun	1A	2BS
Telescope	74	0	33561	#7-3" Gun	1A	
Telescope	74	0	33566	Storeroom	1A	
Telescope	74	0	33569	Storeroom	1A	
Telescope	74	0	33571	#3-3" Gun	1A	
Telescope	74	0	33600	#1-3" Gun	1A	2BS
Telescope	74	1	7342	#3-3" Gun	1A	2BS
Telescope	74	1	9284	#5-3" Gun	1A	
Telescope	74	1	9683	#1-3" Gun	1A	2BS
Spotting Glass	2	0	117	Storeroom	1A	
Spotting Glass	2	0	175	Storeroom	1A	
Spotting Glass	2	0	176	Storeroom	1A	
Spotting Glass	2	0	183	Storeroom	1A	
Spotting Glass	4	0	13	Spot 2	3BP	3CP
Spotting Glass	4	0	67	Storeroom	1A	
Spotting Glass	4	0	91	Storeroom	1A	

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Spotting Glass	4	0	97	Spot 1	3BP	
Computer Director	32	4	6	Main Battery Plot	1A	
Rangekeeper	1	15	68	Main Battery Plot	1A	
Rangekeeper	1	15	79	Main Plotting Room	1A	
Computer	10			Fwd.	3*	
Computer	10			Aft	3*	
Gun Director	20	0	2	Foretop	1A	
Gun Director	20	1	4	Spot 2	2BP	3CP
Gun Director	21	0	2	Conning Tower	1A	3BP
Vicker's Director	6	4	23	Sec. Con. Stbd. Aft	1A	3CP
Vicker's Director	6	4	24	Sec. Con. Port Aft.	1A	3CP
Vicker's Director	7	4	23	Sec. Con. Fwd. Stbd.	1A	
Vicker's Director	7	4	24	Sec. Con. Fwd. Port	1A	
AA Director	50	4	13	Sky Control Fwd.	2BP	3CP
AA Director	50	4	14	Sky Control Aft	3*	
Gun Director	51	1	4952	Fantail	1A	
Gun Director	51	2	1917	#3 Open Bridge	1A	
Gun Director	51	2	1920	#4 Bridge Port	1A	
Gun Director	51	2	2097	#2 Port Boat Deck	1A	
Gun Director	51	2	2122	#5 Mainmast Stbd.	1A	

U.S.S. NEW YORK (BB 34) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gun Director	51	2	2123	#6 Mainmast Port	1A	
Target Bearing Designator	10	0	4	Stbd. Nav. Bridge	1A	
Target Bearing Designator	10	0	29	Port Nav. Bridge	1A	
Stable Element	1	0	7	Plotting Room	3*	
Radar (Less Antenna)	3	1	29	Spot 1	2BP	
Radar (Less Antenna)	3	1	32	Spot 2	1A	
Radar (Less Antenna)	10	5	27	Sky 2	1A	
Radar (Less Antenna)	10	5	34	Sky 1	1A	
Radar (Antenna Only)	3	1	29	Spot 1	1A	
Radar (Antenna Only)	3	1	32	Spot 2	3CS	
Radar (Antenna Only)	10	5	27	Sky 2	1A	
Radar (Antenna Only)	10	5	34	Sky 1	2BP	

U.S.S. PENSACOLA (CA 24)

Gunsight	14	6	43955	#24-20MM	1A	
Gunsight	14	6	85897	#23-20MM	2BP	2BP
Gunsight	14	6	92103	#22-20MM	3BP	
Gunsight	14	6	95697	#21-20MM	3BP	

U.S.S. PENSACOLA (CA 24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Sunsight	14	13	58481	Port Platform	2BP	
Sunsight	14	13	58486	Stbd. Platform	2BP	
Sunsight	15	12	4203	Port 63 Director	1A	
Sunsight	15	12	4559	Stbd. 63 Director	3BP	
Rangefinder	33	0	20	#3 Turret	3AP	
Rangefinder	42	13	488	Fwd. 33 Director	1A	
Rangefinder	42	13	497	Aft 33 Director	1BP	
Rangefinder	43	0	7	Fwd. M.B. Director	1A	
Rangefinder	43	0	14	Aft M.B. Director	2BPS	3CP
Periscope	20	1	21	#2 Turret	1A	
Periscope	20	1	23	#3 Turret	1A	
Periscope	20	1	24	#4 Turret	1A	2BS
Periscope	20	6	217	#1 Turret	1A	
Periscope	27	0	94	Port Fwd. Control Tower	1A	
Periscope	27	0	96	Port Aft Control Tower	1A	
Periscope	27	0	144	Stbd. Aft Control Tower	2BP	
Periscope	27	0	249	Stbd. Fwd. Control Tower	1A	
Director Telescope	28		Pointer	#3 Director	1A	
Director Telescope	28		Trainer	#3 Director	1A	
Director Telescope	28		Leveler	#3 Director	1A	

U.S.S. PENSACOLA (CA 24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Director Telescope	28		Pointer	#4 Director	1A	
Director Telescope	28		Trainer	#4 Director	1A	
Director Telescope	28		Leveler	#4 Director	1A	
Telescope	36		224	Mount 55	1A	
Telescope	36	3	431	Mount 55	1A	
Telescope	36	3	793	Mount 55	1A	2BS
Telescope	36	3	794	Mount 58	1A	2BS
Telescope	36	3	800	Mount 56	1A	2BS
Telescope	36	3	803	Mount 58	1A	2BS
Telescope	36	3	817	Mount 56	1A	
Telescope	36	4	124	Mount 57	3CP	
Telescope	37	0	129	Mount 58	1A	
Telescope	37	0	174	Mount 56	1A	
Telescope	37	0	231	Mount 57	1A	2BP
Telescope	37	4	212	Mount 57	2BS	3CP
Telescope	40		2	#1 Turret	1A	
Telescope	40		4	#4 Turret	1A	
Telescope	40		6	#3 Turret	1A	
Telescope	40		7	#2 Turret	1A	
Telescope	40		8	#3 Turret	1A	
Telescope	40		11	#2 Turret	1A	

U.S.S. PENSACOLA (CA 24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	40		12	#1 Turret	1A	
Telescope	41		2	#4 Turret	1A	2BS
Telescope	41		7	#1 Turret	1A	
Telescope	41		9	#3 Turret	1A	
Telescope	41		95	#1 Turret	1A	
Telescope	41			#2 Turret	1A	
Telescope	51		Cross Level	#3 Director	1A	
Telescope	51		Cross Level	#4 Director	3BP	
Telescope	56		11	#2 Director	1A	
Telescope	56		20	#1 Director	1A	
Telescope	57		13	#1 Director	1A	
Telescope	57		16	#2 Director	1A	2BS
Telescope	57		23	#2 Director	1A	2BS
Telescope	57		25	#1 Director	1A	
Telescope	57		27	#1 Director	1A	
Telescope	58		11	#2 Director	1A	
Telescope	58		14	#1 Director	1A	
Telescope	59		12	#2 Director	1A	
Telescope	59		13	#1 Director	1A	
Telescope	59		27	#1 Director	1A	
Rangekeeper	10	51	125	Fwd. AA	1A	2B

U.S.S. PENSACOLA (CA 24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Rangekeeper	10	52	126	Aft AA	1A	2N
Rangekeeper	11		3	Aft Main Battery	2A	
Rangekeeper	11		8	Fwd Main Battery	2A	2N
Gun Director	33	16	98	Fwd AA	1BP	3CP
Gun Director	33	16	99	Aft AA	2BP	3CP
Gun Director	35		11	Maintop	3BP	3CP
Gun Director	35		16	Foretop	2BP	2BP
Gun Director	51	1	635	Stbd. Searchlight Plat.	3AS	
Gun Director	51	2	5022	Port Searchlight Plat.	1A	
Gun Director	51	6	12645	Starboard	3CP	
Gun Director	51	6	12655	Port	2BP	
Gun Fire Control System	63			Port	2BP	
Gun Fire Control System	63			Starboard	3CP	
Fuzesetter	8	9	1951	Mount 58	1A	
Fuzesetter	8	9	1952	Mount 56	1A	
Fuzesetter	8	9	1957	Mount 57	1A	
Fuzesetter	8	9	1962	Mount 55	1A	
Battle Order Indicator	14	1	24	Mount 58	1A	
Battle Order Indicator	14	1	82	Mount 56	1A	
Battle Order Indicator	14	1	83	Mount 57	1A	

U.S.S. PENSACOLA (CA 24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Battle Order Indicator	14	1	84	Mount 55	1A	
Bearing Indicator	1		132136	Aft Main Battery	1A	
Bearing Indicator	1		132137	Fwd. Main Battery	1A	
Bearing Indicator	10		3435	Stbd. 40MM	3CP	
Bearing Indicator	10		3505	Port 40MM	1A	
Elevation Indicator	4	5	231	Port Searchlight	3A	
Elevation Indicator	7	1	287	Stbd. Searchlight	3CP	
Elevation Indicator	9	3	72	Mount 58	1A	
Elevation Indicator	9	3	131	Mount 57	1A	
Elevation Indicator	9	3	139	Mount 55	1A	
Elevation Indicator	9	3	180	Mount 56	1A	
Train Indicator	10	3	129	Mount 55	1A	
Train Indicator	10	3	130	Mount 56	1A	
Train Indicator	10	3	131	Mount 57	1A	
Train Indicator	10	3	132	Mount 58	1A	
Train Indicator	12	6	188	Port Searchlight	1A	
Train Indicator	14	1	122	Stbd. Searchlight	3CP	

U.S.S. PENSACOLA (CA 24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gun Elevation Indicator	11		132110	#4 Turret	1A	
Gun Elevation Indicator	11		132111	#2 Turret	1A	
Gun Elevation Indicator	11		132112	#3 Turret	1A	
Gun Elevation Indicator	11		132113	#1 Turret	1A	
Gun Train Order Indicator	12	11	132102	#1 Turret	1A	
Gun Train Order Indicator	12	11	132103	#2 Turret	1A	
Gun Train Order Indicator	12	11	132104	#3 Turret	1A	
Gun Train Order Indicator	12	11	132105	#4 Turret	1A	
Double Turret Train Indicator	1		132118	#1 Turret	1A	
Double Turret Train Indicator	1		132119	Fwd. M.B. Control	1A	
Double Turret Train Indicator	1		132121	#2 Turret	1A	
Double Turret Train Indicator	1	1	132126	#3 Turret	1A	
Double Turret Train Indicator	1	1	132127	#4 Turret	1A	
Double Turret Train Indicator	1	1	132128	Fwd. M.B. Control		

U.S.S. PENSACOLA (CA 24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Double Turret Train Indicator	11		6	Aft M.B. Control	1A	
Double Turret Train Indicator	11		8	Aft M.B. Control	1A	
Range Indicator	2	1	213	C.I.C. Fwd.	1A	
Range Indicator	2	1	214	C.I.C. Aft.	1A	
Range Indicator	5	1	341	Fwd. AA	1A	
Range Indicator	5	1	344	Aft. AA	1A	
Range Indicator	6		333	Fwd. M.B. Director	1A	
Range Indicator	6		334	Aft. M.B. Director	1A	
Sight Angle Receiver	2		10	#4 Turret	1A	
Sight Deflection Receiver	2		15	#4 Turret	1A	
Deflection Receiver	1	1	Dr. No. 180035	#1 Turret	1A	
Deflection Receiver	1	1	Dr. No. 180035	#2 Turret	1A	
Deflection	1	1	Dr. No. 180035	#3 Turret	1A	
Gun Train Order Relay Transmitter	1	0	701347	M.B. Switchboard	1A	
Gun Train Order Relay Transmitter	1	0	701348	M.B. Switchboard	1A	
Bearing and Range Indicator	1	6	321	Sky Fwd.	1A	

U.S.S. PENSACOLA (CA24) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Stable Element	2	4	112	Fwd. AA Director	3BP	3CP
Stable Element	2	4	113	Aft. AA Director	3BP	3CP
Stable Element	3		3	Aft. M.B. Director	1A	3CP
Stable Element	3		8	Fwd. M.B. Director	1A	
Radar (Less Antenna)	28	2	356	Port 63	2BP	
Radar (Less Antenna)	28	2	357	Stbd. 63	3BP	
Radar (Less Antenna)	28	3	559	Sky 2	3BP	
Radar (Less Antenna)	28	3	569	Spot 1	3BP	
Radar (Less Antenna)	28	3	571	Spot 2	3BP	
Radar Less Antenna)	28	3	575	Sky 1	3BP	
Radar (Antenna Only)	28	2	356	Port 63	3CP	
Radar (Antenna Only)	28	2	357	Stbd. 63	3CP	
Radar (Antenna Only)	28	3	559	Sky 2	3BP	
Radar (Antenna Only)	28	3	569	Spot 1	3CP	
Radar (Antenna Only)	28	3	571	Spot 2	3CP	
Radar (Antenna Only)	28	3	575	Sky 1	3CP	

U.S.S. SALT LAKE CITY (CA 25)

Equipment	Mark	Mod	Serial	Location	Condition After Test Able	Baker
Gunsight	14	2	685	#1-20MM	1A	
Gunsight	14	2	991	#2-20MM	1A	
Gunsight	14	2	3984	#1-40MM	1A	
Gunsight	14	2	4297	#5-20MM	1A	
Gunsight	14	2	14331	#8-20MM	3BP	3CP
Gunsight	14	2	33144	#7-20MM	1A	
Gunsight	14	2	33735	#3-20MM	1A	2BS
Gunsight	14	2	35165	#6-20MM	1A	
Gunsight	14	2	35585	#4-20MM	1A	
Rangefinder	33	0	5	#1 Turret	2BP	
Rangefinder	33	0	6	#3 Turret	1A	
Rangefinder	33	1	33	#4 Turret	2BP	
Rangefinder	42	13	739	Sky Fwd.	1BP	
Rangefinder	42	13	741	Sky Aft.	1BP	
Rangefinder	45	0	16	34 Director	1A	
Periscope	20		3	#2 Turret	1A	
Periscope	20		4	#3 Turret	1A	
Periscope	20		5	#4 Turret	1A	
Periscope	20		6	#1 Turret	2B	
Spotting Glass	4		44	#2 Director	3CP	
Spotting Glass	4		98	#2 Director	1A	
Spotting Glass	8	2	17	#1 Director	1A	

U.S.S. SALT LAKE CITY (CA 25) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Director Telescope	22		2	#1 Director	1A	
Director Telescope	22		5	#2 Director	1A	
Telescope	28		Pointer	Fwd. 33 Director	1A	
Telescope	28		Trainer	Fwd. 33 Director	1A	
Telescope	28		Leveler	Fwd. 33 Director	1A	
Telescope	28		Pointer	Aft. 33 Director	1A	
Telescope	28		Trainer	Aft. 33 Director	1A	
Telescope	28		Leveler	Aft. 33 Director	1A	
Telescope	36		218	#5-5"/25	1A	
Telescope	36		219	#8-5"/25	1A	
Telescope	36		220	#5-5"/25	1A	
Telescope	36		221	#7-5"/25	1A	
Telescope	36	3	736	#6-5"/25	3CP	
Telescope	36	3	796	#7-5"/25	1A	3CP
Telescope	36	3	799	#6-5"/25	1A	
Telescope	36	3	801	#8-5"/25	1A	
Telescope	37		130	#6-5"/25	1A	
Telescope	37		133	#7-5"/25	1A	
Telescope	37	5	421	#5-5"/25	3BP	
Telescope	37	5	422	#8-5"/25	1A	

SECRET

Enclosure (D) to Director Ship Material Serial 001500.

U.S.S. SALT LAKE CITY (CA 25) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	40		2	#1 Turret	1A	
Telescope	40		5	#3 Turret	2BP	
Telescope	40		6	#2 Turret	1A	
Telescope	40		11	#4 Turret	1A	
Telescope	41		20	#4 Turret	2BP	
Telescope	41		28	#2 Turret	2BP	
Telescope	41		38	#3 Turret	2BP	
Telescope	41		46	#1 Turret	2BP	
Telescope	51	0	177	Sky Aft	1A	
Telescope	51	0	179	Sky Fwd.	1A	
Rangekeeper	5	0	2	#1 Director	1A	
Rangekeeper	5	0	4	Aft F.C. Tower	1A	
Rangekeeper	10	51	161	Sky Fwd.	3A	2BW
Rangekeeper	10	52	150	Sky Aft	1A	2BW
Director	22	1	4	Aft F.C. Tower	1A	
Director	22	2	2	Foretop	3BP	
Director	33	16	102	Sky Fwd.	2BP	3CP
Director	33	16	103	Sky Aft.	2BP	
Director	51	2	1950	#5-40mm	1A	
Funesetter	8	9	2831	#6-5"/25	1A	
Funesetter	8	9	2833	#7-5"/25	2BP	

U.S.S. SALT LAKE CITY (CA 25) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Fuzesetter	8	9	2964	#8-5"/25	1A	
Fuzesetter	8	9	2967	#5-5"/25	1A	
Stable Element	2	13	4	Sky Fwd.	3BP	3CP
Stable Element	2	13	7	Sky Aft.	2BP	3CS
Radar (Less Antenna)	3	0	14	Spot 2	1A	
Radar (Less Antenna)	3	0	105	Spot 1	3BP	
Radar (Less Antenna)	4	0	206	Sky 1	3BP	
Radar (Less Antenna)	28	3	3	Sky 4	1A	
Radar (Antenna Only)	3	0	14	Spot 2	3CP	
Radar (Antenna Only)	3	0	105	Spot 1	3CP	
Radar (Antenna Only)	4	0	206	Sky 1	3CP	
Radar (Antenna Only)	28	3	3	Sky 4	3CP	

U.S.S. INDEPENDENCE (CVL 22)

Gunsight	14	2	3435	#6-20MM	Missing
Gunsight	14	2	5617	#1-20MM	3CP
Gunsight	14	2	14604	#2-20MM	Missing
Gunsight	14	2	15893	#4-20MM	Missing

U.S.S. INDEPENDENCE (CVL 22) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	4	13660	#3 Director	1A	
Gunsight	14	4	28571	#8 Director	2BP	
Gunsight	14	4	28933	#9 Director	1A	
Gunsight	14	4	30640	#4 Director	1A	
Gun Director	51	1	414	#3 Director	1A	
Gun Director	51	1	508	#8 Director	3BP	
Gun Director	51	2	4255	#9 Director	3BP	
Gun Director	51	2	8301	#4 Director	3CP	
			U.S.S. SARATOGA (CV 3)			
Gunsight	14	6	42128	Starboard Aft	1A	
Gunsight	14	6	42570	Port Aft	1A	
Gunsight	14	6	43828	Starboard Aft	1A	
Gunsight	14	6	43919	Port Fantail	2BP	
Gunsight	14	6	44571	Port Fantail	1A	
Gunsight	14	6	50373	Starboard Aft	1A	
Gunsight	14	6	94291	Port Aft	1A	
Gunsight	14	6	101976	Port Aft	3*	
Gunsight	14	6	103304	Port Aft	1A	
Gunsight	14	6	105723	Port Aft	1A	
Gunsight	14	8	100042	Port Frame 72	1A	
Gunsight	14	8	110207	Port Frame 181	1A	
Gunsight	14	8	155462	Starboard Frame 29	1A	

U.S.S. SARATOGA (CV 3) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition after test Able	Baker
Gunsight	14	8	156205	Port Frame 6?	1A	
Gunsight	14	8	157603	Starboard Frame 91	1A	
Gunsight	14	8	158172	Port Frame 188	1A	
Gunsight	14	8	162411	Starboard Frame 188	1A	
Gunsight	14	8	162931	Starboard Frame 115	1A	
Rangefinder	42	12	208	Sky 1	1A	
Rangefinder	42	12	209	Sky 2	1A	
Telescopes	60	0	174	Sky 2	3*	
Telescopes	60	0	244	Sky 2	1A	
Telescopes	60	0	419	Sky 2	1A	
Telescopes	60	0	581	Sky 1	1A	
Telescopes	60	0	584	Sky 1	1A	
Telescope	60	0	605	Sky 1	1A	
Telescope	61	2	856	Gun #10	3*	
Telescope	61	2	878	Gun #3	3*	
Telescope	61	2	879	Gun #4	3*	
Telescope	61	4	926	Gun #11	3*	
Telescope	62	2	726	Gun #11	1A	
Telescope	62	2	840	Gun #3	3*	
Telescope	62	2	841	Gun #4	3*	
Telescope	62	2	870	Gun #10	3*	
Telescope	67	0	107	Mount #5	1A	

U.S.S. SARATOGA (CV 3) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	67	0	109	Mount #6	1A	
Telescope	67	0	112	Mount #7	1A	
Telescope	67	0	116	Mount #7	1A	
Telescope	68	0	55	Mount #5	1A	
Telescope	68	0	59	Mount #7	1A	
Computer	1	10	100	AA Plot.	1A	
Gun Director	37	42	542	Sky 1	1A	
Gun Director	37	42	543	Sky 2	1A	
Gun Director	51	2	1459	#6	1A	
Gun Director	51	2	1463	#5	1A	
Gun Director	51	2	1466	#2	1A	
Gun Director	51	2	4715	#7	1A	
Gun Director	51	2	8915	#8	1A	
Gun Director	51	2	9366	#3	1A	
Gun Director	51	2	10775	#1	3A*	
Gun Director	51	2	10777	#4	1A	
Fusesetter	8	4	1946	Gun #10	32A*	
Fusesetter	8	4	1970	Gun #11	1A	
Fusesetter	8	7	478	Mount #5	1A	
Fusesetter	8	7	480	Mount #7	1A	
Fusesetter	8	9	1405	Gun #3	1A	
Fusesetter	8	9	1502	Gun #4	1A	

U.S.S. SARATOGA (CV 3) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Target Designator Transmitter	1	1	25	Sky Fwd. Starboard	1A	
Target Designator Transmitter	1	1	28	Sky Fwd. Port	1A	
Starshell Spot Transmitter	1	0	6	AA Plot	1A	
Stable Element	6	1	128	AA Plot	1A	
Radar (Less Antenna	4	0	152	Sky 2	2BP	
Radar (Less Antenna	4	0	153	Sky 1	2BP	
Radar (Less Antenna)	22	0	52	Sky 1	1A	
Radar (Less Antenna)	22	0	62	Sky 2	1A	
Radar (Antenna Only)	4	0	152	Sky 2	1A	
Radar (Antenna Only)	4	0	153	Sky 1	1A	
Radar (Antenna Only)	22	0	52	Sky 1	1A	
Radar (Antenna Only)	22	0	62	Sky 2	1A	

U.S.S. ANDERSON (DD 411)

Gunsight	14	6	40270	Starboard Fwd.
Gunsight	14	6	40311	Starboard Aft

U.S.S. ANDERSON (DD 411) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	6	45868	Port Aft		
Gunsight	14	6	96291	Port Fwd		
Gunsight	14	8	100051	Starboard Aft		
Gunsight	14	8	158204	Port Aft		
Rangefinder	42	7	108	37 Director		
Telescope	50	0	37	Torpedo Director		
Telescope	60	0	1	37 Director		
Telescope	60	0	3	37 Director		
Telescope	60	0	4	37 Director		
Telescope	61	0	372	#1 Mount		
Telescope	61	0	373	#2 Mount		
Telescope	61	0	377	#3 Mount		
Telescope	61	0	378	#4 Mount		
Telescope	62	0	374	#2 Mount		
Telescope	62	0	375	#1 Mount		
Telescope	62	0	377	#3 Mount		
Telescope	62	0	378	#4 Mount		
Computer	1	0	3	I.C. Room		
Gun Director	37	0	3	Atop Pilot House		
Gun Director	51	2	1591	Port Aft		
Gun Director	51	2	1595	Starboard Aft		

U.S.S. ANDERSON (DD 411) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Fuzesetter	8	1	100	#1 Mount		
Fuzesetter	8	1	101	#2 Mount		
Fuzesetter	8	1	103	#3 Mount		
Fuzesetter	8	1	104	#4 Mount		
Stable Element	4	0	3	I.C. Room		
Torpedo Course Indicator	1	2	101	Aft Tubes		
Torpedo Course Indicator	1	2	200	Fwd Tubes		
Torpedo Director	27	5	16686	Bridge		
Radar (Less Antenna)	4	CW43 AAC	242	37 Director		
Radar (Less Antenna	22	0	447	37 Director		
Radar (Antenna Only)	4		242	37 Director		
Radar (Antenna Only)	22	0	447	37 Director		

U.S.S. CONYNGHAM (DD 371)

Gunsight	14	6	43928	Starboard Amidship	1A	
Gunsight	14	6	44657	Port Fwd	1A	
Gunsight	14	6	46159	Starboard Fwd	1A	
Gunsight	14	6	93078	Port Amidship	1A	
Gunsight	14	8	156188	Starboard Aft	1A	
Gunsight	14	8	159813	Port Aft	1A	

U.S.S. CONYNGHAM (DD 371) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Rangefinder	41	3	56	33 Director	1A	
Director Telescope	28		Level	33 Director	1A	
Director Telescope	28		Elev.	33 Director	1A	
Director Telescope	28		Train.	33 Director	1A	
Telescope.	50	0	23	Stbd. Torp. Director	1A	
Telescope	50	0	26	Port Torp. Director	1A	
Telescope	51		Cross Level	33 Director	1A	2BS
Telescope	61	0	145	#2 Mount	1A	
Telescope	61	0	146	#1 Mount	1A	
Telescope	61	0	147	#4 Mount	1A	
Telescope	61	0	465	#3 Mount	1A	3CS
Telescope	62	0	141	#2 Mount	1A	
Telescope	62	0	142	#4 Mount	1A	
Telescope	62	0	145	#3 Mount	1A	
Telescope	62	0	146	#1 Mount	1A	
Rangekeeper	10	29	52	33 Director	1A	
Gun Director	33	7	30	Over Pilot House	1A	2BS
Gun Director	51	2	354	Port Aft	1A	
Gun Director	51	2	355	Stbd. Aft	1A	

U.S.S. CONYNGHAM (DD 371) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Fuzesetter	8	9	2717	#1 Mount	1A	
Fuzesetter	8	9	2719	#3 Mount	1A	
Fuzesetter	8	9	2743	#4 Mount	1A	
Fuzesetter	8	9	2746	#2 Mount	1A	
Stable Element	2	1	52	33 Director	1A	
Torpedo Course Indicator	1	1	33	Port Tubes	3*	
Torpedo Course Indicator	1	1	34	Starboard tubes	3*	
Torpedo Director	27	1	1886	Port Nav. Bridge	3BP*	
Torpedo Director	27	1	1887	Stbd. Nav. Bridge	3*	
Radar (Less Antenna)	4	0	87	33 Director	1A	
Radar (Antenna Only)	4	0	87	33 Director	1A	

U.S.S. HUGHES (DD 410)

Gunsight	14	6	42943	Center Aft	2BP	
Gunsight	14	6	82626	Center Fwd.	1A	
Gunsight	14	6	98060	Port Fwd.	1A	3CP
Gunsight	14	6	464943	Starboard Fwd.	1A	
Gunsight	14	8	44707	Starboard Aft	2BP	3CP
Gunsight	14	8	155550	Port Aft	1A	

U.S.S. HUGHES (DD 410) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Rangefinder	42	2	156	37 Director	1A	
Telescope	50	1	973	Torpedo Director	1A	
Telescope	60	0	16	37 Director	1A	
Telescope	60	0	18	37 Director	1A	
Telescope	60	0	19	37 Director	1A	
Telescope	61	0	399	#1 Mount	1A	3CP
Telescope	61	0	400	#2 Mount	1A	
Telescope	61	0	402	#3 Mount	1A	
Telescope	61	0	403	#4 Mount	1A	
Telescope	62	0	396	#1 Mount	1A	
Telescope	62	0	397	#2 Mount	1A	
Telescope	62	0	400	#4 Mount	1A	
Telescope	62	0	402	#3 Mount	1A	
Computer	1	0	2	I.C. Room	1A	3CP
Gun Director	37	0	2	Fwd.	1A	3CP
Gun Director	51	2	10047	Starboard Aft	1BP	
Gun Director	51	2	10048	Port Aft	2BP	3CP
Fuzesetter	8	1	95	#1 Mount	1A	
Fuzesetter	8	1	96	#2 Mount	1A	
Fuzesetter	8	1	98	#3 Mount	1A	
Fuzesetter	8	1	99	#4 Mount	1A	
Searchlight Corrector	5	0	10	37 Director	1A	

U.S.S. HUGHES (DD 410) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Stable Element	6	5	176	I.C. Room	1A	3CP
Torpedo Course Indicator	1	2	241	#2 Torpedo Tube	1A	
Torpedo Course Indicator	1	4	635	#1 Torpedo Tube	1A	
Torpedo Director	27	1	2009	Nav. Bridge	1A	
Radar (Less Antenna)	4		1231	37 Director	3BP	
Radar (Less Antenna)	22	0	518	37 Director	1A	
Radar (Antenna Only)	4		1231	37 Director	3CP	
Radar (Antenna Only)	22	0	518	37 Director	3BP	

U.S.S. LAMSON (DD 367)

Gunsight	14	6	80876	Starboard Fwd.	
Gunsight	14	6	86753	Port Amidship	
Gunsight	14	6	89727	Starboard Amidship	
Gunsight	14	6	90378	Port Fwd.	
Gunsight	14	8	100597	Port 51 Director	
Gunsight	14	8	156225	Starboard 51 Director	
Rangefinder	41	1	23	33 Director	
Director Telescope	28		Pointer	33 Director	

U.S.S. LAWSON (DD 367) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Director Telescope	28		Trainer	33 Director		
Director Telescope	28		Leveler	33 Director		
Telescope	50	1	934	Torpedo Director		
Telescope	50	1	950	Torpedo Director		
Telescope	51	0	160	33 Director		
Telescope	61	0	101	#3 Mount		
Telescope	61	0	103	#1 Mount		
Telescope	61	0	104	#4 Mount		
Telescope	61	0	105	#2 Mount		
Telescope	62	0	99	#1 Mount		
Telescope	62	0	100	#2 Mount		
Telescope	62	0	101	#3 Mount		
Telescope	62	0	104	#4 Mount		
Rangekeeper	10	54	141	33 Director		
Gun Director	33	23	114	Atop Pilot House		
Gun Director	51	2	4899	Starboard Aft		
Gun Director	51	2	4900	Port Aft		
Fusesetter	8	9	2691	#4 Mount		
Fusesetter	8	9	2692	#3 Mount		
Fusesetter	8	9	2715	#2 Mount		
Fusesetter	8	9	2716	#1 Mount		

U.S.S. LAMSON (DD 367) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Stable Element	2	6	145	33 Director		
Torpedo Course Indicator	1	4	1016	Fwd Centerline		
Torpedo Director	27	5	16319	Port Bridge		
Torpedo Director	27	5	16826	Starboard Bridge		
Radar (Less Antenna)	28	0	58	33 Director		
Radar (Antenna Only)	28	0	6[illegible]	33 Director		
			U.S.S. MAYRANT (DD 402)			
Gunsight	14	6	81303	Starboard Aft	3*	
Gunsight	14	6	91411	Port Fwd	1A	
Gunsight	14	6	96916	Starboard Fwd	3*	
Gunsight	14	6	99265	Port Aft	1A	
Gunsight	14	8	107735	Starboard Aft 51 Dir.	1A	2BS
Gunsight	14	8	160497	Port Aft 51 Director	3*	
Rangefinder	41	3	54	33 Director	1A	2BS
Telescope	28		Pointer	33 Director	1A	
Telescope	28		Trainer	33 Director	1A	
Telescope	28		Leveler	33 Director	1A	
Telescope	50	1	123	Starboard Torp. Dir.	1A	
Telescope	50	1	124	Port Torpedo Director	1A	
Telescope	51	0	106	Cross Level 33 Director	1A	2BS

U.S.S. MAYRANT (DD 402) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	61	0	259	#1 Mount	1A	
Telescope	61	0	396	#3 Mount	2B	
Telescope	61	2	911	#4 Mount	1A	
Telescope	61	2	2459	#2 Mount	1A	
Telescope	62	0	233	#4 Mount	2B	
Telescope	62	0	238	#1 Mount	1A	
Telescope	62	0	395	#3 Mount	1A	
Telescope	62	2	890	#2 Mount	1A	
Rangekeeper	10	53	171	33 Director	1A	1BN
Gun Director	33	9	68	Atop Pilot House	1BP	
Gun Director	51	1	559	Aft	1A	
Gun Director	51	2	4378	Fwd	1A	
Fusesetter	8	1	63	#2 Mount	1A	
Fusesetter	8	1	64	#3 Mount	3*	
Fusesetter	8	1	65	#4 Mount	1A	
Fusesetter	8	5	2059	#1 Mount	1A	
Searchlight Train Indicator	14	1	698	Searchlight	1A	
Searchlight Elevation Indicator	14	1	698	Searchlight	1A	
Stable Element	2	1	81	33 Director	1A	

U.S.S. MAYRANT (DD 402) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Torpedo Course Indicator	1	2		Torpedo Tubes	1A	
Torpedo Director	27	1	6983	Port Nav. Bridge	1A	
Torpedo Director	27	1	6984	Starboard Nav. Bridge	1A	
Radar (Less Antenna)	28	3	501	33 Director	2BP	
Radar (Antenna Only)	28	3	501	33 Director	1A	
			U.S.S. MUGFORD (DD 389)			
Gunsight	14	6	44074	Starboard Amidship	1A	
Gunsight	14	6	49530	Starboard Fwd	1A	2BS
Gunsight	14	6	54324	Port Amidship	1A	
Gunsight	14	6	96821	Port Fwd	1A	
Gunsight	14	8	107471	Fwd 51 Director	1A	
Gunsight	14	8	159454	Aft 51 Director	1A	
Rangefinder	41	1	70	33 Director	1A	
Director Telescope	28		Pointer	33 Director	1A	
Director Telescope	28		Trainer	33 Director	1A	
Director Telescope	28		Leveler	33 Director	1A	
Telescope	50		99	#1 Torpedo Director	1A	
Telescope	50		100	#2 Torpedo Director	1A	

U.S.S. MUGFORD (DD 389) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After Test Able	Baker
Telescope	51		Cross Level	33 Director	1A	
Telescope	61	0	293	#4 Mount	1A	
Telescope	61	0	294	#3 Mount	1A	
Telescope	61	0	296	#2 Mount	1A	
Telescope	61	0	803	#1 Mount	1A	
Telescope	62	0	295	#1 Mount	1A	
Telescope	62	0	297	#2 Mount	1A	
Telescope	62	0	298	#3 Mount	1A	
Telescope	62	0	307	#4 Mount	1A	
Rangekeeper	10	3	170	33 Director	1A	
Gun Director	33	8	45	Atop Pilot House	1BP	1BN
Gun Director	51	2	4441	Fwd	1A	
Gun Director	51	2	4445	Aft	1A	1BP
Fuzesetter	8	5	1766	#1 Mount	1A	
Fuzesetter	8	5	1768	#2 Mount	1A	2BS
Fuzesetter	8	9	2689	#4 Mount	1A	
Fuzesetter	8	9	2773	#3 Mount	1A	
Stable Element	2	1	75	33 Director	2B	
Torpedo Director	27	1	1953	Stbd. Nav. Bridge	1A	2BN
Torpedo Director	27	1	1954	Port Nav. Bridge	1A	2BN

U.S.S. MUGFORD (DD 389) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Radar (Less Antenna)	28	0	79	33 Director	3CP	
Radar (Antenna Only)	28	0	79	33 Director	1A	

U.S.S. MUSTIN (DD 413)

Gunsight	14	6	10201	#23 Mount	2BP	
Gunsight	14	6	41158	#21 Mount	1A	
Gunsight	14	6	86511	#22 Mount	1A	
Gunsight	14	8	110263	Port 51 Director	1A	
Gunsight	14	8	157775	Starboard 51 Director	1A	
Rangefinder	42	7	115	37 Director	1A	
Telescope	60	0	10	37 Director	1A	
Telescope	60	0	81	37 Director	1A	
Telescope	61	0	405	#1 Mount	1A	
Telescope	61	0	406	#2 Mount	2AS	
Telescope	61	0	409	#3 Mount	1A	
Telescope	61	0	410	#4 Mount	1A	
Telescope	62	0	401	#1 Mount	1A	
Telescope	62	0	403	#3 Mount	1A	
Telescope	62	0	405	#2 Mount	1A	
Telescope	62	0	407	#4 Mount	1A	
Computer	1	0	5	I.C. Room	1A	
Gun Director	37	0	5	Atop Pilot House	1A	

U.S.S. MUSTIN (DD 413) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gun Director	51	2	2485	Starboard Aft	1A	
Gun Director	51	2	2542	Port Aft	1A	
Fuzesetter	8	1	110	#4 Mount	1A	
Fuzesetter	8	1	111	#3 Mount	1A	
Fuzesetter	8	1	113	#1 Mount	1A	
Fuzesetter	8	1	114	#2 Mount	1A	
Sight Angle & Deflection Indicator	31	4	29526	#3 Mount	1A	
Sight Angle & Deflection Indicator	31	5	29491	#1 Mount	1A	
Sight Angle & Deflection Indicator	31	5	29492	#2 Mount	1A	
Sight Angle & Deflection Indicator	31	5	29493	#4 Mount	1A	
Stable Element	4	0	5	I.C. Room	1A	
Radar (Less Antenna)	28	3	571	37 Director	1A	
Radar (Antenna Only)	28	3	571	37 Director	1A	

U.S.S. RALPH TALBOT (DD 390)

Gunsight	14	6	41609	Fwd. Starboard	1A	
Gunsight	14	6	42853	Aft Starboard	1A	

U.S.S. RALPH TALBOT (DD 390) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	6	80196	Aft Port	1A	
Gunsight	14	6	97022	Fwd. Port	1A	
Gunsight	14	8	110201	Aft 51 Director	3*	
Rangefinder	41	1	31	33 Director	1A	
Director Telescope	28	0	220	33 Director	1A	
Director Telescope	28	0	221	33 Director	1A	
Director Telescope	28	0	225	33 Director	1A	2BS
Telescope	50	0	88	Port Torpedo Director	1A	2BS
Telescope	50	1	398	Starboard Torpedo Dir.	1A	
Telescope	51	0	73	Cross-Level 33 Dir.	1A	
Telescope	61	0	29	#1 Mount	1A	
Telescope	61	0	75	#4 Mount	1A	
Telescope	61	0	298	#2 Mount	1A	
Telescope	61	0	301	#3 Mount	1A	
Telescope	62	0	5	#4 Mount	1A	
Telescope	62	0	33	#3 Mount	1A	
Telescope	62	0	298	#1 Mount	1A	
Telescope	62	0	300	#2 Mount	1A	
Rangekeeper	10	31	81	33 Director	1A	2BN
Gun Director	33	8	46	Ator Pilot House	2BP	

U.S.S. RALPH TALBOT (DD 390) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gun Director	51	1	256	Aft	3BP	3CP
Gun Director	51	2	5030	Fwd	3BP	
Fuzesetter	8	8	819	#1 Mount	1A	
Fuzesetter	8	8	2063	#2 Mount	1A	
Fuzesetter	8	9	1495	#4 Mount	1A	
Fuzesetter	8	9	1498	#3 Mount	1A	
Searchlight Elevation Indicator	4	3	113	Searchlight	3BP	
Searchlight Train Indicator	12	4	113	Searchlight	3BP	
Stable Element	2	1	71	33 Director	3BP	
Torpedo Director	27	1	1966	Port Bridge Wing	1A	
Torpedo Director	27	3	2693	Stbd. Bridge Wing	1A	
Torpedo Course Indicator	1	2	366	#1 Torpedo Tube	1A	
Torpedo Course Indicator	1	2	367	#3 Torpedo Tube	1A	
Torpedo Course Indicator	1	4	724	#2 Torpedo Tube	1A	
Torpedo Course Indicator	1	4	726	#4 Torpedo Tube	3*	
Radar (Less Antenna)	4	0	115	33 Director	2BP	

U.S.S. RALPH TALBOT (DD 390) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Radar (Antenna Only)	4	0	115	33 Director	1A	
			U.S.S. PHIND (DD 404)			
Gunsight	14	6	41454	Starboard Amidship	3BP*	
Gunsight	14	6	43970	Starboard Fwd	3BP	
Gunsight	14	6	80774	Port Amidship	1A	2BS
Gunsight	14	6	90266	Port Fwd	3*	
Gunsight	14	8	107379	Aft 51 Director	3BP	
Gunsight	14	8	159021	Fwd 51 Director	1A	
Rangefinder	41	9	85	33 Director	1B	
Director Telescope	28		Pointer	33 Director	1A	
Director Telescope	28		Trainer	33 Director	1A	
Director Telescope	28		Leveler	33 Director	1A	
Telescope	50	1	129	Port Torpedo Director	1A	
Telescope	50	1	130	Stbd Torpedo Director	1A	
Telescope	51		108	33 Director	1A	
Telescope	61	0	5	#1 Mount	1A	
Telescope	61	0	217	#2 Mount	1A	
Telescope	61	0	387	#4 Mount	1A	
Telescope	61	0	393	#3 Mount	1A	
Telescope	62	0	390	#1 Mount	1A	

U.S.S. RHIND (DD 404) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	62	0	391	#2 Mount	1A	
Telescope	62	0	392	#3 Mount	1A	
Telescope	62	0	393	#4 Mount	1A	
Rangekeeper	10	31	83	33 Director	1A	
Gun Director	33	9		Atop Pilot House	2BP	
Gun Director	51	1	688	Aft	2BP	
Gun Director	51	2	6209	Fwd	3CP	3BP
Fuzesetter	8	1	70	#1 Mount	1A	
Fuzesetter	8	1	71	#2 Mount	1A	
Fuzesetter	8	1	72	#3 Mount	1A	
Fuzesetter	8	1	73	#4 Mount	1A	
Stable Element	2	1	83	33 Director	3BP	3BP
Torpedo Course Indicator	1	1	3220	Starboard Tubes	3*	
Torpedo Course Indicator	1	1	3221	Port Tubes	1A	
Torpedo Director	27	1	1985	Starboard	2BP	
Torpedo Director	27	1	1986	Port	1BP	
Radar (Less Antenna)	28	0	85	33 Director	1A	
Radar (Antenna Only)	28	0	85	33 Director	3CP	

SECRET

U.S.S. STACK (DD 406)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	6	40393	#4-20MM	1A	2BS
Gunsight	14	6	82942	#3-20MM	1A	
Gunsight	14	6	93256	#1-20MM	3BP*	
Gunsight	14	6	99197	#2-20MM	3AS	
Gunsight	14	8	107444	Fwd	1BP	
Gunsight	14	8	158122	Aft	1A	2BS
Rangefinder	41	1	38	33 Director	1A	
Director Telescope	28		Pointer	33 Director	1A	
Director Telescope	28		Trainer	33 Director	1A	
Director Telescope	28		Leveler	33 Director	1A	
Telescope	50	1	137	#1 Torpedo Director	1A	
Telescope	50	1	138	#2 Torpedo Director	3*	
Telescope	51	0	124	33 Director	1A	
Telescope	61	0	426	#1 Mount	1A	
Telescope	61	0	429	#3 Mount	1A	
Telescope	61	0	431	#2 Mount		
Telescope	61	2	859	#4 Mount	3*	
Telescope	62	0	426	#2 Mount	1A	
Telescope	62	0	428	#3 Mount	1A	
Telescope	62	0	429	#4 Mount	3*	

U.S.S. STACK (DD 406) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	62	0	430	#1 Mount	1A	
Rangekeeper	10	31	85	33 Director	1A	
Gun Director	33	9	71	Atop Pilot House	2BP	3BP
Gun Director	51	1	1004	Aft	1BP	
Gun Director	51	2	4459	Fwd	1A	
Fusesetter	8	1	77	#4 Mount	1A	
Fusesetter	8	1	78	#1 Mount	1A	
Fusesetter	8	1	79	#2 Mount	1A	
Fusesetter	8	1	80	#3 Mount	1A	
Sight Angle & Deflection Indicator	31	4	29018	#4 Mount	1A	
Sight Angle & Deflection Indicator	31	5	29039	#1 Mount	1A	
Sight Angle & Deflection Indicator	31	5		#3 Mount	1A	
Sight Angle & Deflection Indicator	31	6	29040	#2 Mount	1A	
Stable Element	2	1	85	33 Director	3BP	
Torpedo Course Indicator	1	2	178	Port Tubes	3BP	
Torpedo Course Indicator	1	2	179	Starboard Tubes	1A	

U.S.S. STACK (DD 406) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Torpedo Director	27	1	1997	Starboard	1A	
Torpedo Director	27	1	1998	Port	1A	
Radar (Less Antenna)	4	1	296	33 Director	2BP	
Radar (Antenna Only)	4	1	296	33 Director	2BP	
			U.S.S. TRIPPE (DD 403)			
Gunsight	14	6	80182	Port Fwd		
Gunsight	14	6	86852	Starboard Amidship		2BS
Gunsight	14	6	91039	Starboard Fwd		
Gunsight	14	6	98561	Port Amidship		
Gunsight	14	8	99754	Fwd 51 Director		
Gunsight	14	8	101625	Aft 51 Director		
Rangefinder	41	2	52	33 Director		
Director Telescope	28		Pointer	33 Director		
Director Telescope	28		Trainer	33 Director		
Director Telescope	28		Leveler	33 Director		
Telescope	50	1	135	#1 Torpedo Director		
Telescope	50	1	136	#2 Torpedo Director		
Telescope	51	1	Cross Level	33 Director		

U.S.S. TRIPPE (DD 403) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	61	0	108	#2 Mount		
Telescope	61	0	152	#1 Mount		
Telescope	61	0	416	#3 Mount		
Telescope	61	0	419	#4 Mount		
Telescope	62	0	235	#2 Mount		
Telescope	62	0	420	#1 Mount		
Telescope	62	0	422	#3 Mount		
Telescope	62	0	423	#4 Mount		
Rangekeeper	10	53	168	33 Director		
Gun Director	33	9	70	Atop Pilot House		
Gun Director	51	1	597	Aft		
Gun Director	51	2	690	Fwd		
Fusesetter	8	1	66	#1 Mount		
Fusesetter	8	1	67	#2 Mount		
Fusesetter	8	1	68	#3 Mount		
Fusesetter	8	1	69	#4 Mount		
Stable Element	2	1	82	33 Director		
Torpedo Course Indicator	1	2	175	Starboard Tube		
Torpedo Course Indicator	1	2	176	Port Tube		
Torpedo Director	27	1	1995	Starboard		

U.S.S. TRIPPE (DD 403) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Torpedo Director	27	1	1996	Port		
Radar (Less Antenna)	28	3	502	33 Director		
Radar (Antenna Only)	28	3	502	33 Director		

U.S.S. WAINWRIGHT (DD 419)

Gunsight	14	6	45160	Fwd Center	1A	2BS
Gunsight	14	6	90613	Port Fwd	1A	
Gunsight	14	6	91436	Aft	3S5	
Gunsight	14	6	95961	Starboard Fwd	1A	
Gunsight	14	8	59667	Aft	1A	
Gunsight	14	14	58897	Fwd	1A	
Rangefinder	42	13	401	37 Director	1A	
Telescope	50	1	147	Torpedo Director	1A	
Telescope	60	0	33	37 Director	1A	
Telescope	60	0	43	37 Director	1A	
Telescope	60	0	45	37 Director	1A	
Telescope	61	0	449	#1 Mount	1A	
Telescope	61	0	452	#2 Mount	1A	
Telescope	61	0	456	#3 Mount	1A	2BS
Telescope	61	0	457	#4 Mount	1A	2BS
Telescope	62	0	107	#1 Mount	1A	

U.S.S. WAINWRIGHT (DD 419) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	62	0	454	#2 Mount	1A	
Telescope	62	0	457	#3 Mount	1A	
Telescope	62	0	458	#4 Mount	1A	
Computer	1	0	11	I.C. Room	1A	2BP
Gun Director	37	0	11	Atop Pilot House	2BP	2BP
Gun Director	51	1	551	Starboard Aft	1A	
Gun Director	51	2		Fwd Bridge	1A	
Fusesetter	8	1	140	#1 Mount	1A	
Fusesetter	8	1	141	#2 Mount	1A	
Fusesetter	8	1	143	#3 Mount	1A	
Fusesetter	8	1	144	#4 Mount	1A	
Searchlight Corrector	3	0	11	37 Director	1A	
Searchlight Control Transmitter	1	0	728	37 Director	1A	
Stable Element	4	0	11	I.C. Room	1A	
Torpedo Course Indicator	1	2	230	Fwd. Tubes	1A	
Torpedo Course	1	2	231	Aft Tubes	1A	
Torpedo Director	27	1	2029	Flying Bridge	1A	
Radar (Less Antenna)	28	3	522	37 Director	1A	

U.S.S. WAINWRIGHT (DD 419) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Radar (Antenna Only)	28	3	522	37 Director	1A	
			U.S.S. WILSON (DD 408)			
Gunsight	14	6	84218	Fwd Port	3*	
Gunsight	14	6	84775	Aft Port	1A	2BS
Gunsight	14	6	86188	Fwd Starboard	3*	
Gunsight	14	6	102119	Aft Starboard	3BP	
Gunsight	14	8	109201	Aft 51 Director	3BP	
Gunsight	14	8	157681	Fwd 51 Director	3*	
Rangefinder	41	3	59	33 Director	1A	
Director Telescope	28		Pointer	33 Director	1A	
Director Telescope	28		Trainer	33 Director	1A	
Director Telescope	28		Leveler	33 Director	1A	
Telescope	50	0	38	Port 27 Director	1A	
Telescope	50	0	39	Starboard 27 Director	1A	
Telescope	51		112	33 Director	1A	
Telescope	61	0	363	#2 Mount	1A	
Telescope	61	0	365	#1 Mount	1A	
Telescope	61	0	366	#3 Mount	3*	
Telescope	61	0	367	#4 Mount	1A	

U.S.S. WILSON (DD 408) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Telescope	62	0	276	#1 Mount	1A	
Telescope	62	0	359	#2 Mount	1A	
Telescope	62	0	362	#3 Mount	1A	
Telescope	62	0	367	#4 Mount	1A	
Rangekeeper	10	31	87	33 Director	3BP*	2BN
Gun Director	33	9	65	Atop Pilot House	1BP	2BS
Gun Director	51	1	452	Port 40MM	1BP	2BS
Gun Director	51	2	7429	Fwd	1A	
Fuzesetter	8	1	86	#1 Mount	1A	
Fuzesetter	8	1	87	#2 Mount	1A	
Fuzesetter	8	1	88	#3 Mount	1A	
Fuzesetter	8	1	89	#4 Mount	1A	
Stable Element	2	1	87	33 Director	3BP	
Torpedo Course Indicator	1	1	3206	Starboard Tube	1A	
Torpedo Course Indicator	1	1	6218	Port Tube	1A	
Torpedo Director	27	4	16721	Starboard Bridge	1A	
Torpedo Director	27	5	16630	Port Bridge	1A	2ES

S E C R E T

Enclosure (D) to Director Ship Material Serial 001500.

U.S.S. WILSON (DD 408) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After Test Able	Baker
Radar (Less Antenna)	28	0	46	33 Director	2BP	
Radar (Antenna Only)	28	0	46	33 Director	1A	
			U.S.S. APAGON (SS 308)			
Binoculars	38	0	236	Cig. Deck	1A	
Binoculars	91	0	3	Bridge	1A	
Gyro Setting Indicator	1	2	269	Aft Torpedo Room	1A	
Gyro Setting Indicator	1	2	270	Fwd Torpedo Room	1A	
Target Bearing Transmitter	8	0	210	Cig. Deck	1A	
Target Bearing Transmitter	9	0	13	Bridge	1A	
Bearing & Range Indicator	4	0	140	Con. Tower	1A	
Bearing & Range Indicator	4	0	141	Control Room	1A	
Bearing Indicator	10	0	2403	Con. Tower	1A	
Bearing Indicator	12	0	350	Con. Tower	1A	
Torpedo Data Computer	3	5	152	Con. Tower	1A	
			U.S.S. BERMUDA (SS 335)			
Binocular	38	0	265	Cig. Deck	1A	

U.S.S. DENTUDA (SS 335) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Binocular	38	0	271	Bridge	1A	
Gyro Setting Indicator	1	3	436	Fwd Torpedo Room	1A	
Gyro Setting Indicator	1	3	437	Aft Torpedo Room	1A	
Target Bearing Transmitter	8	0	268	Cig. Deck	1A	
Target Bearing Transmitter	8	0	854	Bridge	1A	
Periscope Bearing Transmitter	Sylvania Type			Con. Tower (Experimental)	1A	
Bearing Indicator	10	0	2280	Con. Tower	1A	
Bearing Indicator	12	0	64	Con. Tower	1A	
Torpedo Data Computer	3	5	236	Con. Tower	1A	

U.S.S. PARCHE (SS 384)

Binocular	91	0	222	Bridge	1A	
Binocular	91	0	477	Cig. Deck	1A	
Gyro Setting Indicator	1	3	285	Aft Torpedo Room	1A	
Gyro Setting Indicator	1	3	288	Fwd Torpedo Room	1A	
Target Bearing Transmitter	8	0	278	Bridge Aft	1A	

U.S.S. PARCHE (SS 384) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Target Bearing Transmitter	9	0	75	Bridge Fwd	1A	
Range & Bearing Repeater	4	0	440	Con. Tower	1A	
Range & Bearing Repeater	4	0	441	Control Room	1A	
Bearing Repeater	10	0	4282	Con. Tower	1A	
Bearing Repeater	10	0	4283	Control Room	1A	
Bearing Repeater	12	0	228	Con. Tower	1A	
Torpedo Data Computer	3	5	240	Con. Tower	1A	
U.S.S. PILOTFISH (SS 386)						
Binocular	38	0	63	Bridge	1A	
Binocular	38	0	65	Cig. Deck	1A	
Gyro Setting Indicator	1	3	287	Aft Torpedo Room	1A	
Gyro Setting Indicator	1	3	290	Fwd Torpedo Room	1A	
Target Bearing Transmitter	8	0	22	Cig. Deck	1A	
Target Bearing Transmitter	8	[illegible]	139	Bridge	1A	
Bearing Indicator	10	0	283	Con. Tower	1A	

U.S.S. PILOTFISH (SS 386) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Bearing Indicator	12	0	33	Con. Tower	1A	
Torpedo Data Computer	3	5	163	Con. Tower	1A	
			U.S.S. SKATE (SS 305)			
Binocular	38	0	282	Cig. Deck	3CP	
Binocular	91	0	185	Bridge	1A	
Gyro Setting Indicator	1	2	230	Aft Torpedo Room	1A	
Gyro Setting Indicator	1	2	231	Fwd Torpedo Room	1A	
Target Bearing Transmitter	8	0	312	Cig. Deck	3CP	
Target Bearing Transmitter	9	0	62	Bridge	3BP	
Bearing Indicator	10	2	2422	Con. Tower	1A	
Torpedo Data Computer	3	5	101	Con. Tower	1A	
			U.S.S. BANNER (APA 60)			
Gunsight	14	6	40078	Gun Deck Stbd. Fr. 137	1A	
Gunsight	14	6	43040	Flying Bridge Fr 59	1A	
Gunsight	14	6	83175	Flying Bridge Fr. 63	1A	
Gunsight	14	6	88545	Gun Deck Fr. 137	1A	
Gunsight	14	8	191925	51 Dir. Aft Stbd.	1A	
Gunsight	14	8	101137	51 Dir. Fwd Port	1A	

U.S.S. BANNER (APA 60) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	15	3	878	51 Director Aft C/L	3BP	
Rangefinder	65	0	346	Bridge	2BP	
Telescope	62	3	Pointer	Aft 5" Gun	1A	2BS
Telescope	83	1	2019	Aft 5" Gun	1A	2BS
Gun Director	51	2	6331	Fwd Port	1A	
Gun Director	51	2	6333	Aft Starboard	1A	
Gun Director	51	3	5885	Aft C/L	1BP	
			U.S.S. BARROWN (APA 61)			
Gunsight	14	6	81160	Fwd Port 20MM	1A	
Gunsight	14	6	81739	Stbd Fwd 20MM	1A	
Gunsight	14	6	85490	Aft Stbd 20MM	1A	3CS
Gunsight	14	6	95481	Aft Port 20MM	1A	
Gunsight	14	8	154570	Aft 51 Director	1A	
Gunsight	14	8	161818	Fwd 51 Director	1A	
Gunsight	15	3	1113	Aft 51 Director	1A	
Rangefinder	65	0	356	Signal Bridge	1A	
Telescope	62	3	4956	5" Aft	1A	
Telescope	83	1	1731	5" Aft	1A	3CS
Gun Director	51	2	6472	Fwd Stbd.	1A	
Gun Director	51	2	6475	Aft Port	1A	
Gun Director	51	3		C/L Superstructure Deck Aft	1A	

U.S.S. BARROW (APA 61) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Wind Box	4		498	Atop After Deck House	Missing	
			U.S.S. BLADEN (APA 63)			
Gunsight	14	6	54546	Signal Bridge Port	1BP	
Gunsight	14	6	103141	Signal Bridge Stbd.	3BS	
			U.S.S. BRACKEN (APA 64)			
Gunsight	14	6	54292	Stbd. Signal Bridge	1A	3CS
Gunsight	14	6	82621	20MM Aft Port	3BP	
Gunsight	14	6	98314	Port Signal Bridge	3*	
Gunsight	14	6	98459	20MM Stbd Aft	1A	3CS
Gunsight	14	8	106599	51 Dir. Fwd.	1A	
Gunsight	15	3	815	51 Dir. Aft	1A	
Rangefinder	63	0	152	Signal Bridge	1A	2BS
Telescope	62	3	4543	5" Aft	1A	3CS
Telescope	83	1	1629	5" Aft	1A	3CS
Gun Director	51	2	6641	Fr. 33 Starboard	1A	
Gun Director	51	3	11500	Fr. 145	1A	
			U.S.S. BRISCOE (APA 65)			
Gunsight	14	6	44054	Signal Bridge	1A	2BS
Gunsight	14	6	54154	Signal Bridge	1A	
Gunsight	14	6	86261	Signal Bridge	1A	
Gunsight	14	6	89645	Signal Bridge	1A	2BS

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
				U.S.S. BRULE (APA 66)		
Gunsight	14	6	93999	20MM Stbd. Amidship	1A	
Gunsight	14	6	96503	20MM Port Amidship	1A	
Rangefinder	63	0	151	Bridge	1A	
				U.S.S. BUTTE (APA 68)		
Gunsight	14	6	93409	20MM Starboard	1A	
Gunsight	14	6	93840	20MM Port	1A	
Rangefinder	63	0	131	Signal Bridge	1A	
				U.S.S. CARLISLE (APA 69)		
Gunsight	14	6	10768	Stbd. Aft		
Gunsight	14	6	82525	Port Aft		
Gunsight	14	6	94722	Fwd Stbd.		
Gunsight	14	6	103323	Fwd. Port		
Gunsight	14	8	109078	Port Aft		
Gunsight	15	3	2874	Aft		
Rangefinder	63	0	153	Bridge		
Telescope	62	4	5363	5"/38		
Telescope	83	1	1987	5"/38		
Gun Director	51	2	8063	Aft Port		
Gun Director	51	3	11558	Aft Stbd.		
				U.S.S. CARTERET (APA 70)		
Gunsight	14	6	40026	20MM Aft Stbd.	1A	

U.S.S. CARTERET (APA 70) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	6	91896	20MM Fwd. Starboard	1A	
Gunsight	14	6	93361	20MM Aft Port	2BP	2BS
Gunsight	14	6	94224	20MM Fwd Starboard	1A	2BS
Gunsight	14	8	100370	51 Director Fwd.	1A	2BS
Gunsight	14	8	155757	51 Director Aft Port	1A	
Gunsight	15	3	2855	51 Director Aft C/L	2BP	2BS
Rangefinder	63	0	128	Bridge	1A	
Gun Director	51	2	8066	Fwd Deck House	1A	
Gun Director	51	2	8067	Aft Deck House	1A	
Gun Director	51	3	11559	Aft Deck House	1A	

U.S.S. CATRON (APA 71)

Gunsight	14	6	93437	20MM Aft Port	1A	
Gunsight	14	6	93835	20MM Starboard Bridge	1A	
Gunsight	14	6	93850	Port Signal Bridge	1A	
Gunsight	14	6	93875	20MM Aft Starboard	1A	
Gunsight	14	8	109242	Fwd 51 irector	1A	
Gunsight	15	3	1152	51 Director Aft	1A	
Rangefinder	63	0	157	Bridge	1A	2BS
Telescope	62	3	4866	5" Aft	1A	
Telescope	83	1	1814	5" Aft	1A	2BS
Gun Director	51	3	11560	Frame 116	1A	

U.S.S. CORTLAND (APA 75)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	6	42809	#2 Port	1A	2BS
Gunsight	14	6	88584	20MM Starboard Fwd.	1A	
Gunsight	14	8	155016	51 Director Aft	1A	
Gunsight	14	8	160150	51 Director Aft	1A	
Gunsight	15	3	2338	51 Director Aft	1A	2BS
Rangefinder	65		343	Bridge	1A	2BS
Telescope	62	3	4958	5" Aft	1A	
Telescope	83	1	1860	5" Aft	1A	
Gun Director	51	2	7951	Frame 130	1A	
Gun Director	51	2	7952	Frame 27	1A	
Gun Director	51	3	11601	Frame 145	1A	

U.S.S. CRITTENDEN (APA 77)

Gunsight	14	6	47335	20MM Port Amidship	3AP
Gunsight	14	6	90515	20MM Starboard Amid.	1A
Gunsight	14	6	93487	20MM Starboard Fwd.	3BP
Gunsight	14	6	97953	20MM Port Fwd.	3BP
Gunsight	14	8	107915	51 Director Fwd.	1A
Gunsight	15	8	108105	51 Director Port Aft	3BP
Gunsight	15	3	2483	51 Director Aft	2BP
Rangefinder	65	0	469	Bridge	2BP
Telescope	62	2	4435	5"/38	1A
Telescope	83	1	1998	5"/38	1A

U.S.S. CRITTENDEN (APA 77) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gun Director	51	2	8915	03 Deck Aft Deck House	3CP	
Gun Director	51	2	8922	02 Deck Frame 3C	1A	
Gun Director	51	3	11969	02 Deck Aft Fr. 142	1A	
			U.S.S. DAWSON (APA 79)			
Gunsight	14	6	PH6	Signal Bridge	1A	
Gunsight	14	6	80292	20MM Port Aft	1BP	
Gunsight	14	6	81518	20MM Starboard	3BP	
Gunsight	14	6	91431	20MM Starboard	1A	2BS
Gunsight	14	8	156276	Aft 51 Director	2BP	
Gunsight	14	8	157714	Fwd 51 Director	3BP	
Gunsight	15	3	2607	Aft 51 Director	1A	
Rangefinder	65	0	430	Bridge	3BP	
Telescope	62	2	4754	5" Gun	1A	
Telescope	83	3	1792	5" Gun	1A	
Gun Director	51	2	8923	#41-40MM	1A	
Gun Director	51	2	8960	#44-40MM	1A	
Gun Director	51	3	11508	5"/38 Amidship Aft	2BP	
			U.S.S. FALLON (APA 81)			
Gunsight	14	6	84593	20MM Aft	3AS	3CP
Gunsight	14	6	89448	Starboard Bridge	1A	
Gunsight	14	6	93763	Signal Bridge	1A	
Gunsight	14	6	105316	20MM Starboard Aft	3As	

U.S.S. FALLON (APA 81) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gunsight	14	8	107241	51 Director Aft	1A	
Gunsight	15	3	1239	51 Director Fwd Port	3*	
Rangefinder	65	0	468	Bridge	1A	3CP
Telescope	62	4	6024	5" Gun	1A	2BP
Telescope	83	2	2700	5" Gun	1A	2BP
Gun Director	51	2	8645	Fwd Port	1A	
Gun Director	51	2	9351	Aft Starboard	1A	
Gun Director	51	3	11497	Aft Deck House	1A	
				U.S.S. FILLMORE (APA 83)		
Gunsight	14	6	48278	04 Deck Starboard	1A	
Gunsight	14	6	54349	04 Deck Port	1A	
				U.S.S. GASCONADE (APA 85)		
Gunsight	14	6	48690	Signal Bridge Port	1A	
Gunsight	14	6	49016	20MM #9	1A	
Gunsight	14	6	91521	Fwd Signal Bridge	1A	
Gunsight	14	6	105780	Aft Port	3*	
Gunsight	14	8	160970	Fwd 51 Director	1A	
Gunsight	15	3	2536	51 Director Aft	3*	
Rangefinder	65	0	484	Signal Bridge	1A	3CP
Telescope	62	4	6153	5" Aft	1A	2BS
Telescope	83	2	3359	5" Aft	1A	2BS

U.S.S. GASCONADE (APA 85) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Gun Director	51	2		Fwd 51 Director	3AN	
Gun Director	51	3		Aft 51 Director	3AN	
			U.S.S. GENEVA (APA 86)			
Gunsight	14	6	47562	04 Deck Port	1A	
Gunsight	14	6	47659	04 Deck Starboard	1A	
			U.S.S. GILLIAM (APA 57)			
Gunsight	14	6	84202	Port Amidship		
Gunsight	14	6	90236	Starboard Amidship		
Gunsight	14	8	103741	Starboard Fwd.		
Gunsight	15	3	2617	Aft Cent.		
Rangefinder	65	0	351	Bridge		
Telescope	62	3	5575	5"/38		
Telescope	83	1	1997	5"/38		
Gun Director	51	2	5383	Fwd Deck House		
Gun Director	51	3	5665	Aft Deck House		
			U.S.S. NIAGARA (APA 87)			
Gunsight	14	6	45716	20MM Stbd. Aft	1A	
Gunsight	14	6	47032	20MM Stbd. Bridge	1A	
Gunsight	14	6	47393	20MM Port Bridge	1A	
Gunsight	14	6	47798	20MM Port Aft	1A	
Gunsight	15	3	2735	51 Director Aft	1A	

U.S.S. NIAGARA (APA 87) (Cont'd)

Equipment	Mark	Mod	Serial	Location	Condition After test Able	Baker
Rangefinder	65	0	501	Bridge	1A	
Telescope	62	4	6600	5" Aft	1A	2BS
Telescope	83	2	3541	5" Aft	1A	2BS
Gun Director	51	3	12235	Aft Centerline	1A	

FIRE CONTROL DAMAGE CHARTS

TEST "A"

Damage to Gunsights, Mark 14 and Mods.

Damage to Gunsights, Mark 15 and Mods.

Damage to Rangefinders.

Damage to Gunsight Telescopes for 3 inch and 5 inch Guns.

Damage to Gunsight Telescopes for Turret and Broadside Guns.

Damage to Director Telescopes.

Damage to Periscopes.

Damage to Rangekeepers.

Damage to Computers, Mark 1, 10 and Mods.

Damage to Stable Elements and Stable Verticals.

Damage to Gun Directors (Surface).

Damage to Gun Directors, Mark 33, 37, 50 and Mods.

Damage to Gun Directors, Mark 51 and Mods., G.F.C.S. 57, 63 and Mods.

Damage to Torpedo Directors, Mark 27 and Mods.

Damage to Fuse Setters.

Damage to Submarine Fire Control Equipment.

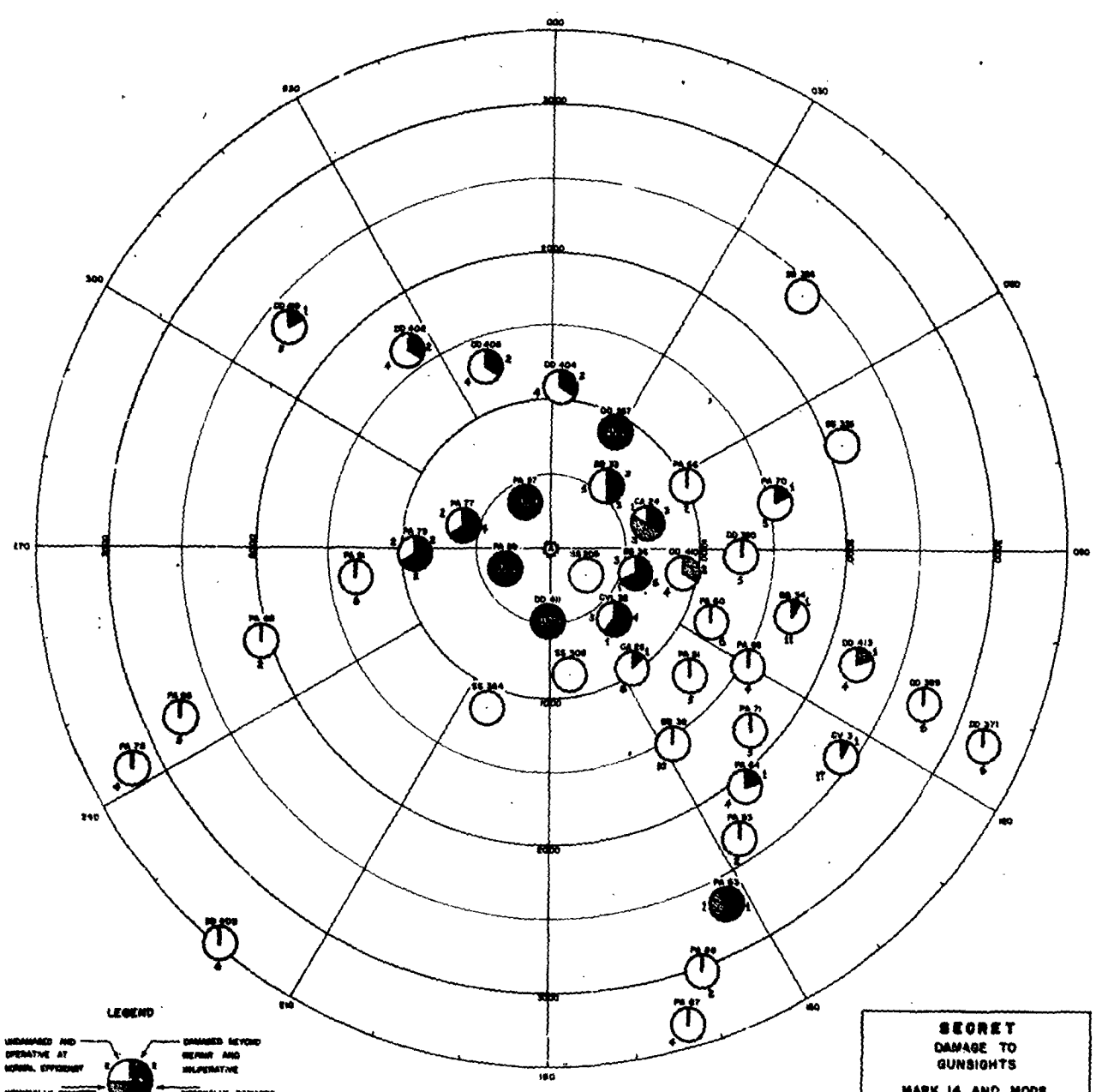
Fire Control Radar Overall Damage All Marks and Mods.

Fire Control Radar Antennae Only All Marks and Mods.

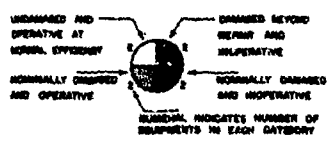
Fire Control Radar Antennae Only Marks 4 and 12, All Mods.

Fire Control Radar Antennae Only Marks 10, 28, 29, All Mods.

TEST ABLE

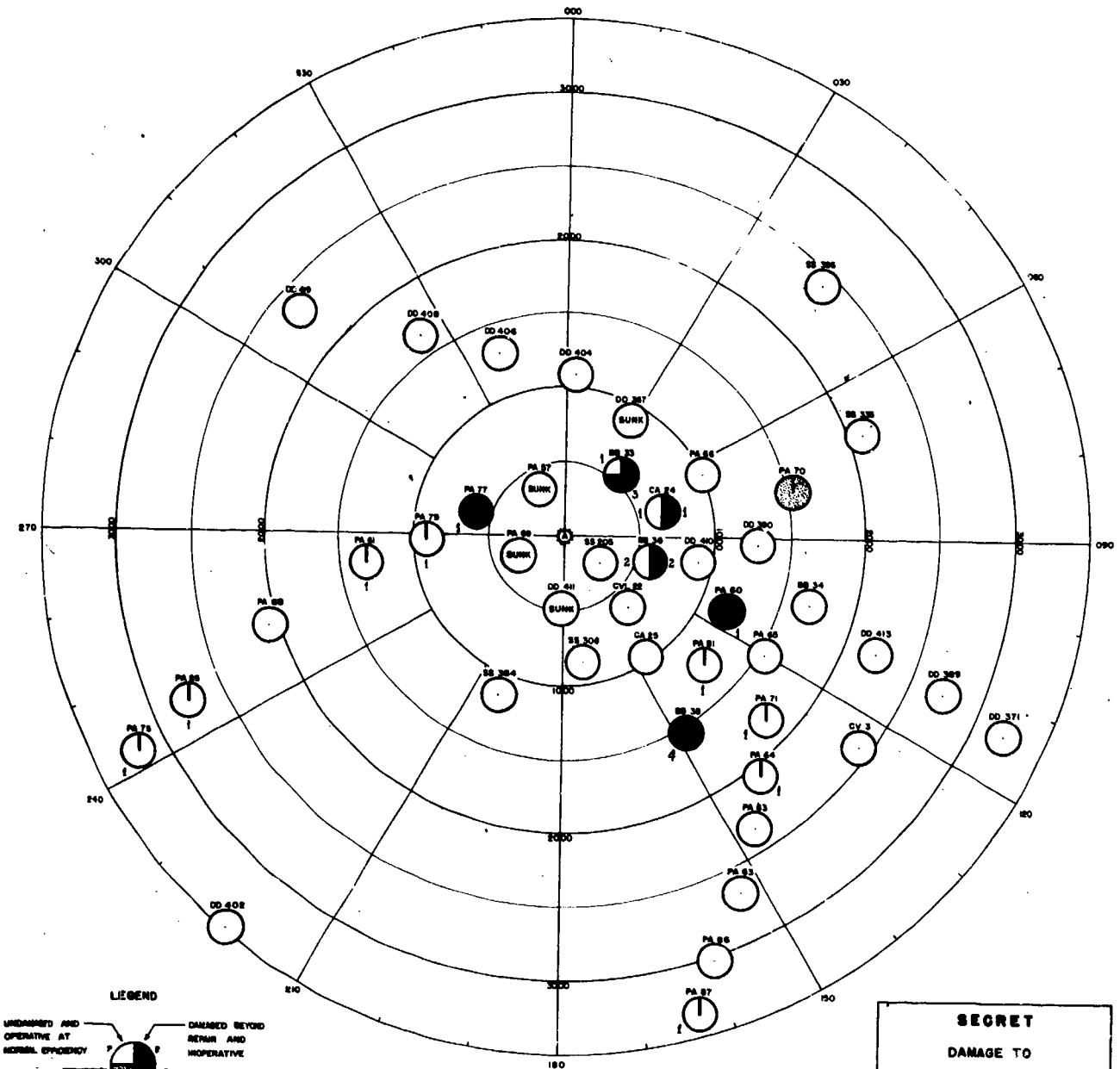


LEGEND

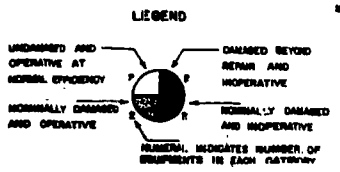


SECRET
DAMAGE TO
GUNSIGHTS
MARK 14 AND MODS.

TEST ABLE



LEGEND



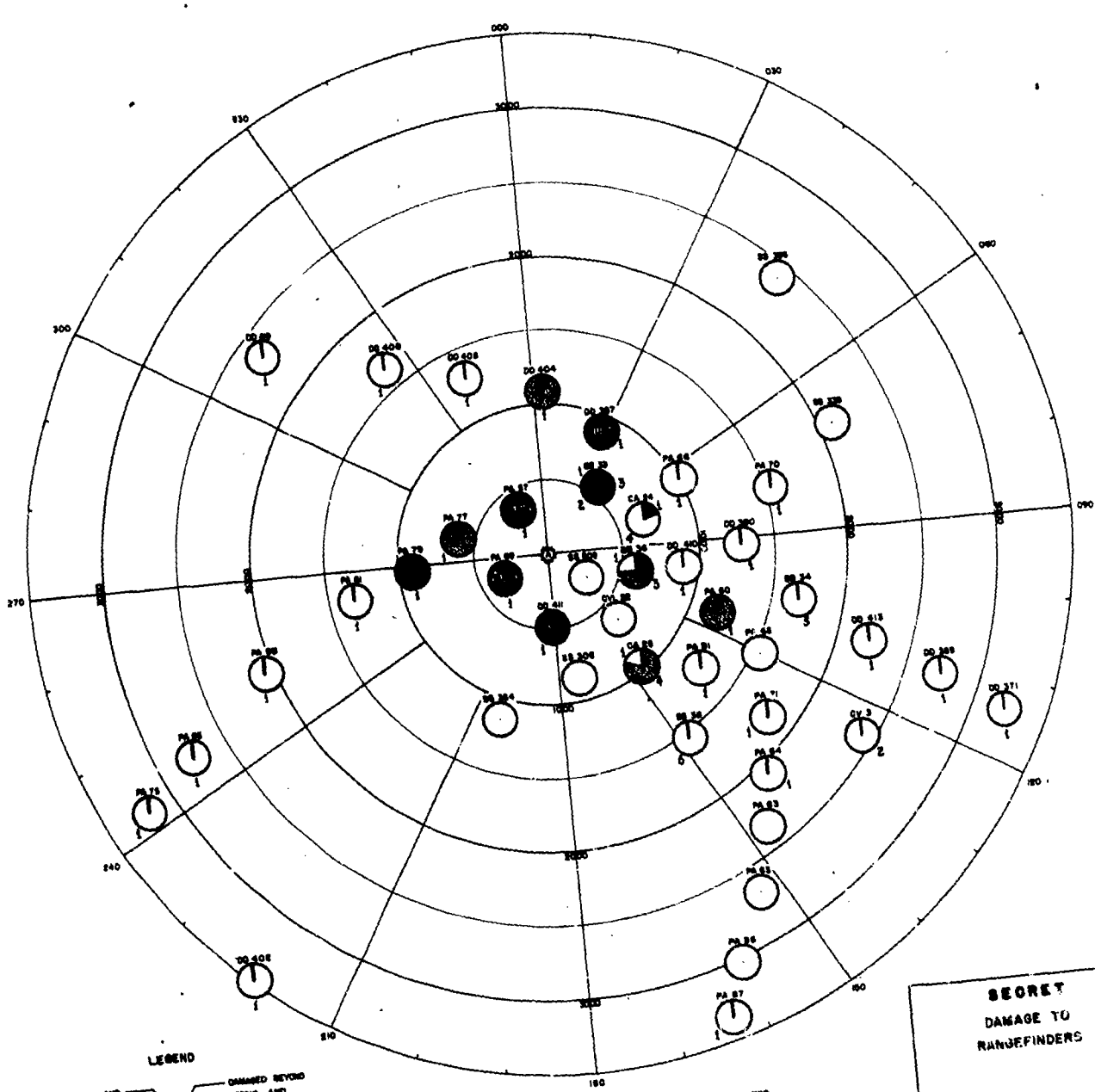
SECRET

DAMAGE TO

GUNSIGHTS

MARK 15 AND MODS.

TEST ABLE



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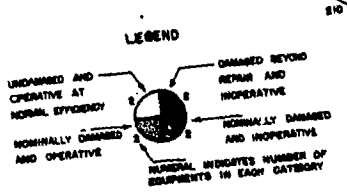
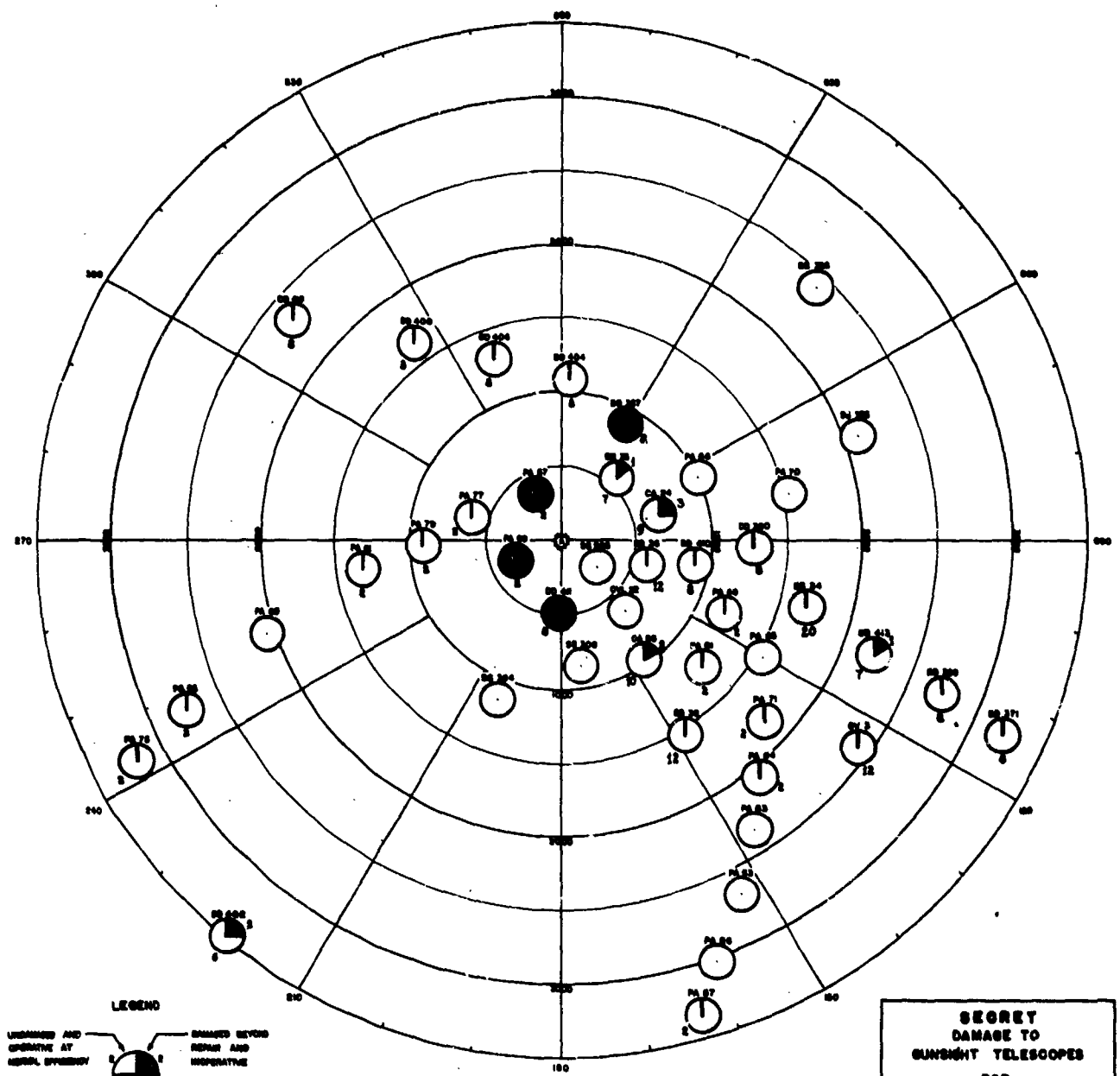


SECRET
DAMAGE TO
RANGEFINDERS

TEST ABLE



LEGEND

UNDAMAGED AND OPERATIVE AT NORMAL EFFICIENCY

DAMAGED BEYOND REPAIR AND INOPERATIVE

NORMALLY DAMAGED AND OPERATIVE

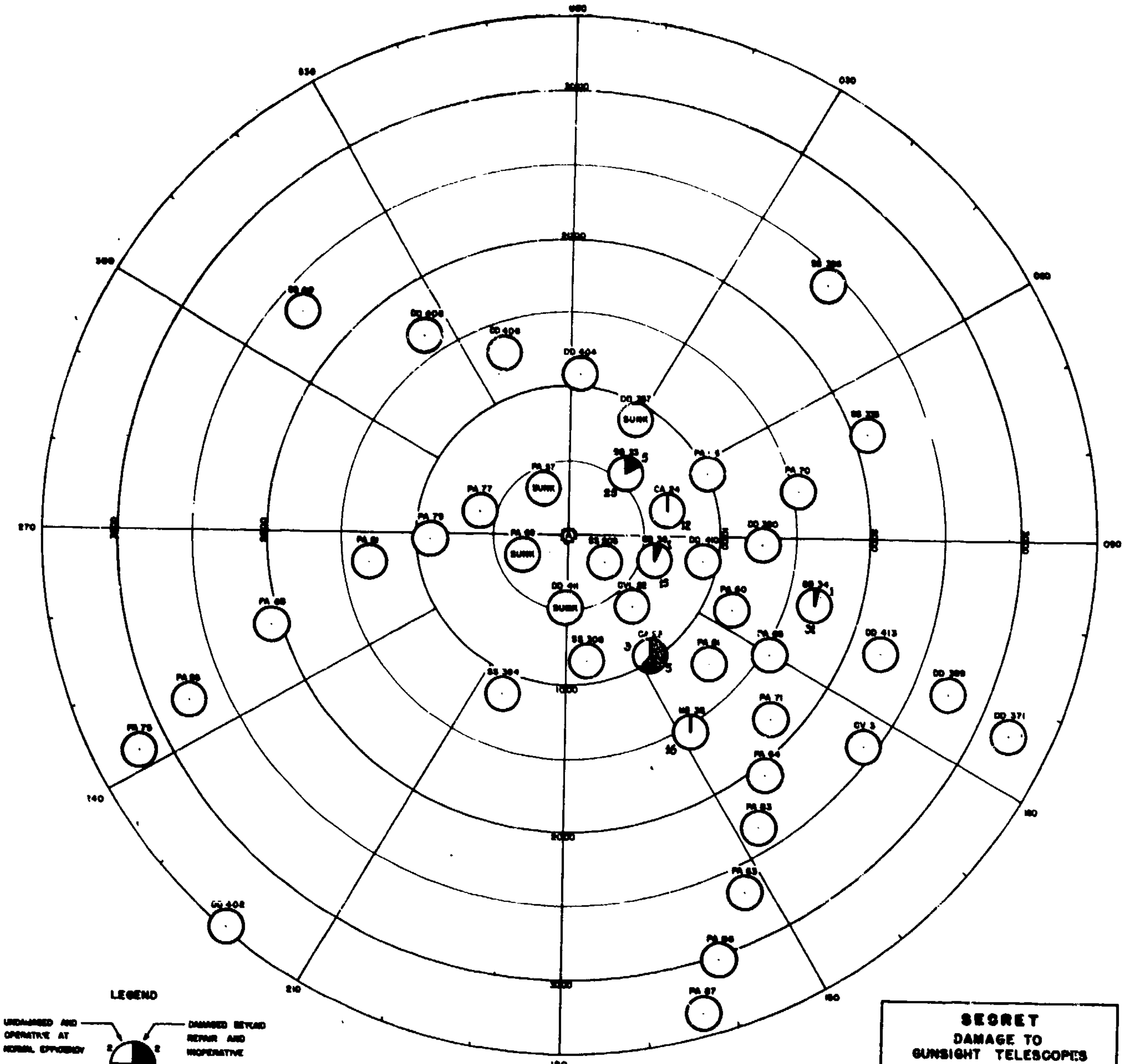
NORMALLY DAMAGED AND INOPERATIVE

NUMERAL INDICATES NUMBER OF COMPONENTS IN EACH CATEGORY

SECRET
DAMAGE TO
GUNSIGHT TELESCOPES
FOR
3 INCH AND 5 INCH GUNS

3927

TEST ABLE



LEGEND

UNDAMAGED AND OPERATIVE AT NORMAL EFFICIENCY

DAMAGED BEYOND REPAIR AND INOPERATIVE

NOMINALLY DAMAGED AND OPERATIVE

NOMINALLY DAMAGED AND INOPERATIVE

NUMERAL INDICATES NUMBER OF EQUIPMENTS IN EACH CATEGORY

Enclosure (D) to Director Ship Material Serial 001500

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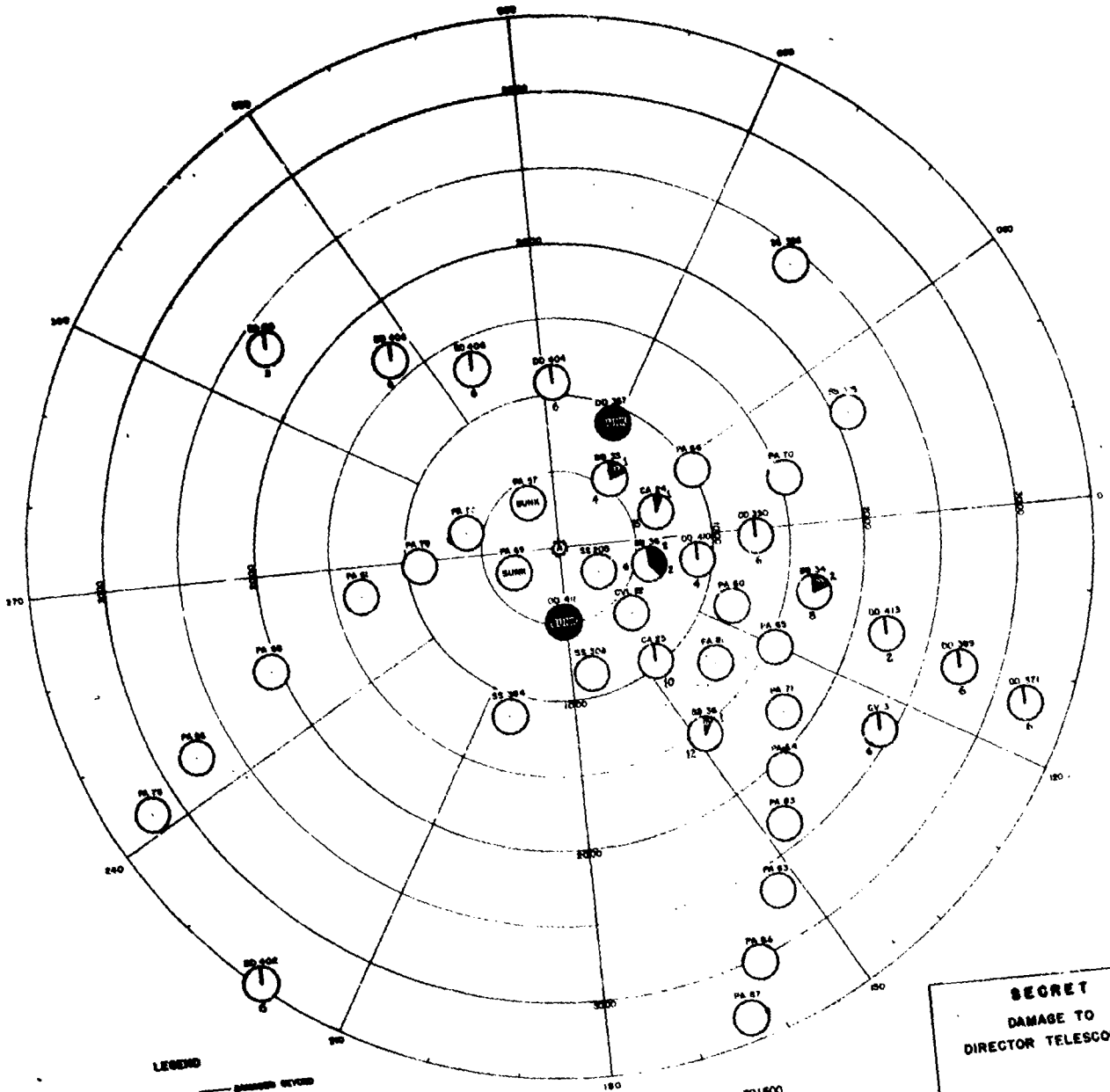
SECRET

DAMAGE TO GUNSIGHT TELESCOPES FOR TURRET AND BROADSIDE GUNS

3927

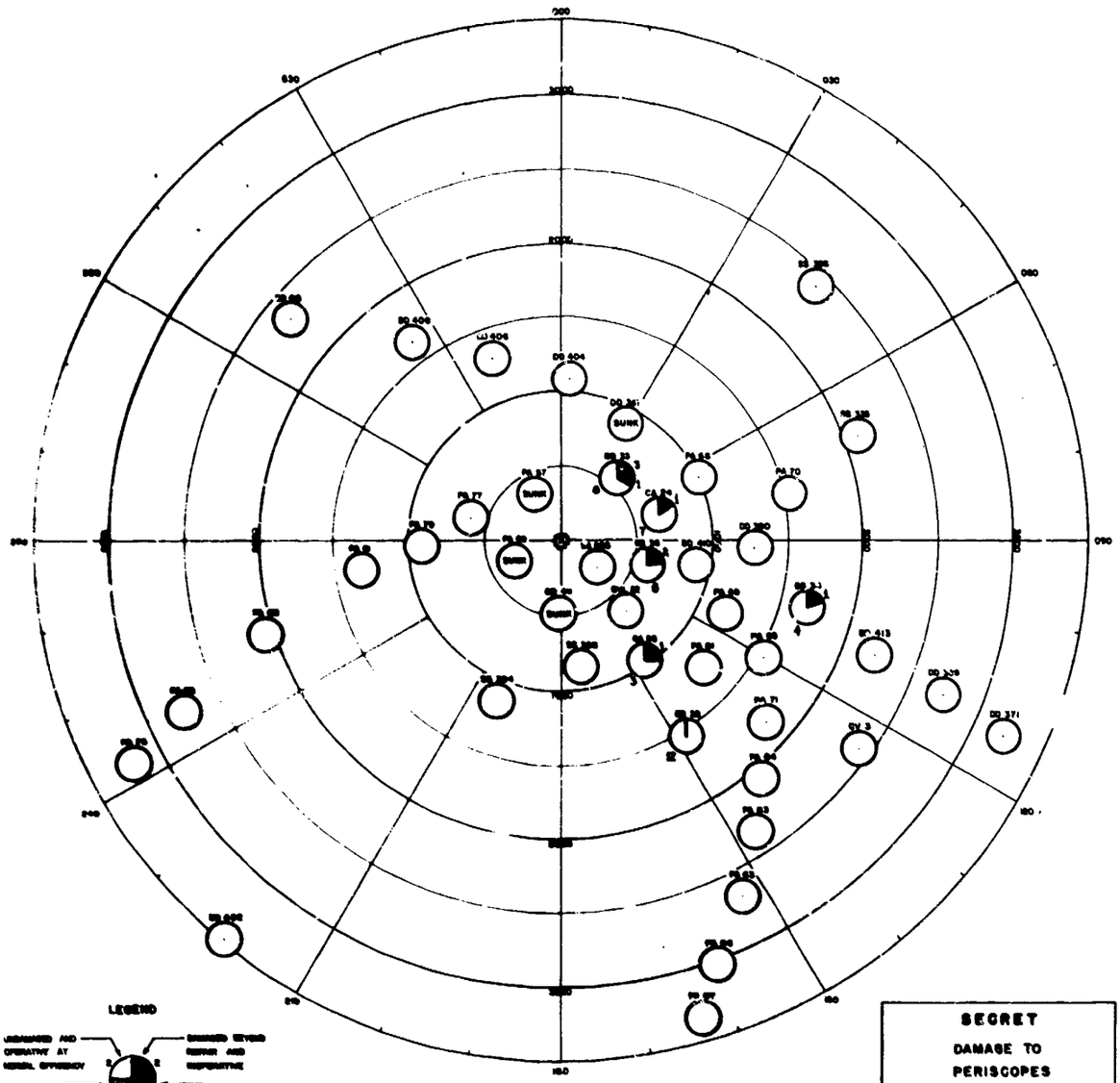
TEST ABLE



SECRET
DAMAGE TO
DIRECTOR TELESCOPES

5727

TEST ABLE



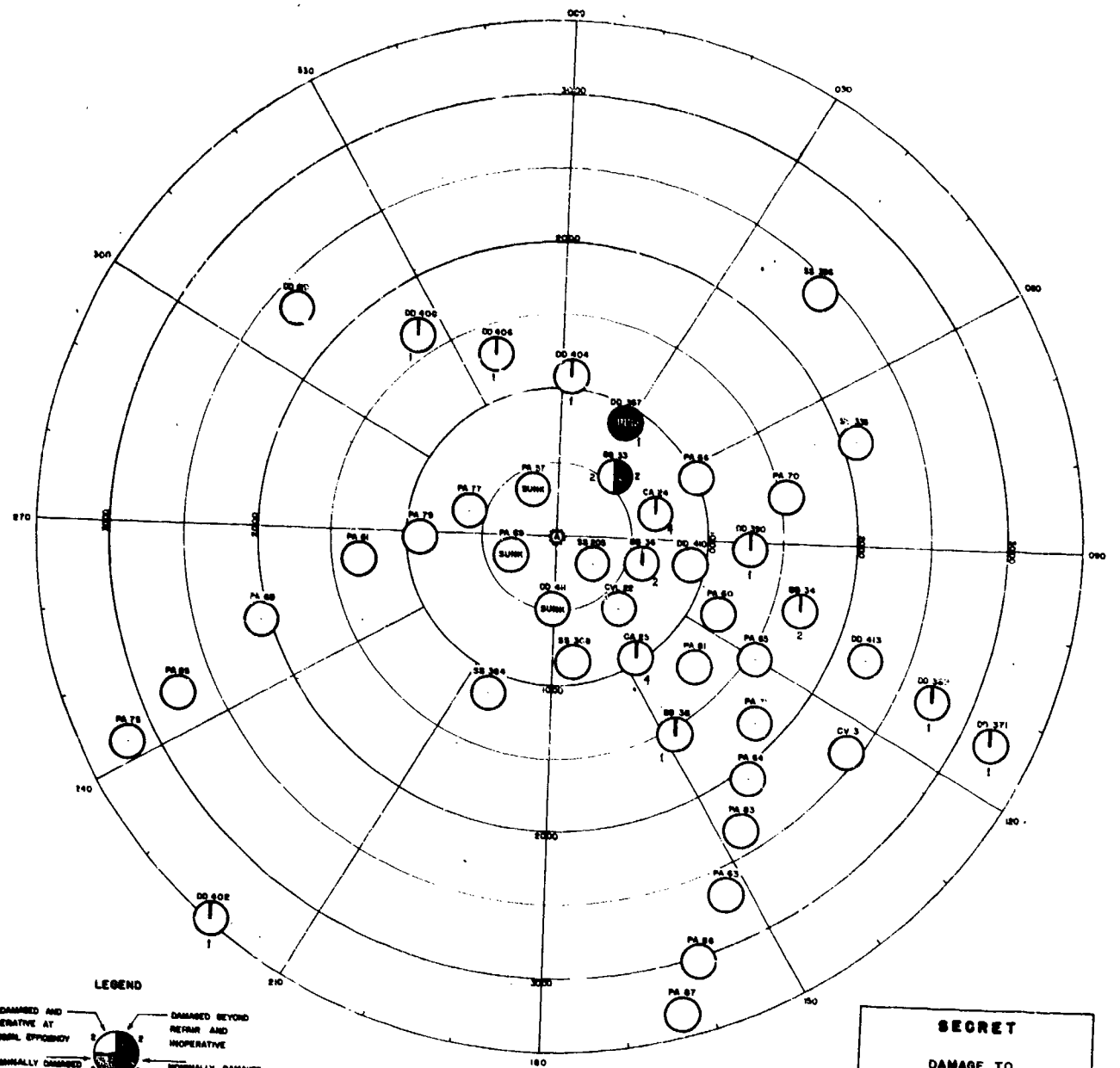
LEGEND

SECRET

DAMAGE TO

PERISCOPES

TEST ABLE



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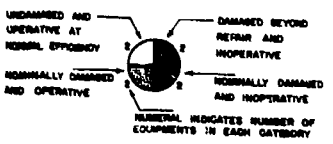
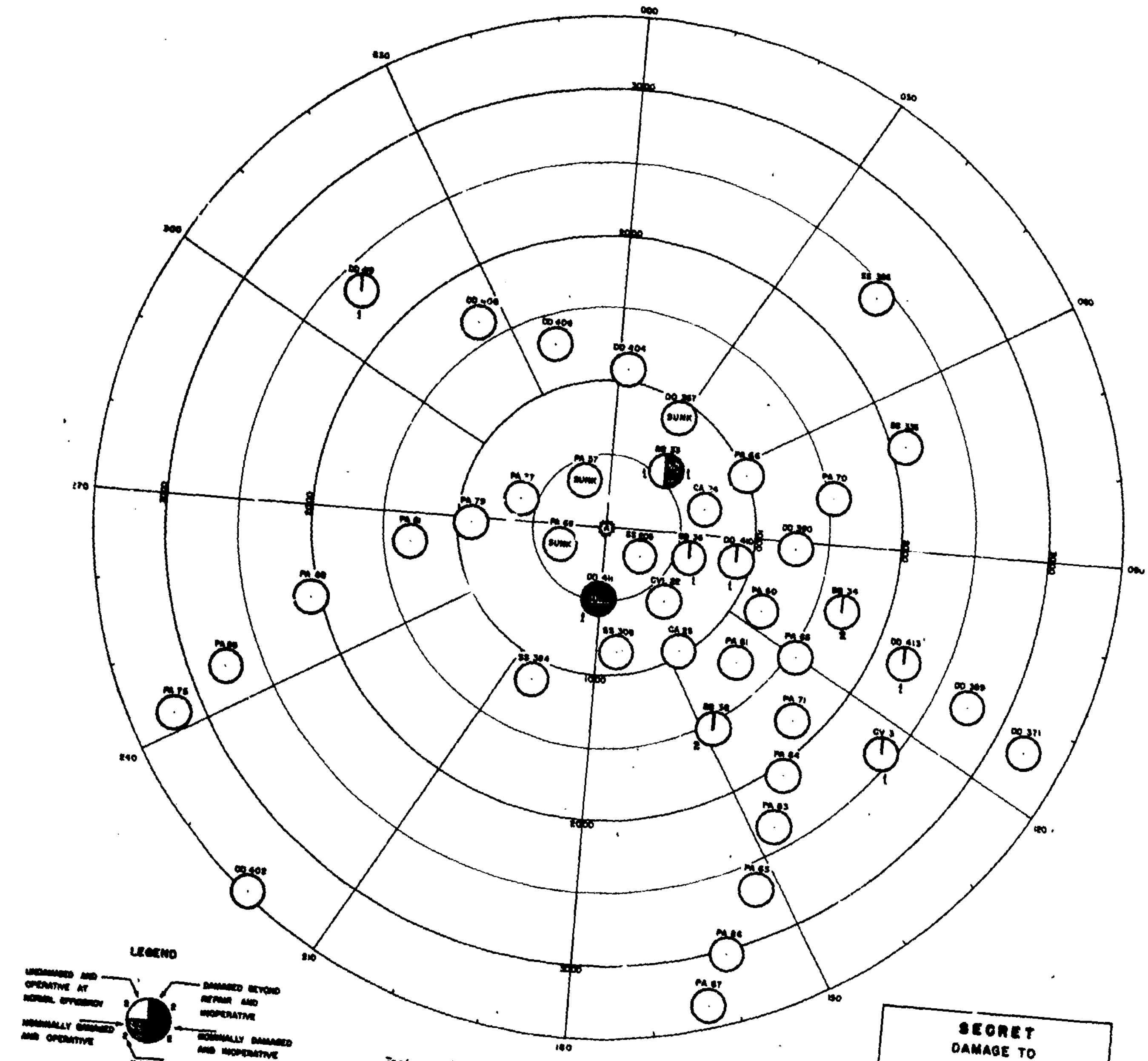


SECRET

DAMAGE TO

RANGEKEEPERS

TEST ABLE



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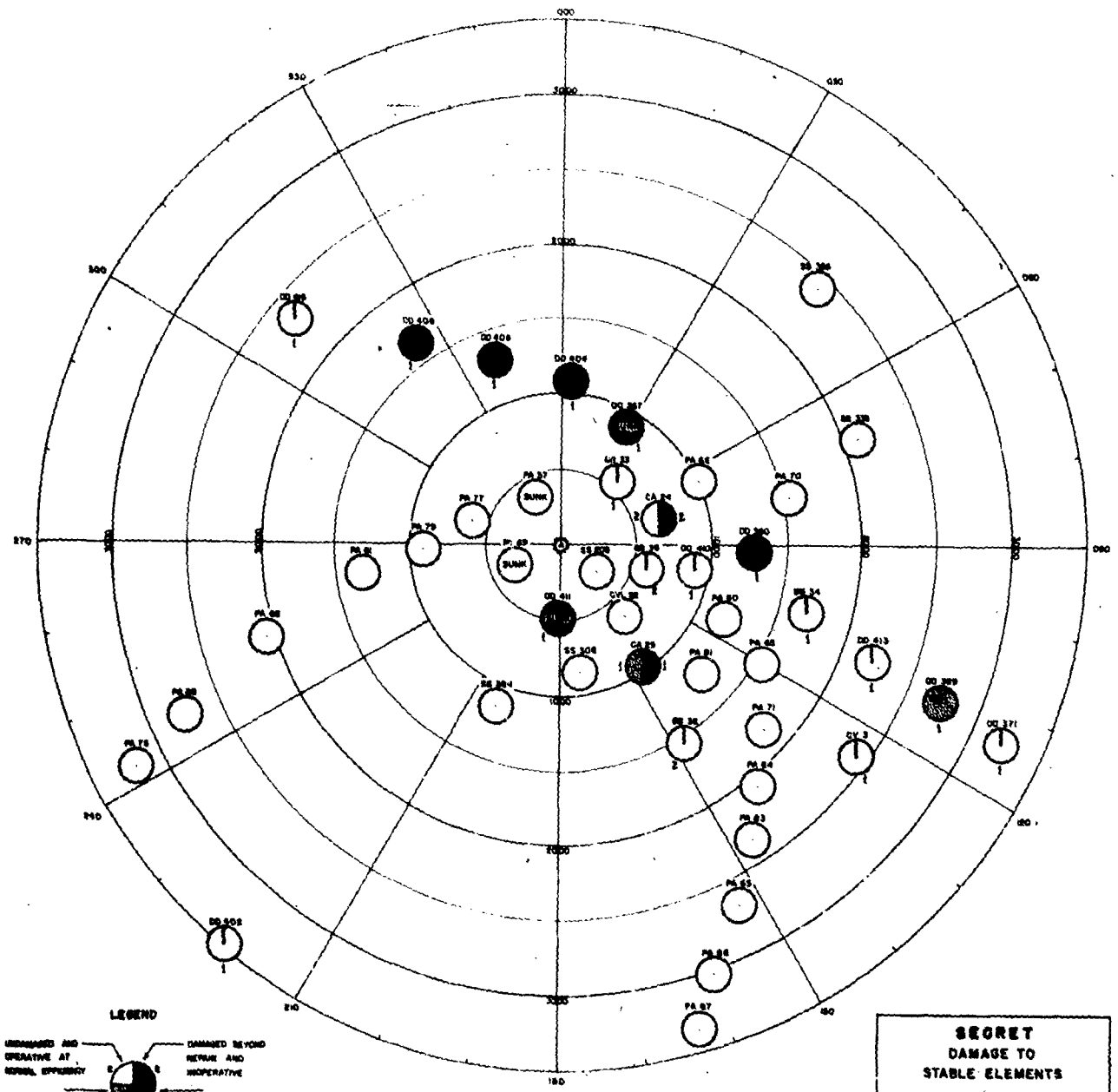
SECRET
DAMAGE TO
COMPUTERS

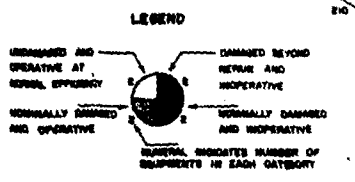
MARK I, IO AND MODS.

3927

TEST ABLE



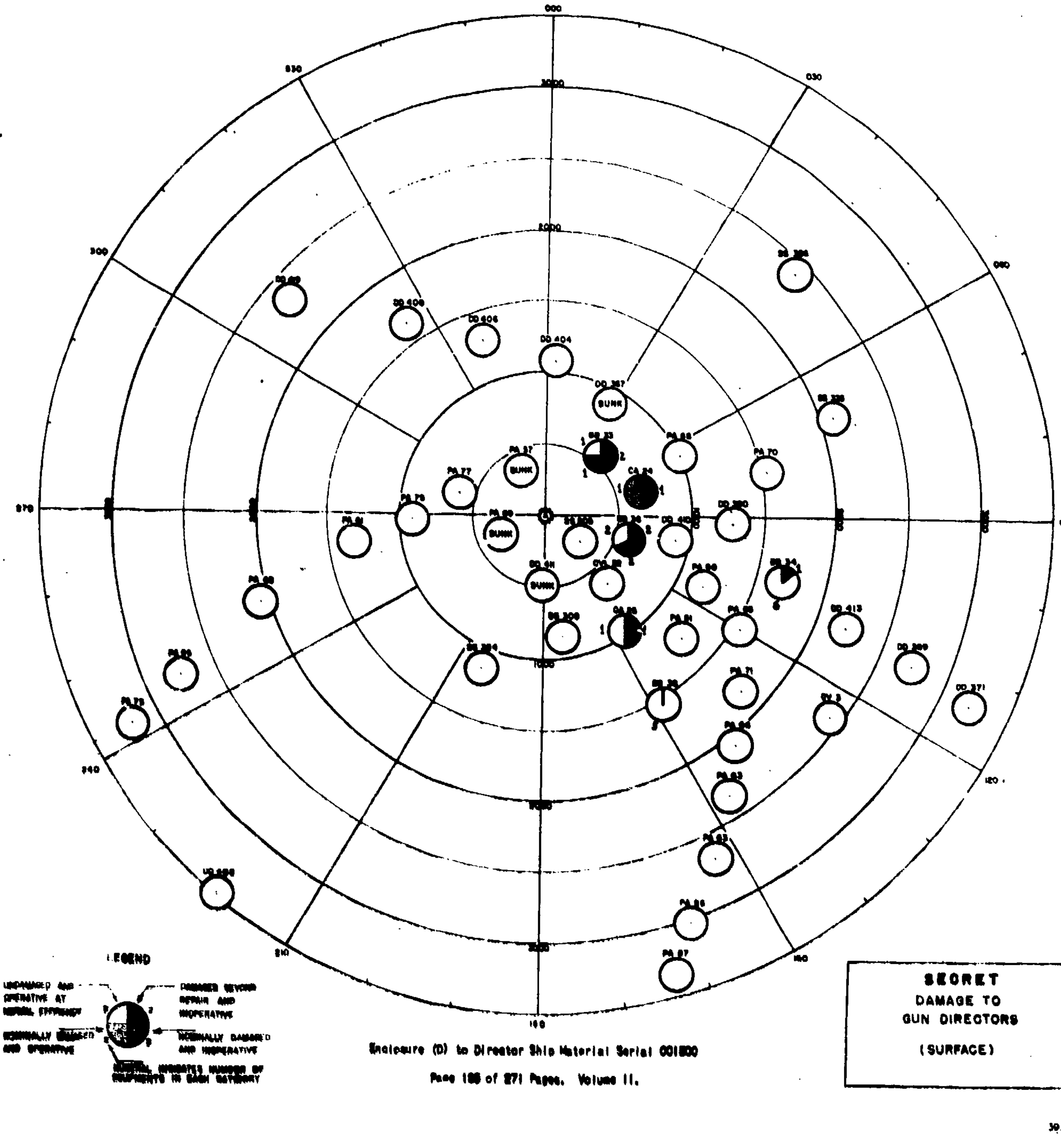
LEGEND



SECRET
DAMAGE TO
STABLE ELEMENTS
AND
STABLE VERTICALS

3927

TEST ABLE



Enclosure (D) to Director Ship Material Serial 001800

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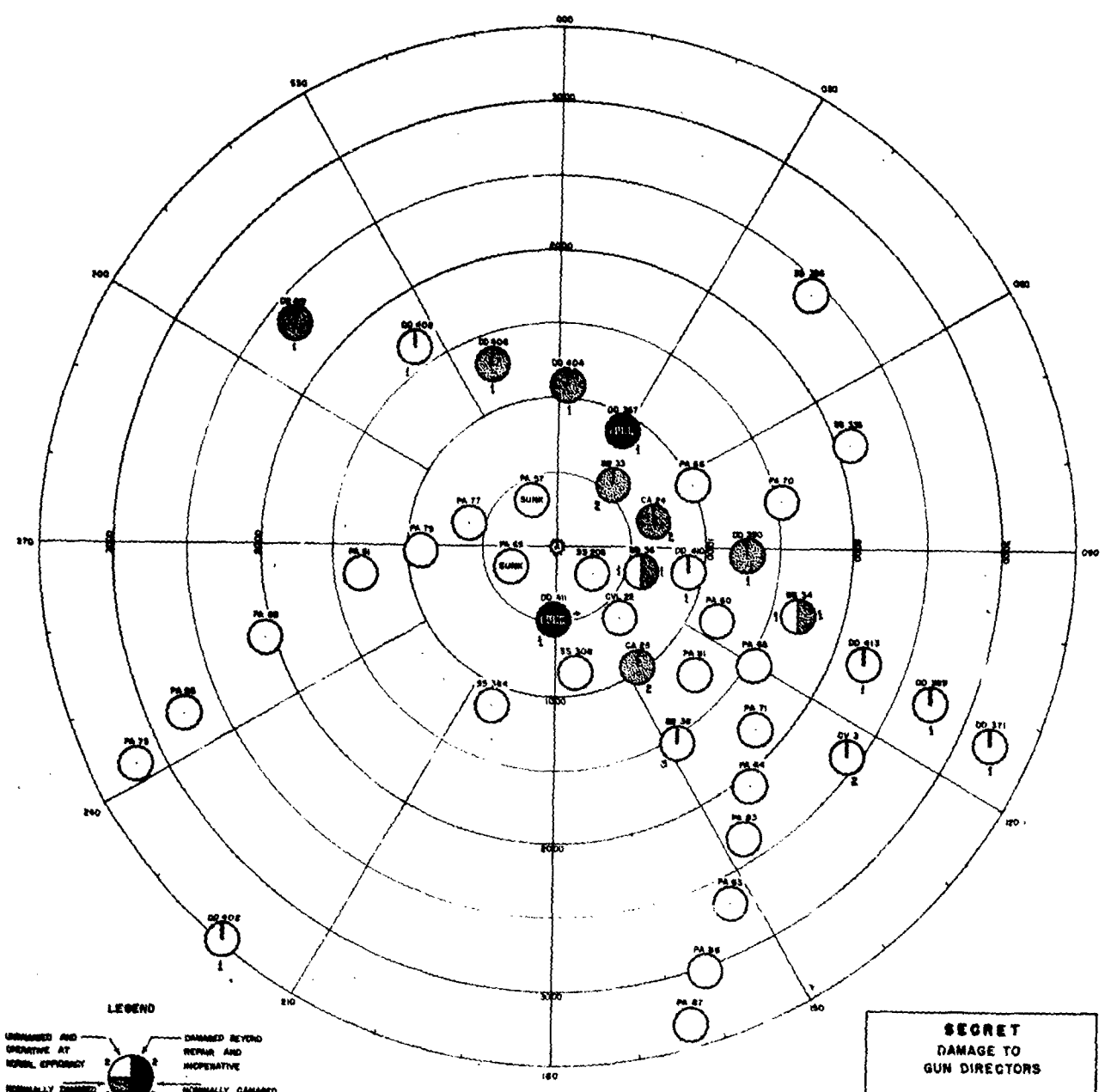
SECRET
DAMAGE TO
GUN DIRECTORS
(SURFACE)

TEST ABLE

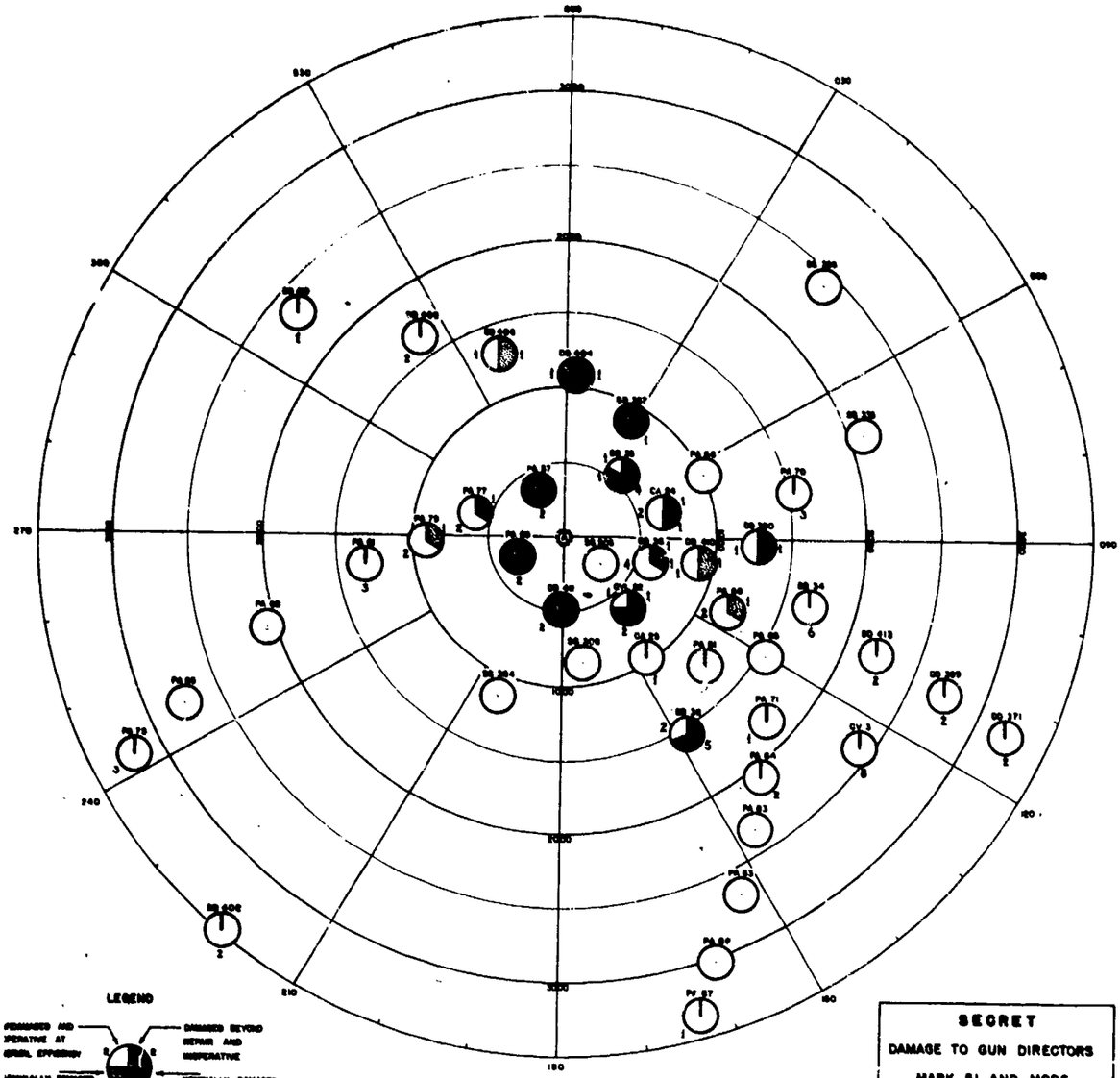


SECRET
DAMAGE TO
GUN DIRECTORS

MARK 33, 37, 50 AND MODS.

3927

TEST ABLE

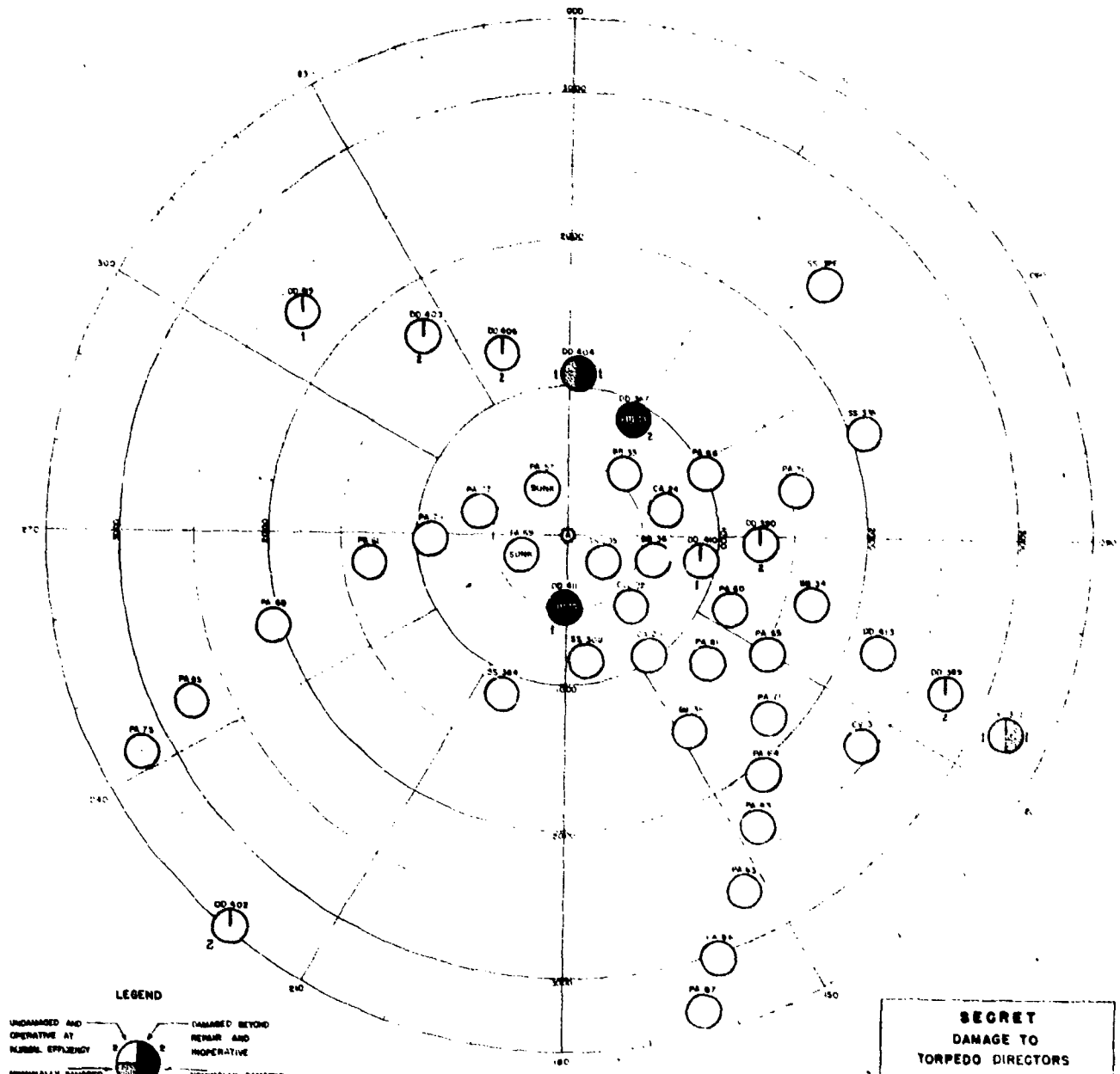


LEGEND

SECRET

DAMAGE TO GUN DIRECTORS MARK 51 AND MODS. G.F.C.S. MARK 57, 63 AND MODS.

TEST ABLE



LEGEND

UNDAMAGED AND OPERATIVE AT NORMAL EFFICIENCY

NORMALLY DAMAGED AND OPERATIVE.

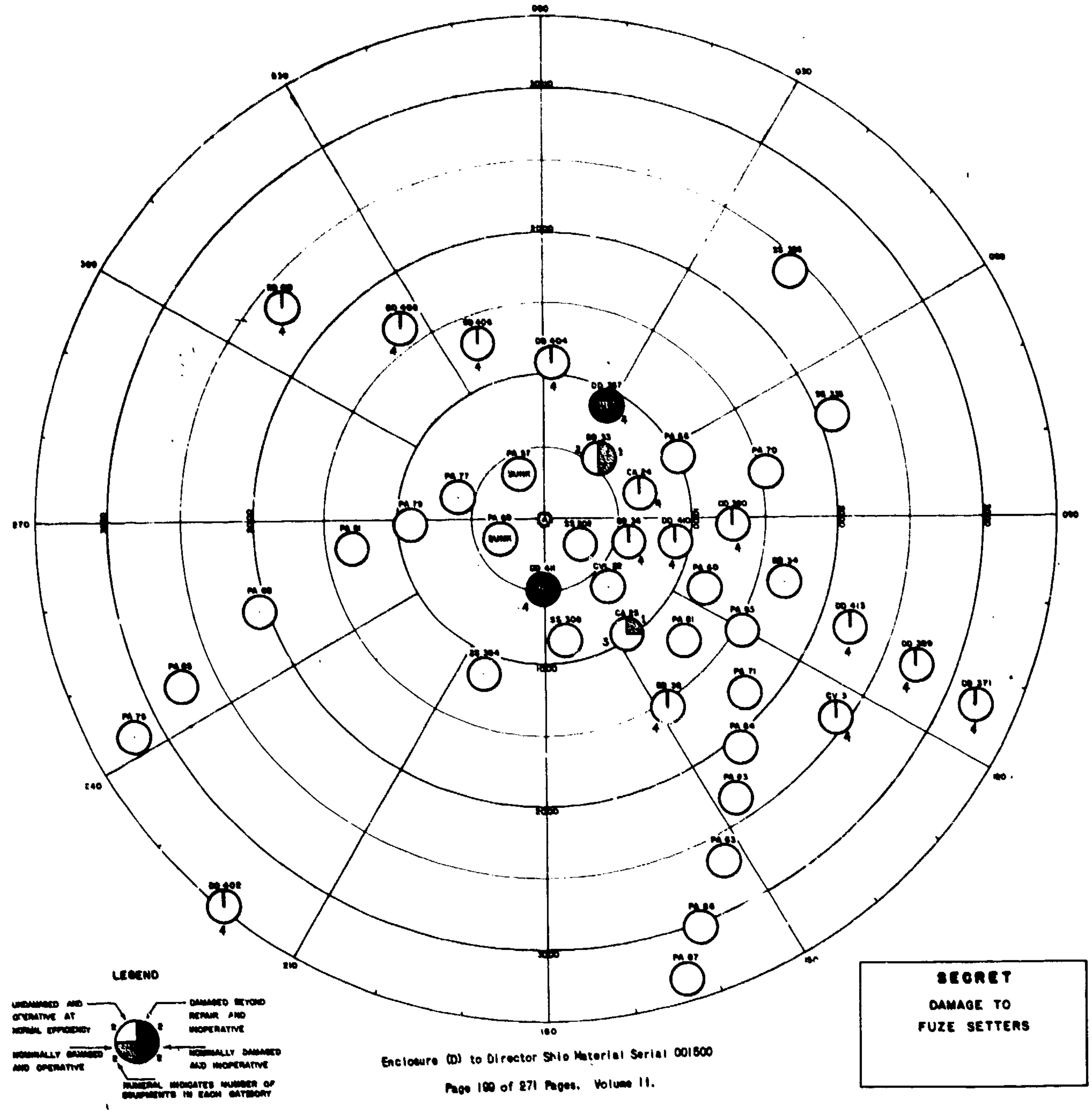
DAMAGED BEYOND REPAIR AND INOPERATIVE

NORMALLY DAMAGED AND INOPERATIVE

NUMERAL INDICATES NUMBER OF EQUIPMENTS IN EACH CATEGORY

SECRET
DAMAGE TO
TORPEDO DIRECTORS
MARK 27 AND MODS

TEST ABLE



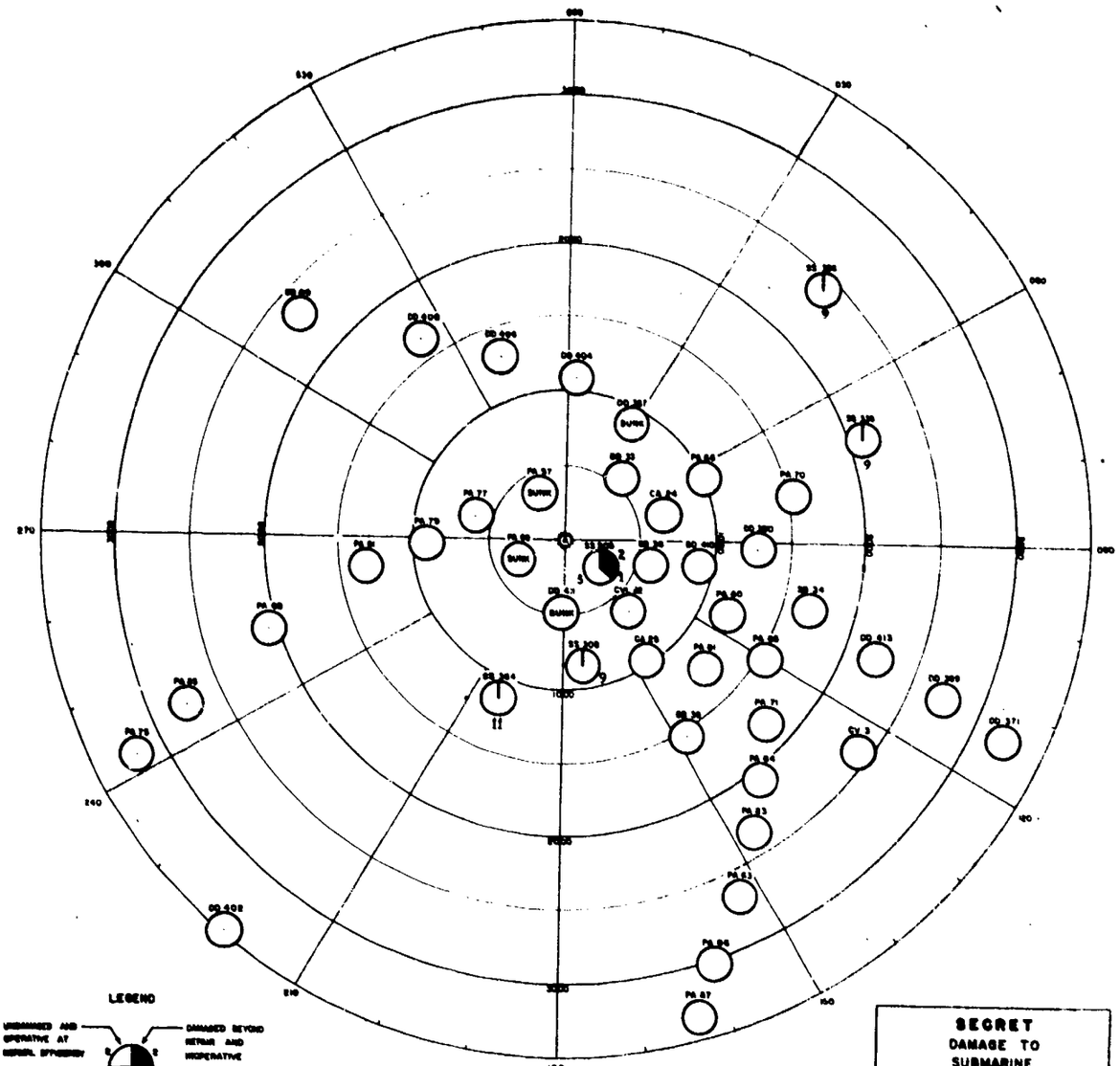
SECRET

DAMAGE TO FUZE SETTERS

Enclosure (D) to Director Ship Material Serial 001600

3927

TEST ABLE



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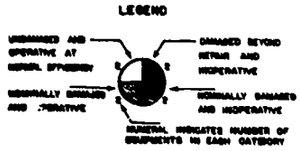
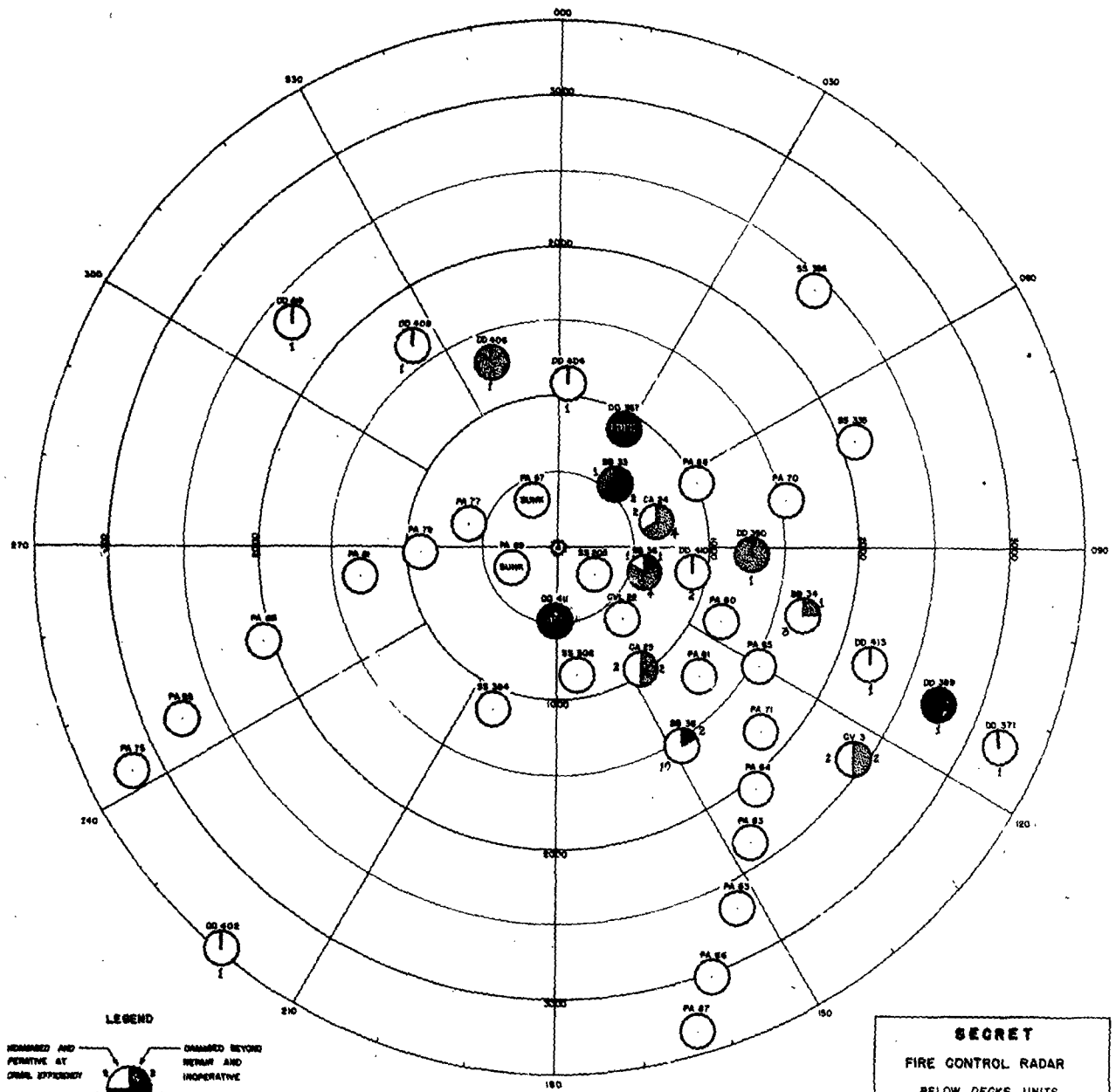


SECRET
DAMAGE TO
SUBMARINE

FIRE CONTROL EQUIPMENT

3927

TEST ABLE



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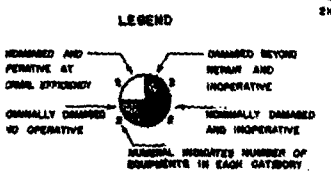


SECRET

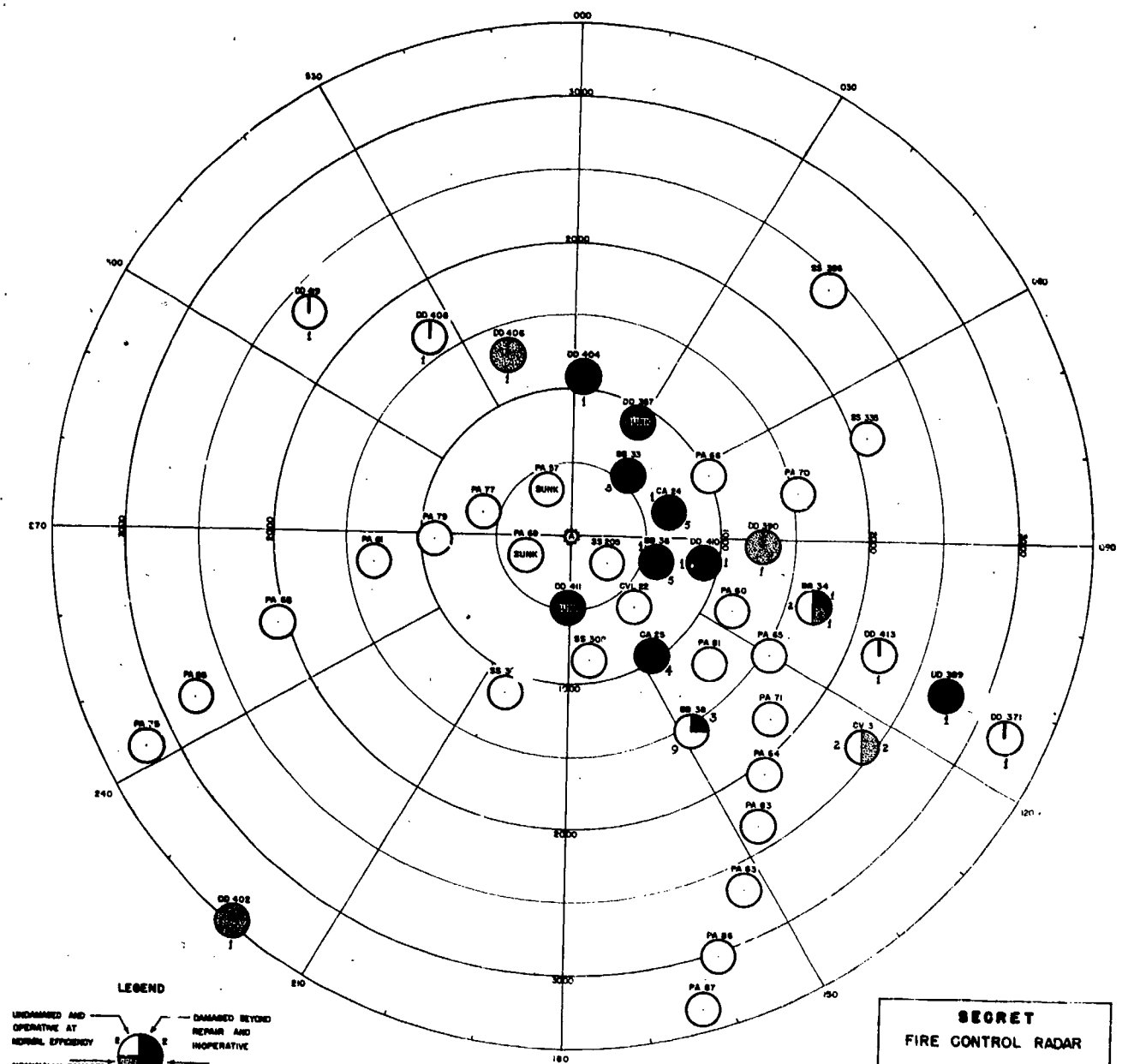
FIRE CONTROL RADAR

BELOW DECKS UNITS

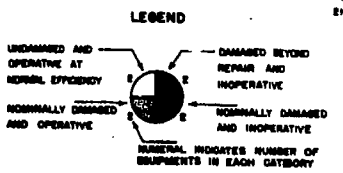
ALL MARKS AND MODS.

3927

TEST ABLE



LEGEND



SECRET

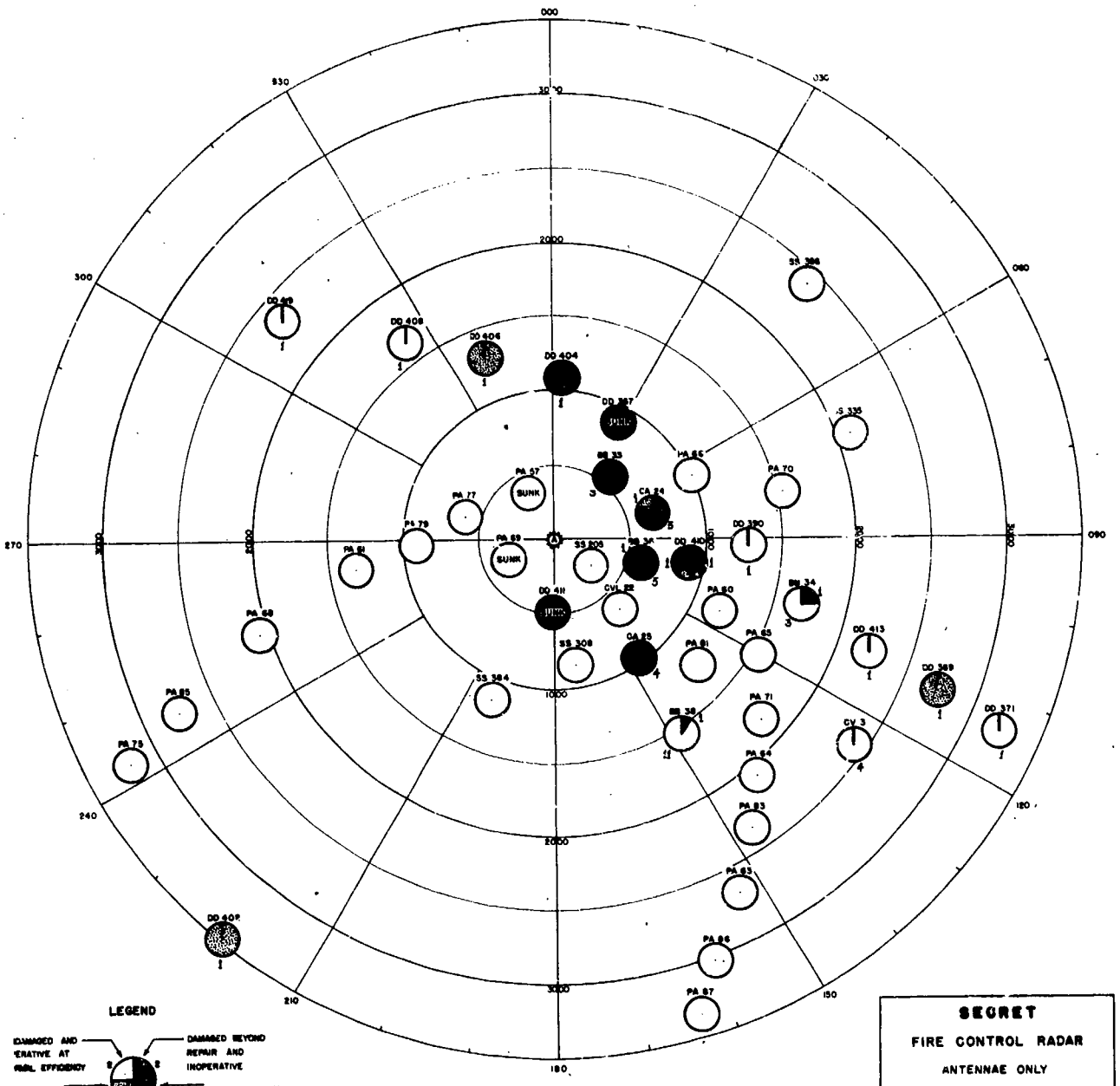
FIRE CONTROL RADAR

OVERALL DAMAGE

ALL MARKS & MODS

3927

TEST ABLE



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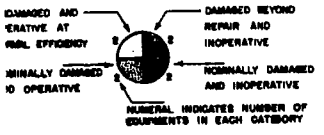


SECRET

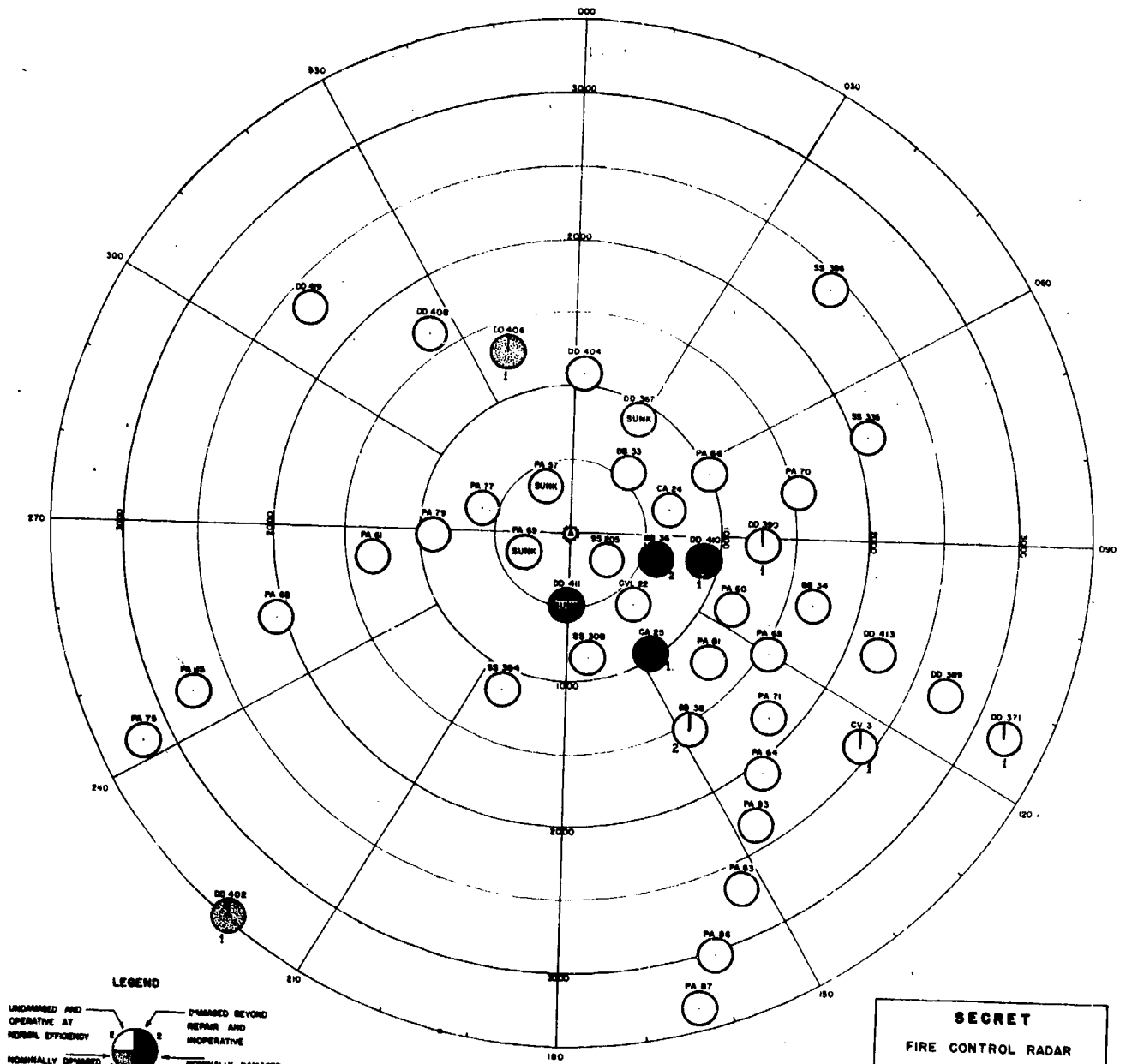
FIRE CONTROL RADAR

ANTENNAE ONLY

ALL MKS. AND MODS.

3927

TEST ABLE



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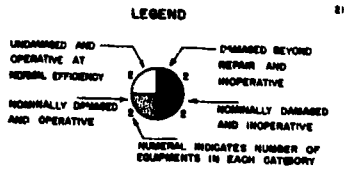


SECRET

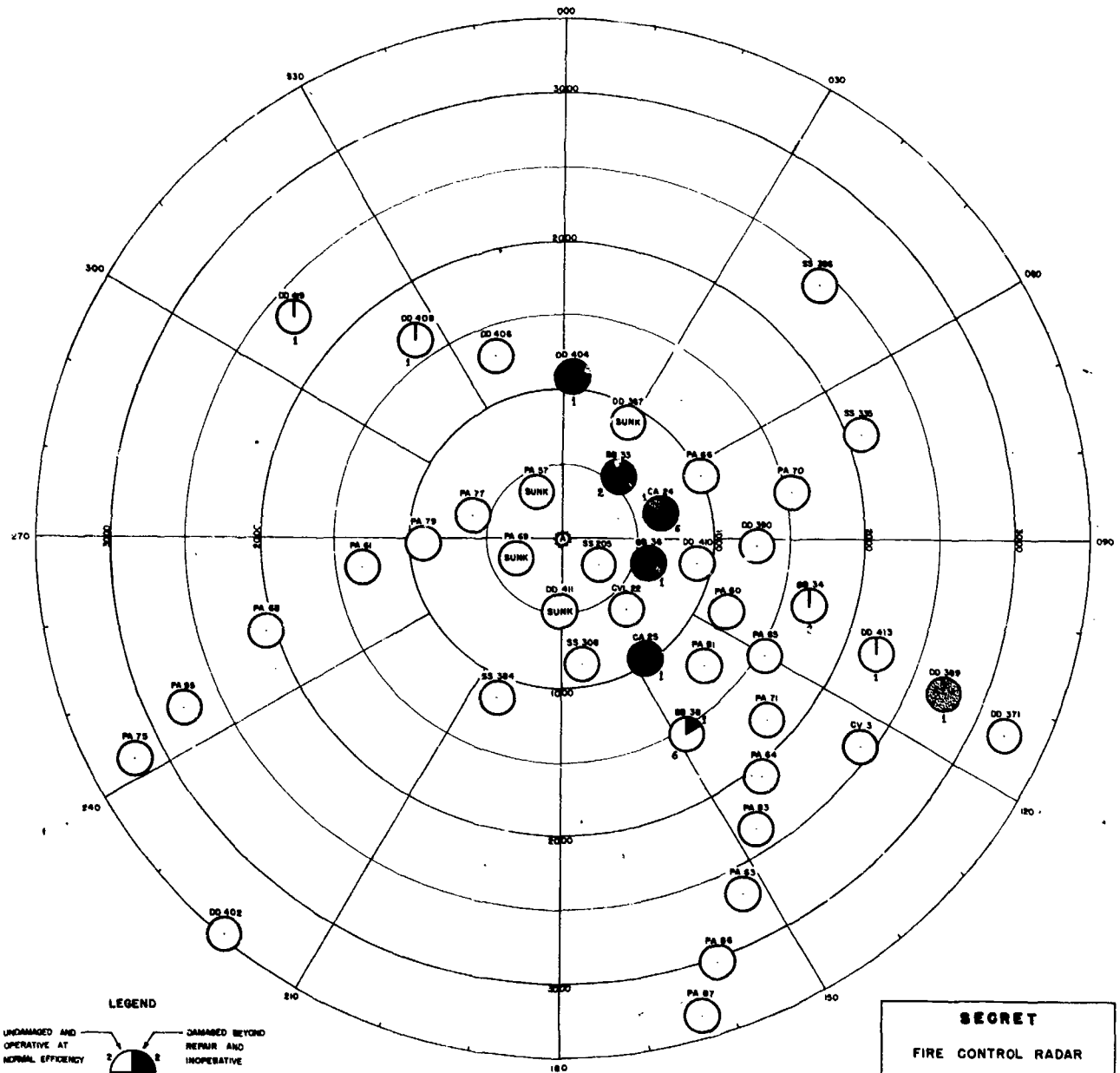
FIRE CONTROL RADAR

ANTENNAE ONLY

MARKS 4 AND 12 ALL MODS.

3927

TEST ABLE



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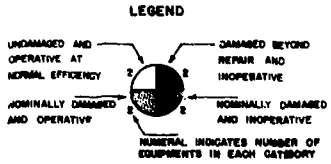


SECRET

FIRE CONTROL RADAR

ANTENNAE ONLY

MARKS 10, 28, 29 ALL MODS.

FIRE CONTROL DAMAGE CHARTS

TEST "B"

Damage to Gunsights, Mark 14 and Mods.

Damage to Gunsights, Mark 15 and Mods.

Damage to Rangefinders.

Damage to Gunsight Telescopes for 3 inch and 5 inch Guns.

Damage to Gunsight Telescopes for Turret and Broadside Guns.

Damage to Director Telescopes.

Damage to Periscopes.

Damage to Rangekeepers.

Damage to Computers, Mark 1, 10 and Mods.

Damage to Stable Elements and Stable Verticals.

Damage to Gun Directors. (Surface).

Damage to Gun Directors, Mark 33, 37, 50 and Mods.

Damage to Gun Directors Mark 51 and Mods. G.F.C.S. Mark 57, 63 and Mods.

Damage to Torpedo Directors, Mark 27 and Mods.

Damage to Fuze Setters.

Damage to Submarine Fire Control Equipment.

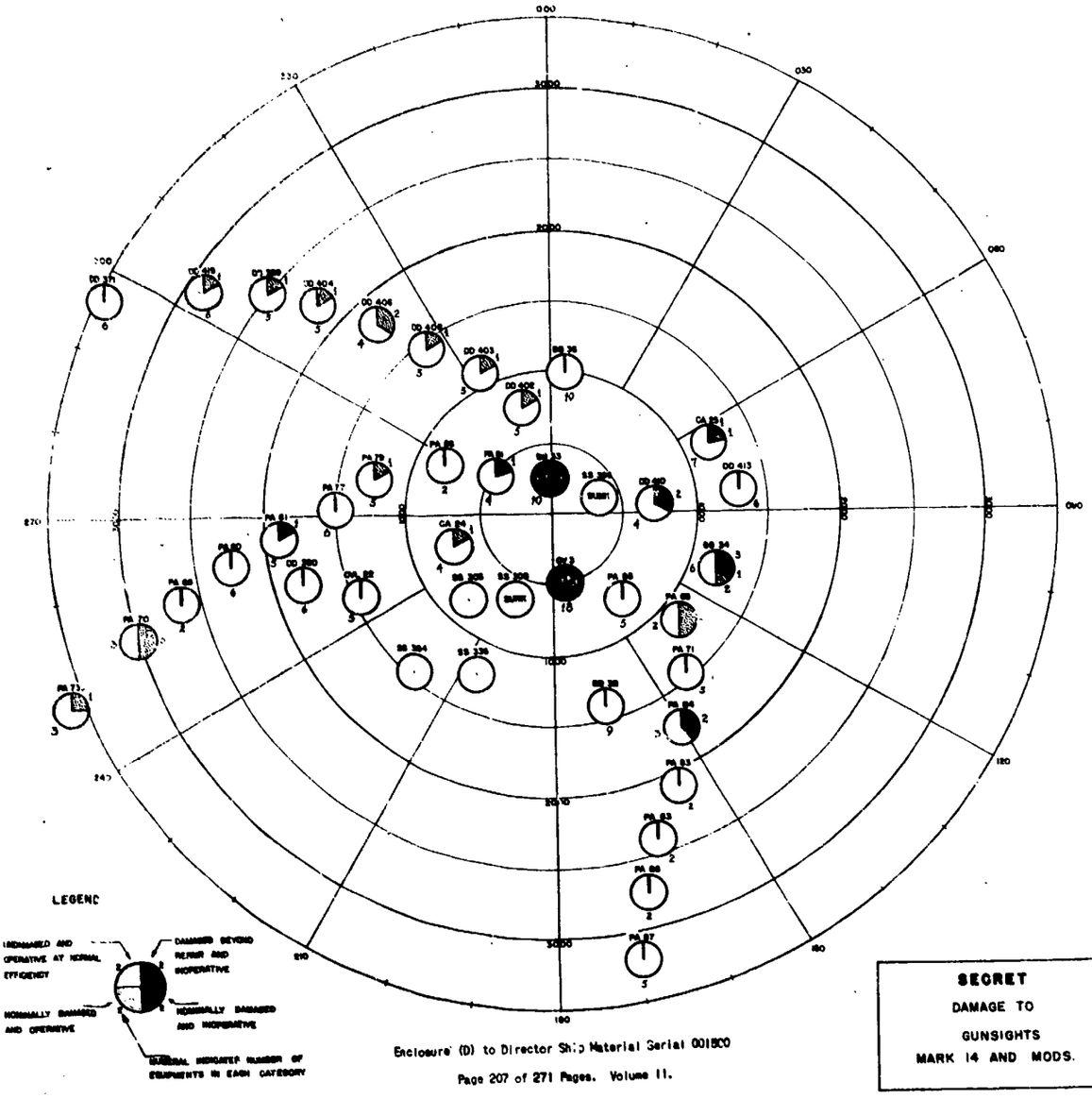
Fire Control Radar Equipments Overall Damage Including All Marks and Mods.

Fire Control Radar Equipment Below Decks Units Only.

Fire Control Radar Antennae Only Mark 4 and 12, All Mods.

Fire Control Radar Antennae Only Mark 10, 28, 29, All Mods.

TEST BAKER



Enclosure (D) to Director Ship Material Serial 001500

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SECRET

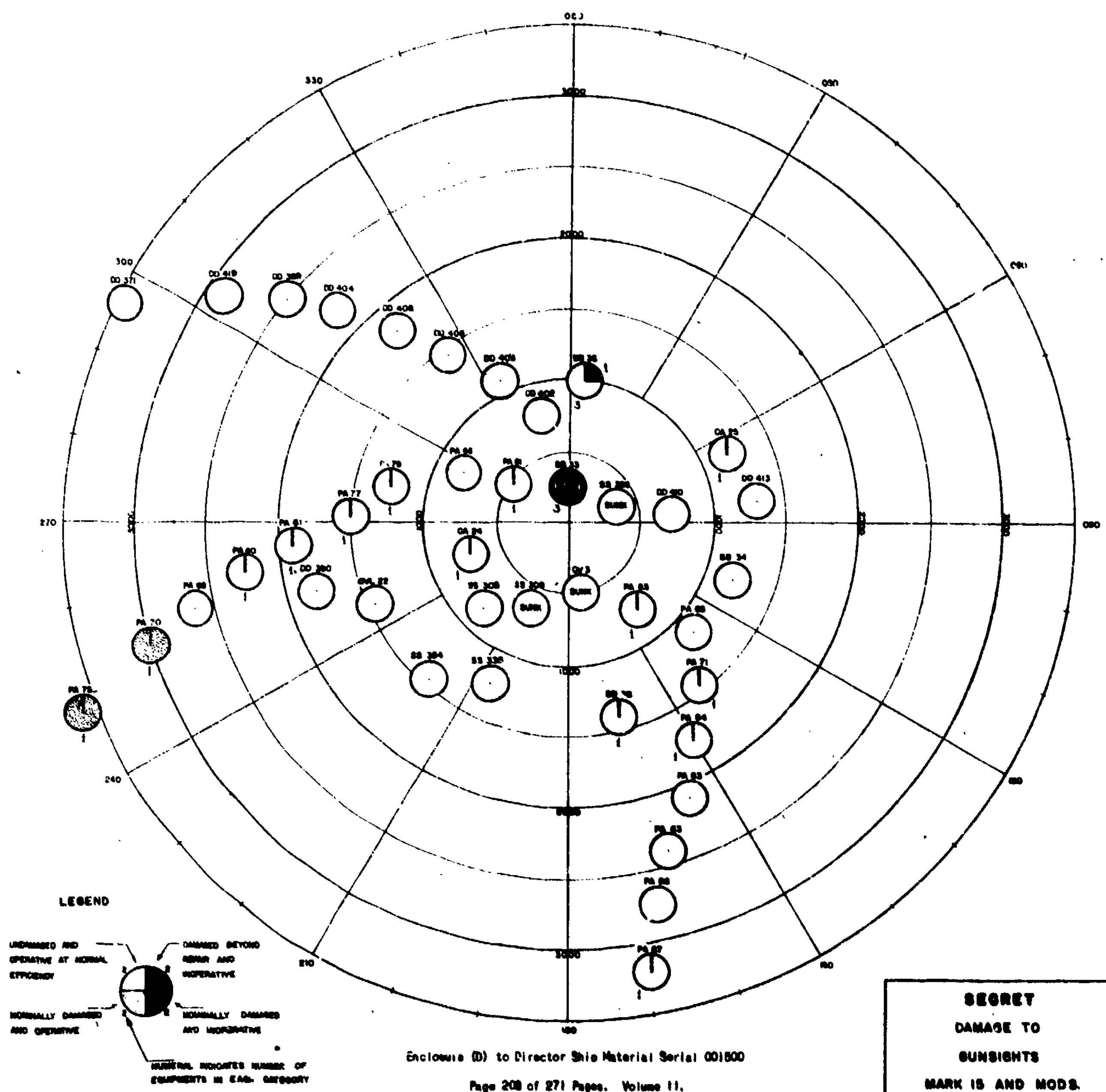
DAMAGE TO

GUNSIGHTS

MARK 14 AND MODS.

3927

TEST BAKER



Enclosure (D) to Director Ship Material Serial 001500

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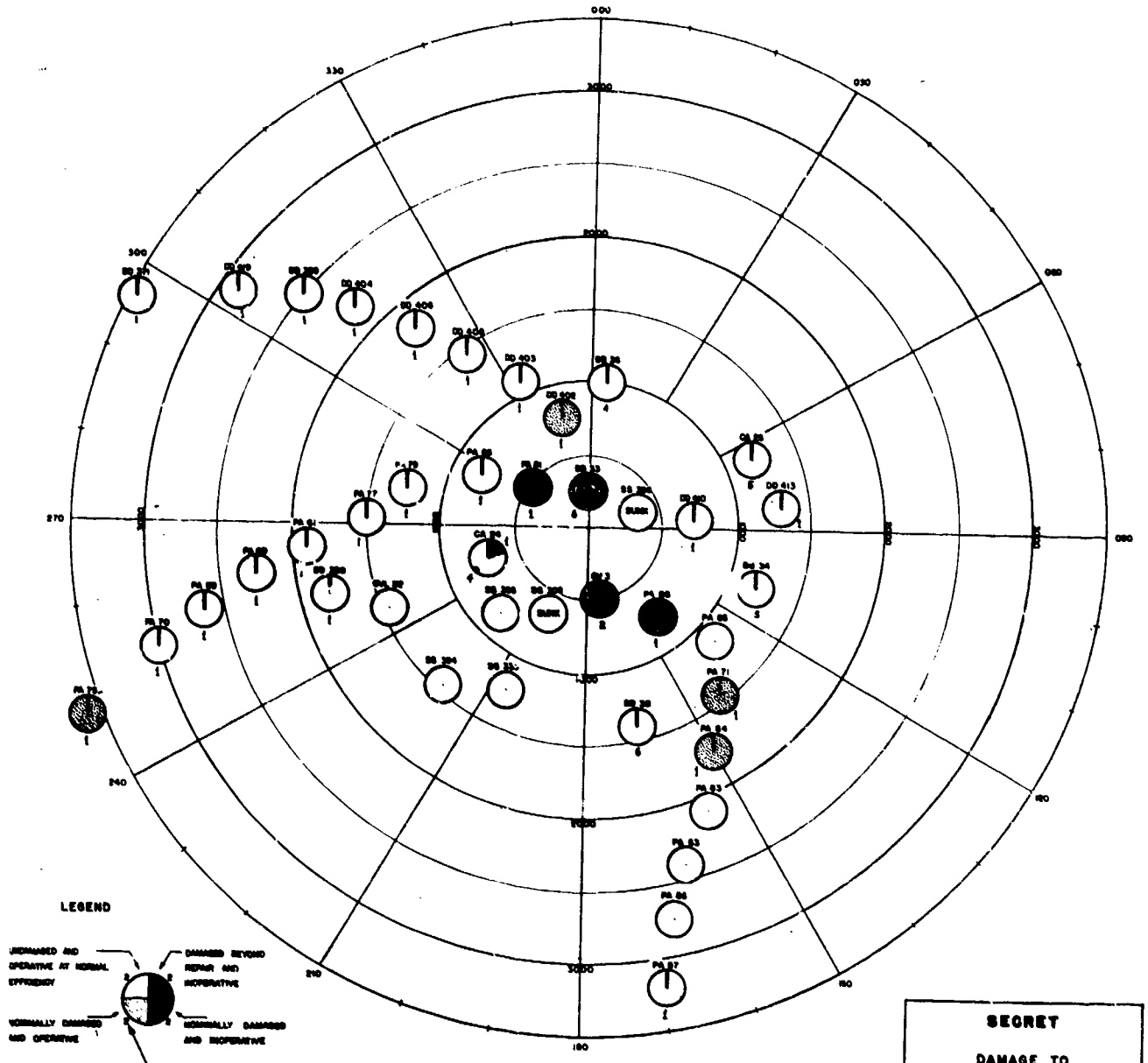
SECRET

DAMAGE TO

GUNSIGHTS

MARK 15 AND MODS.

TEST BAKER



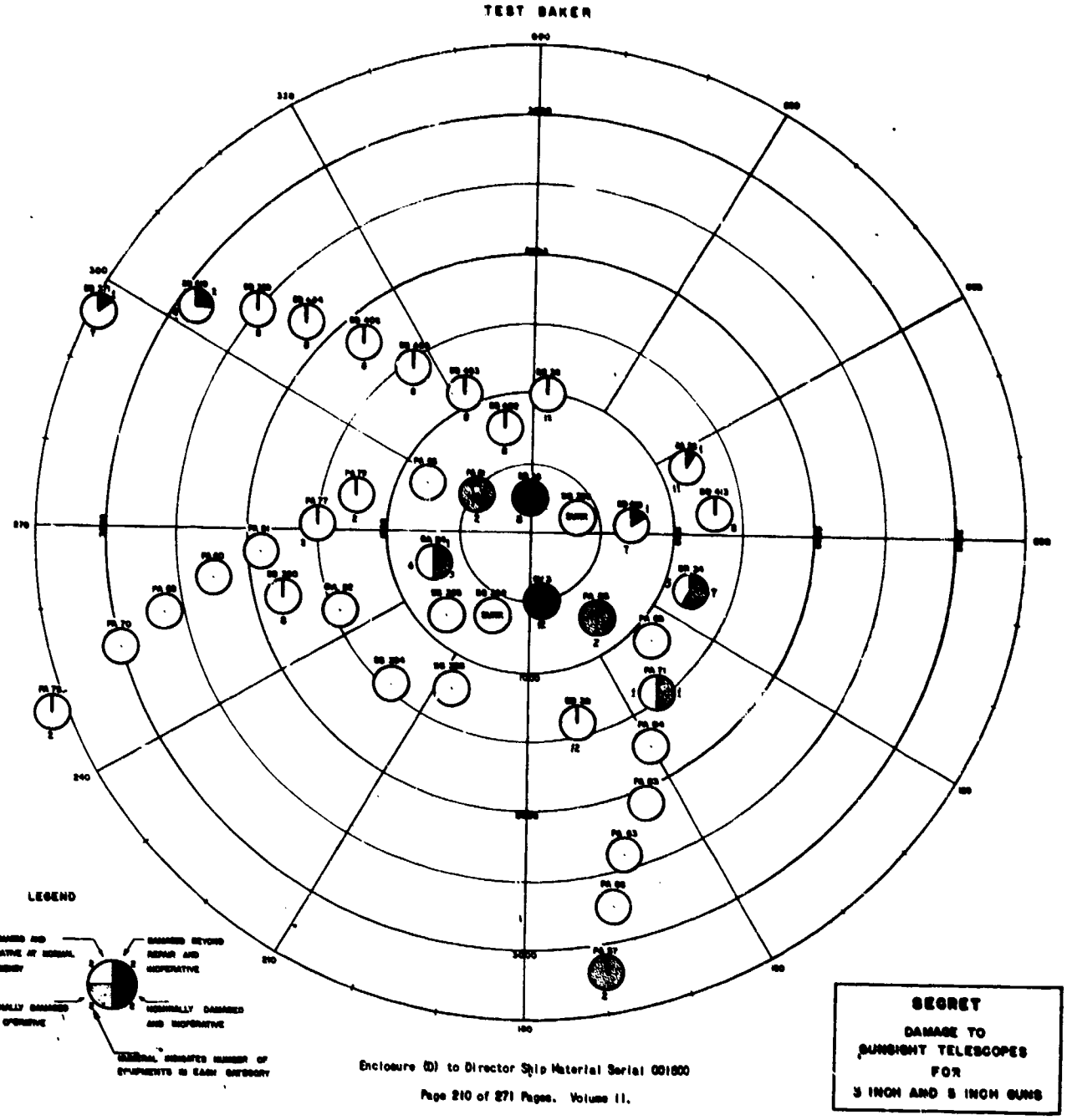
SECRET

DAMAGE TO

RANGEFINDERS

3927

TEST BAKER



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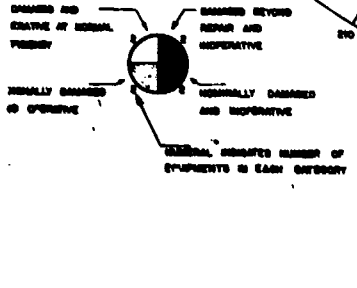

Enclosure (D) to Director Ship Material Serial 001600

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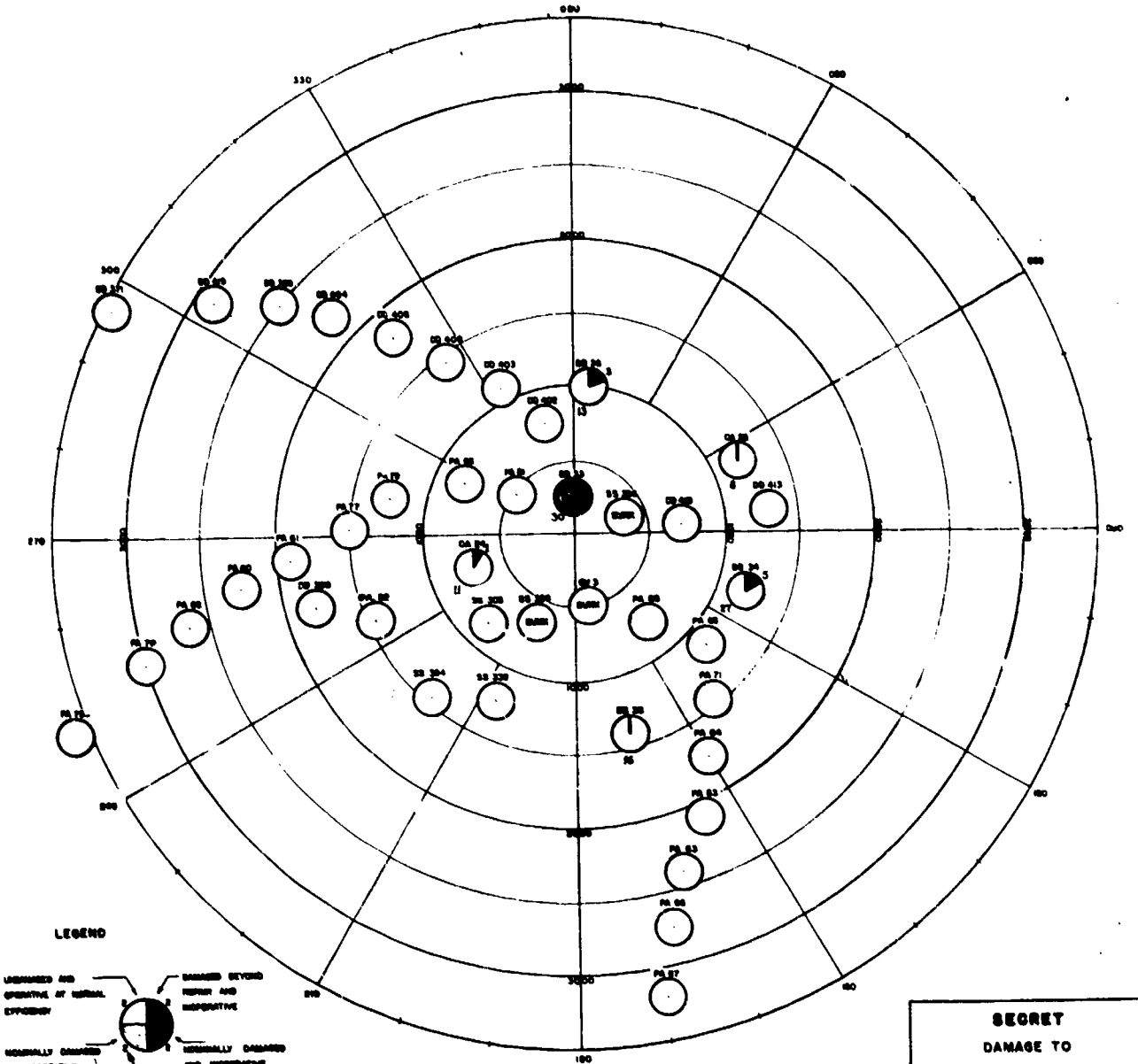
SECRET

DAMAGE TO
SUNSIGHT TELESCOPES
FOR
3 INCH AND 5 INCH GUNS

3927

TEST BAKER



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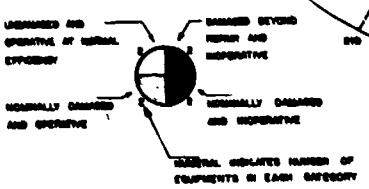
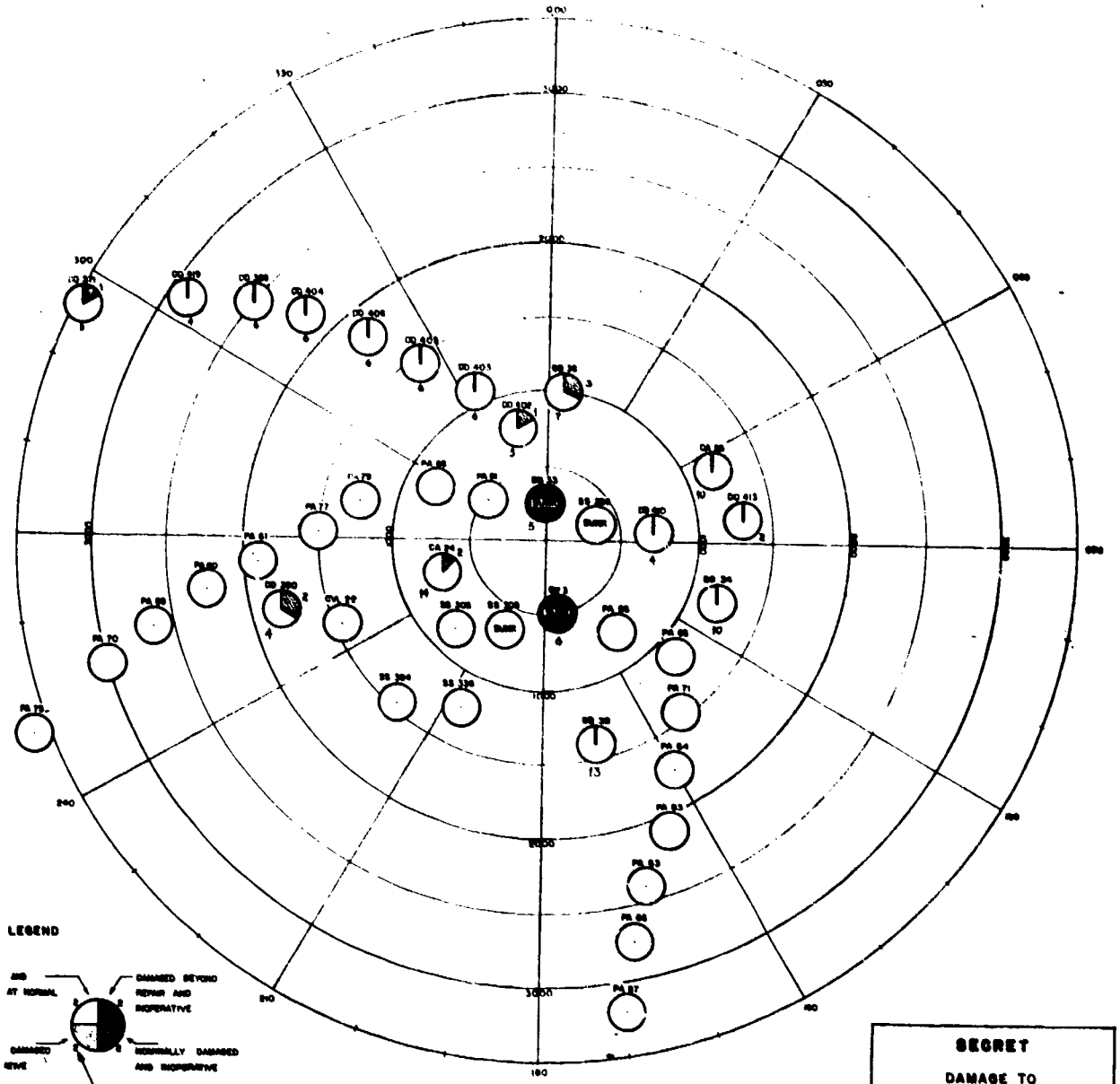


SECRET
DAMAGE TO
GUNSIGHT TELESCOPES
FOR
TURRET AND BROADSIDE GUNS

3927

TEST BAKER



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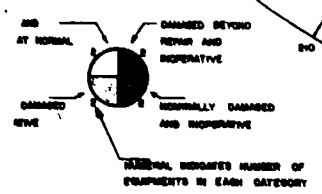


NUMERAL INDICATES NUMBER OF EQUIPMENTS IN EACH CATEGORY

Enclosure (D) to Director Ship Material Serial 001500

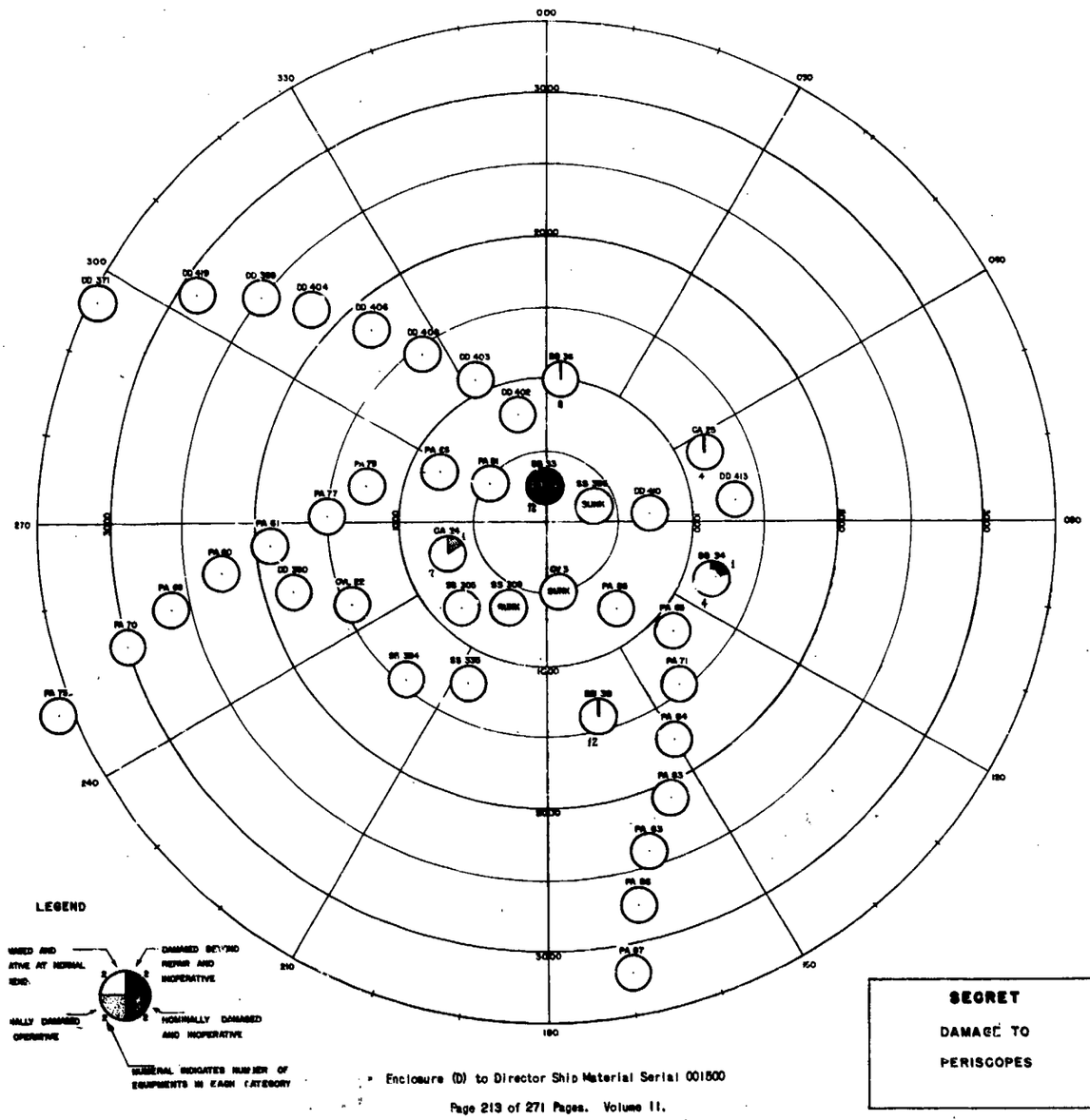
SECRET

DAMAGE TO

DIRECTOR TELESCOPES

3927

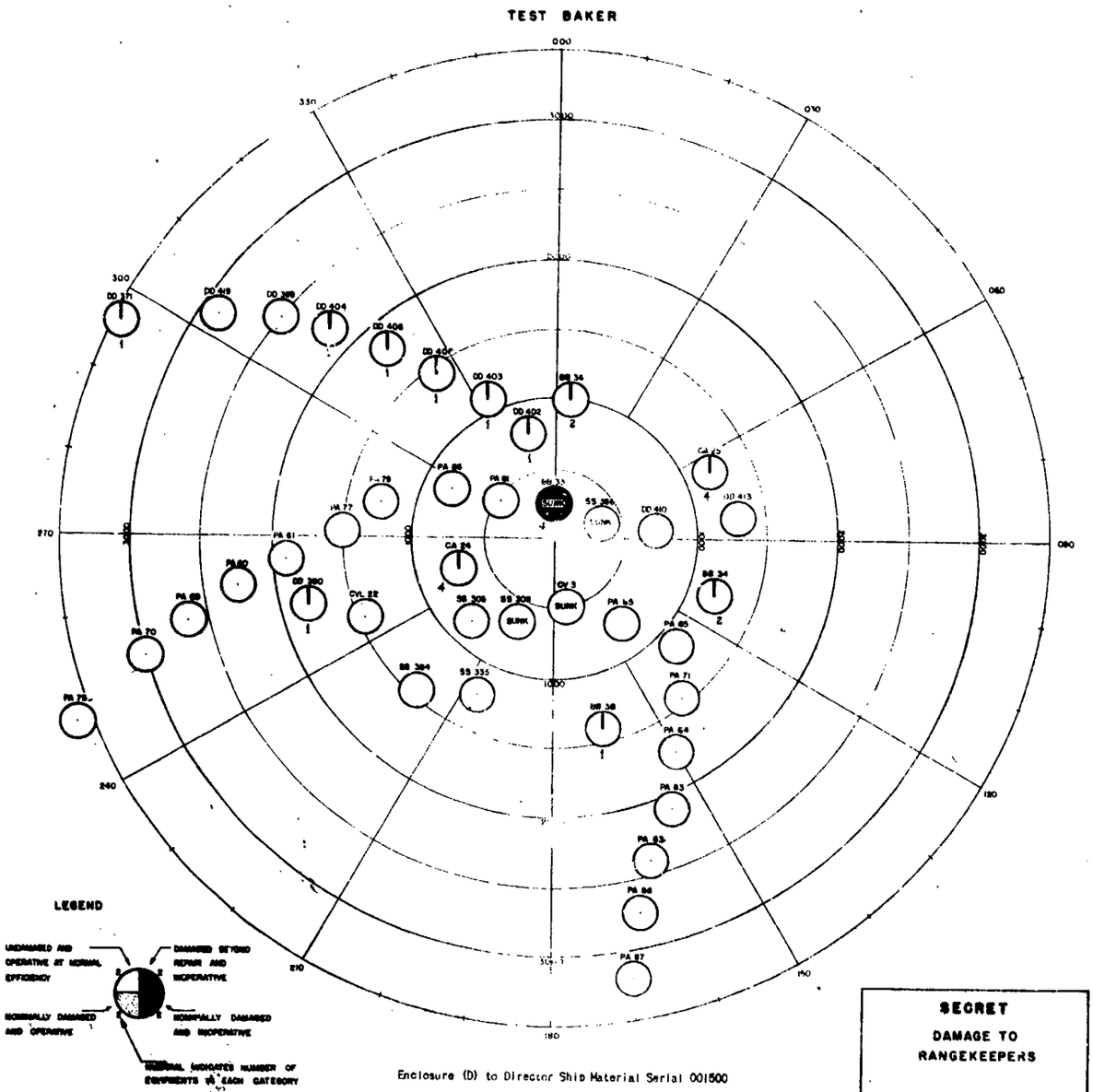
TEST BAKER



SECRET

DAMAGE TO

PERISCOPES



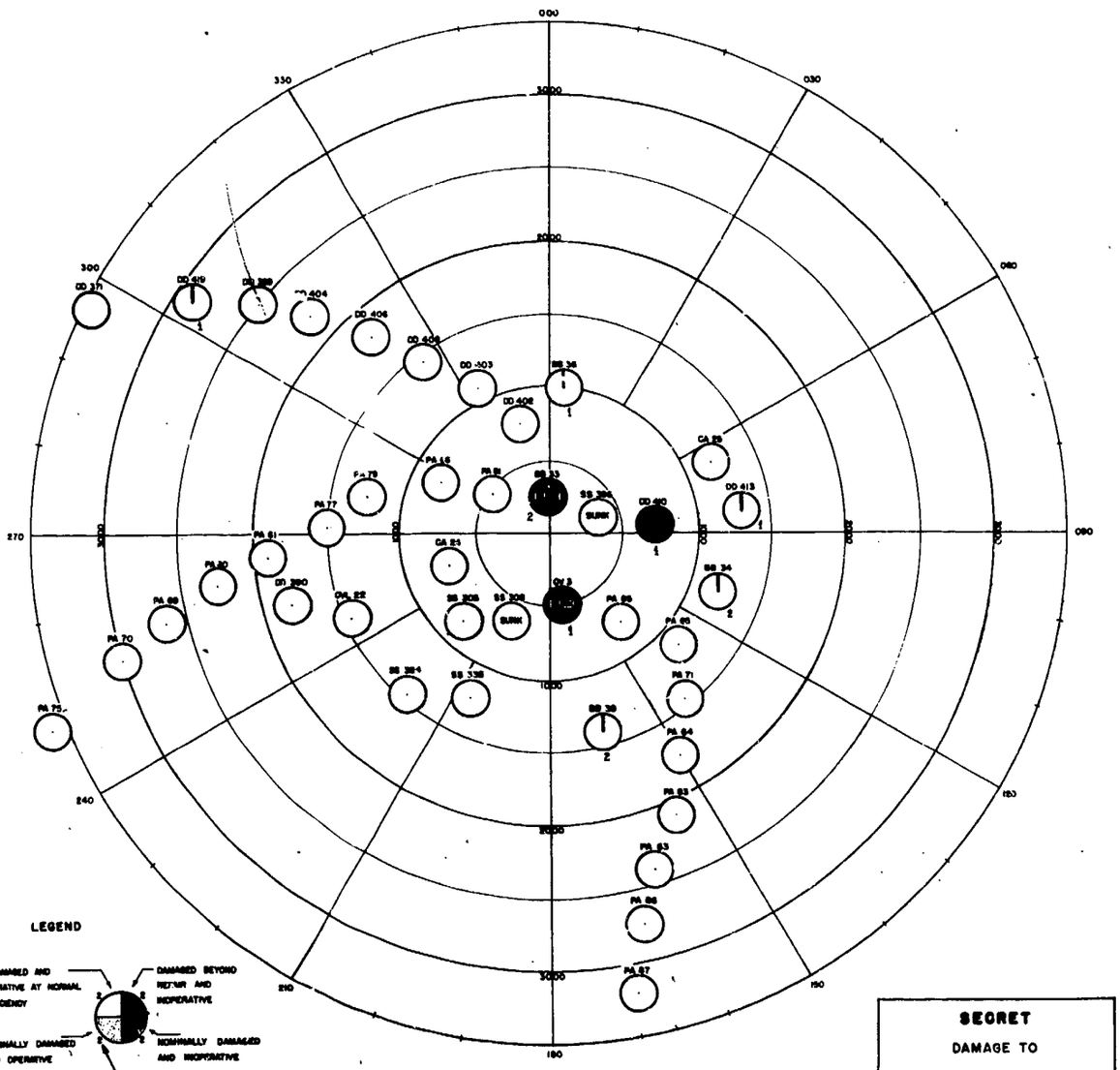
Enclosure (D) to Director Ship Material Serial 001500

SECRET

DAMAGE TO RANGEKEEPERS

5927

TEST BAKER



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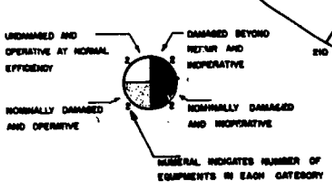


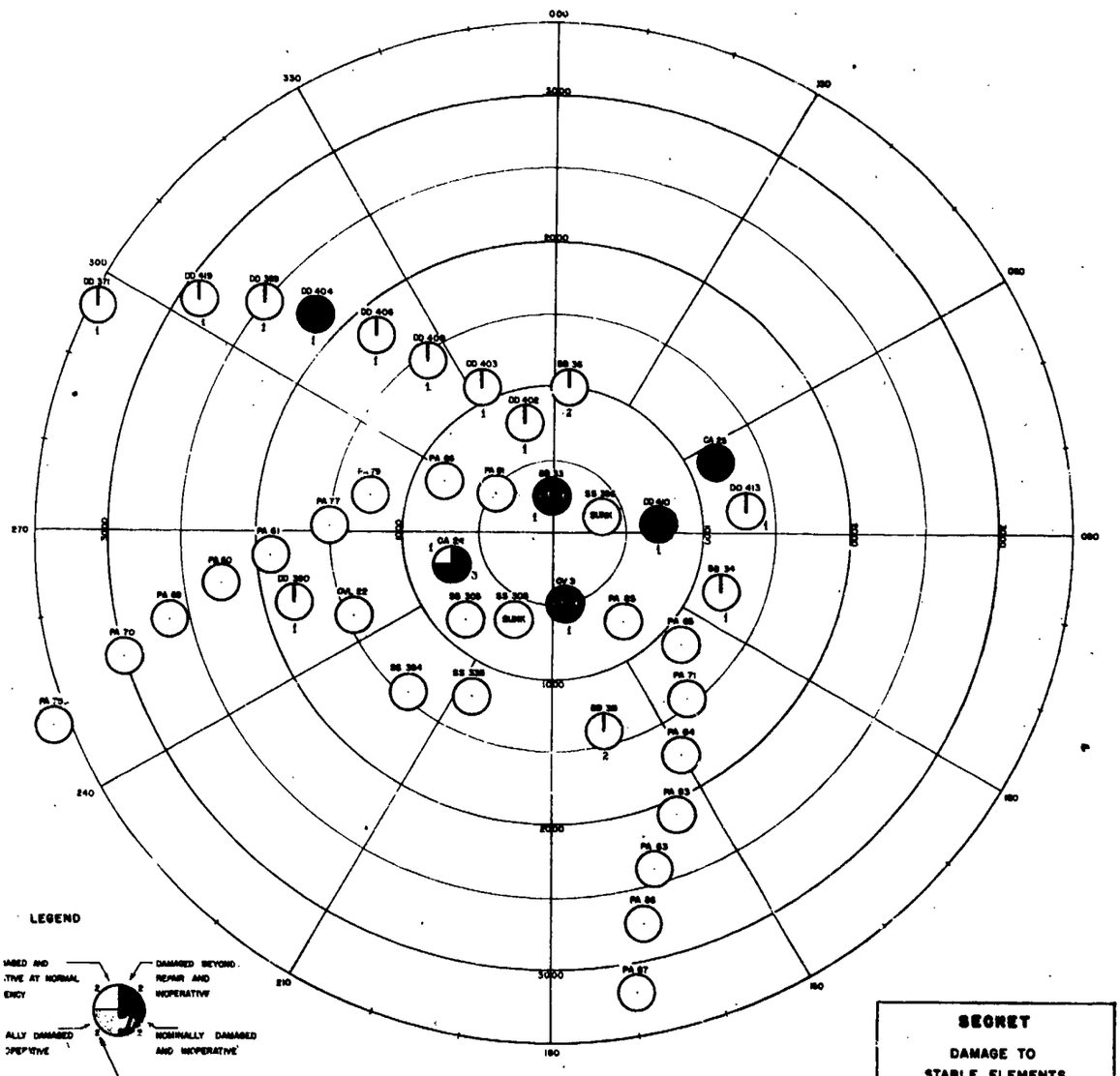
SECRET

DAMAGE TO

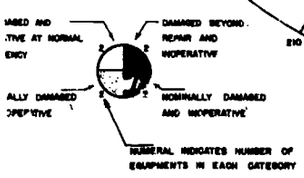
COMPUTERS MARK I, IO

AND MODS.

TEST BAKER



LEGEND



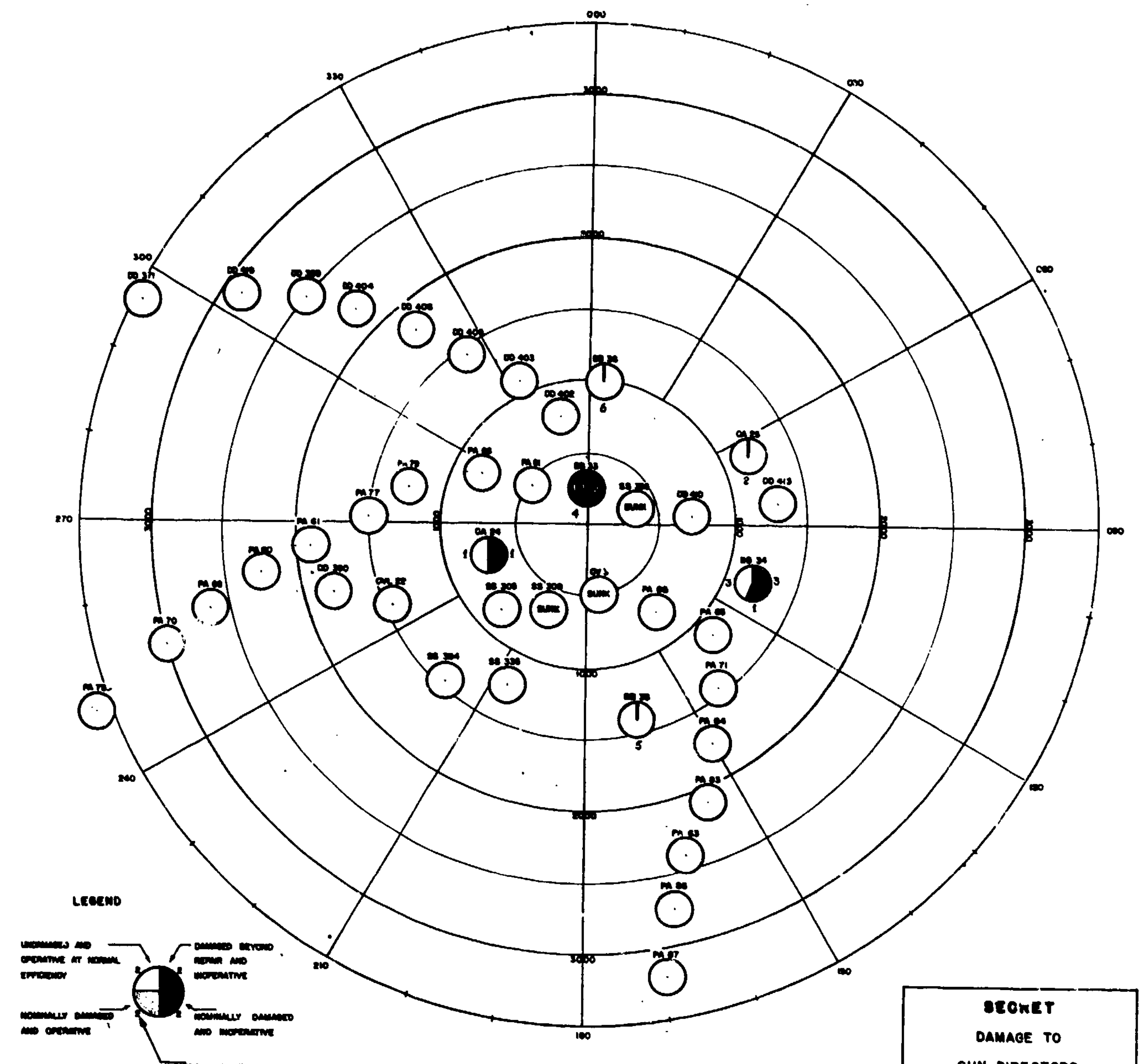
Enclosure (D) to Director Ship Material Serial 001900

SECRET

DAMAGE TO STABLE ELEMENTS AND STABLE VERTICALS

3927

TEST BAKER



Enclosure (D) to Director Ship Material Serial 001500

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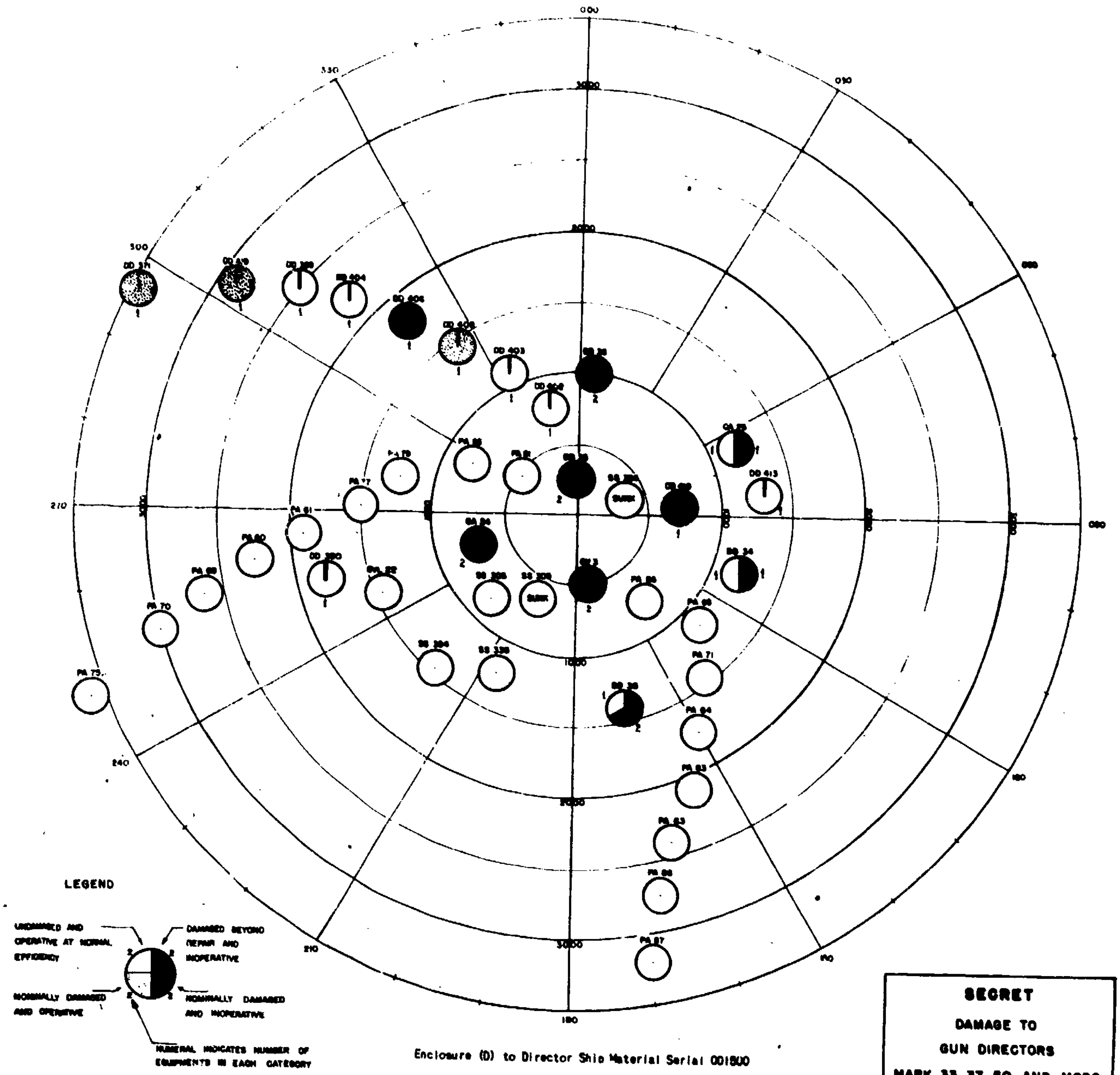
SECRET

DAMAGE TO GUN DIRECTORS (SURFACE)

3927

TEST BAKER

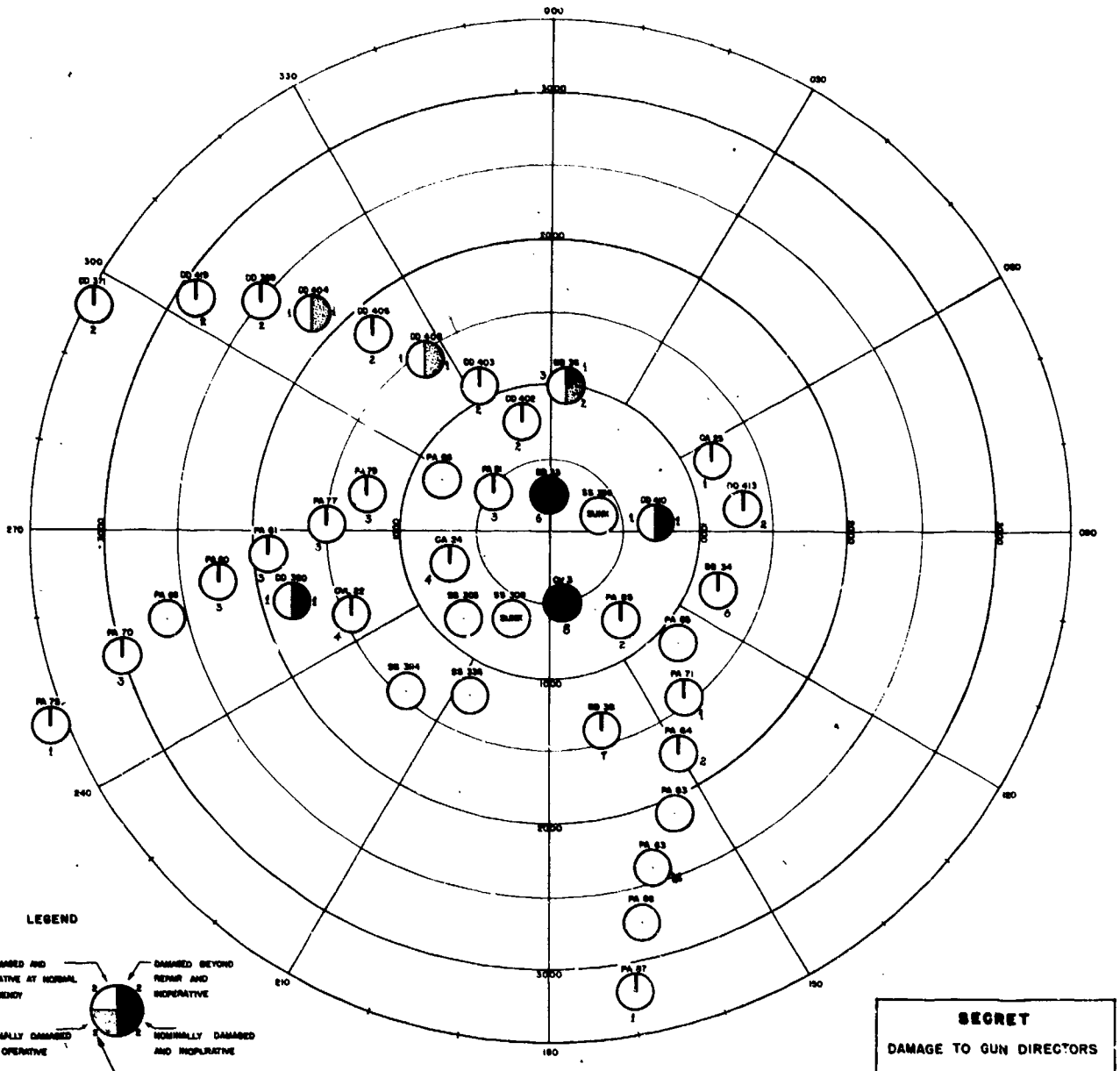


Enclosure (D) to Director Ship Material Serial 001800

SECRET

DAMAGE TO
GUN DIRECTORS
MARK 33, 37, 50 AND MODS.

TEST BAKER



Enclosure (D) to Director Ship Material Serial 001500

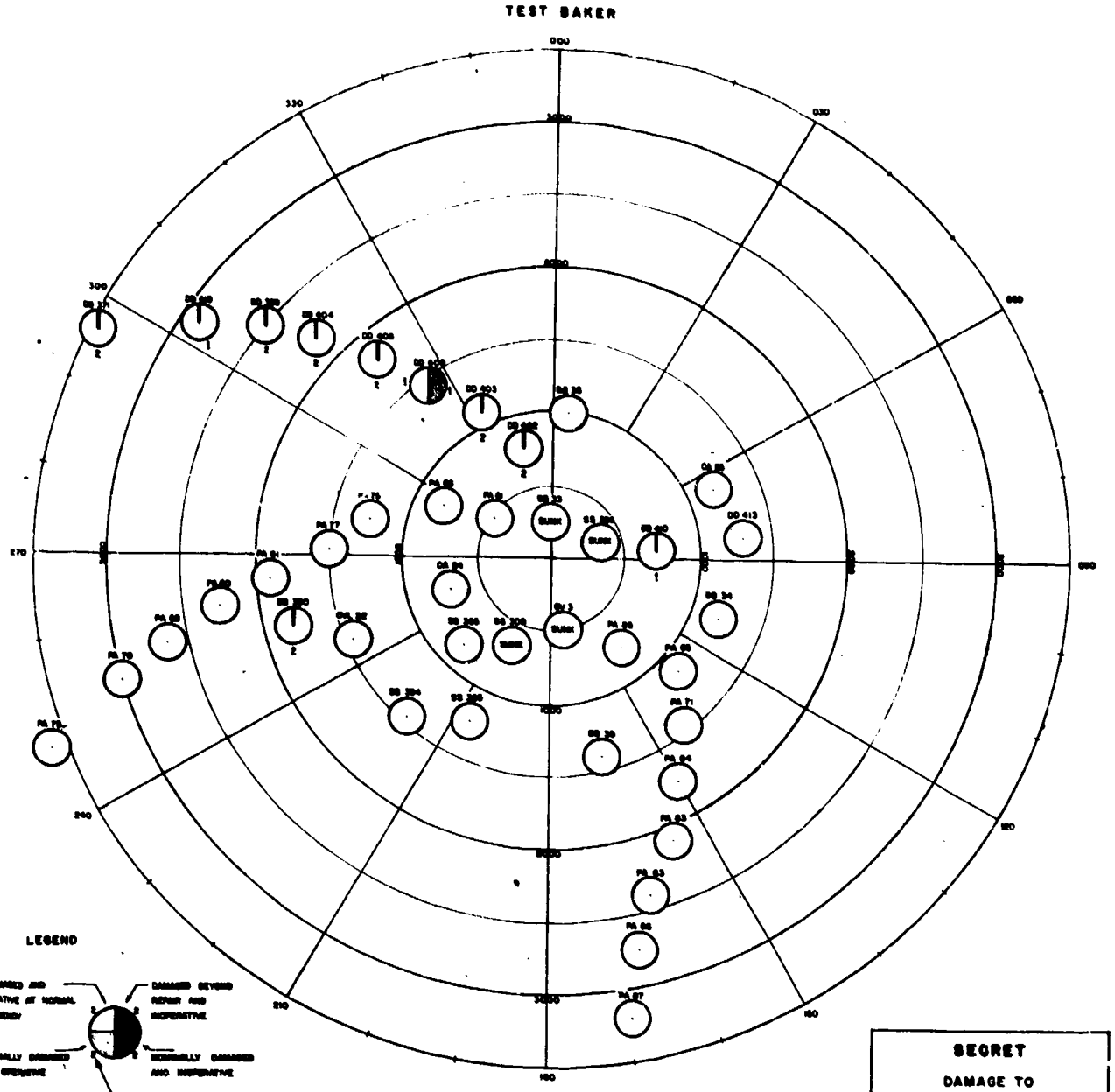
SECRET

DAMAGE TO GUN DIRECTORS MARK 51 AND MODS

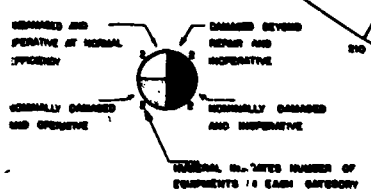
G.F.C.S. MARK 57, 63 AND MODS.

5927

TEST BAKER



LEGEND



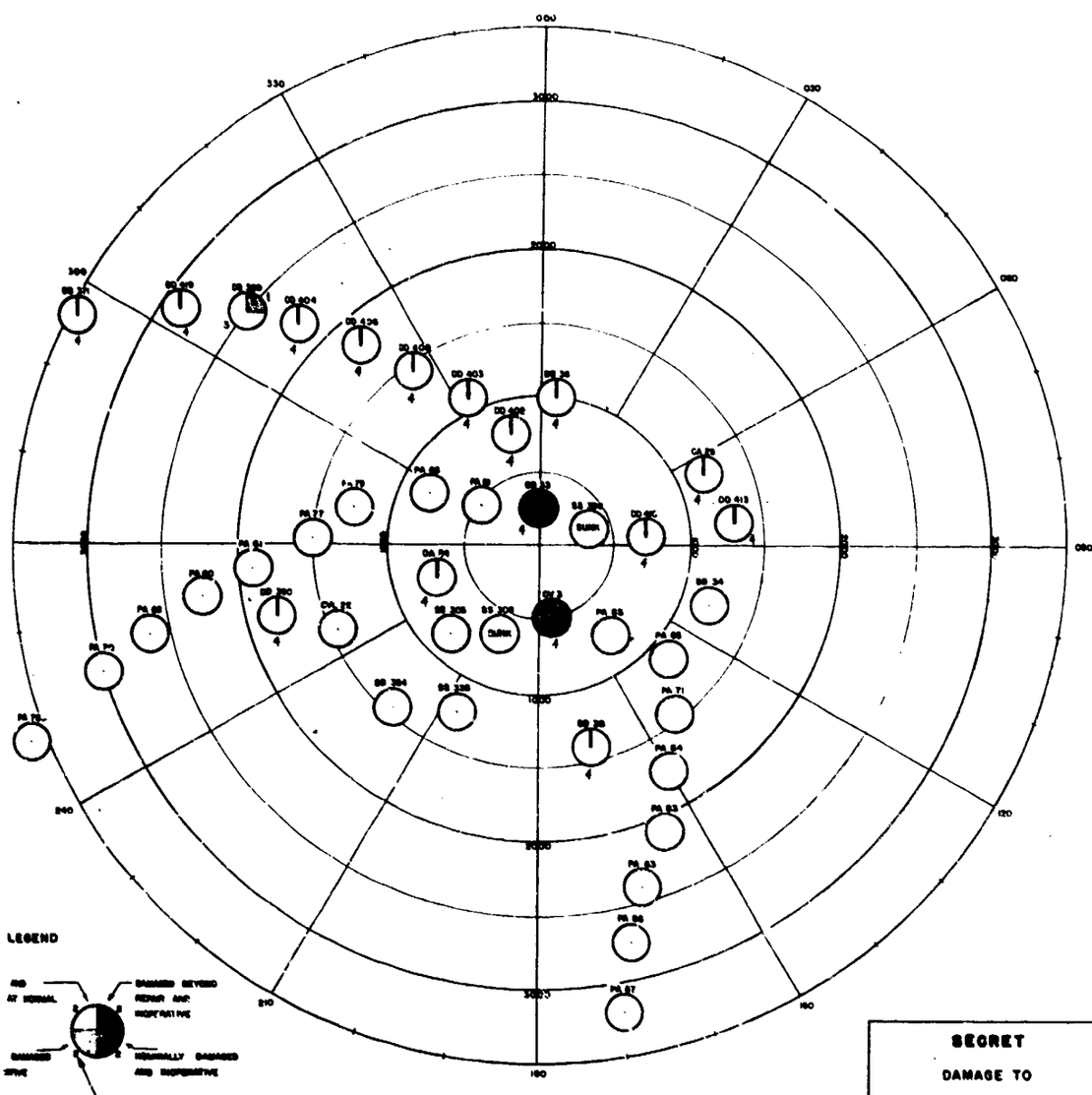
SECRET

DAMAGE TO

TORPEDO DIRECTORS

MARK 27 AND MODS.

TEST BAKER



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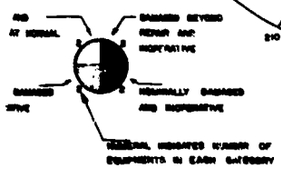


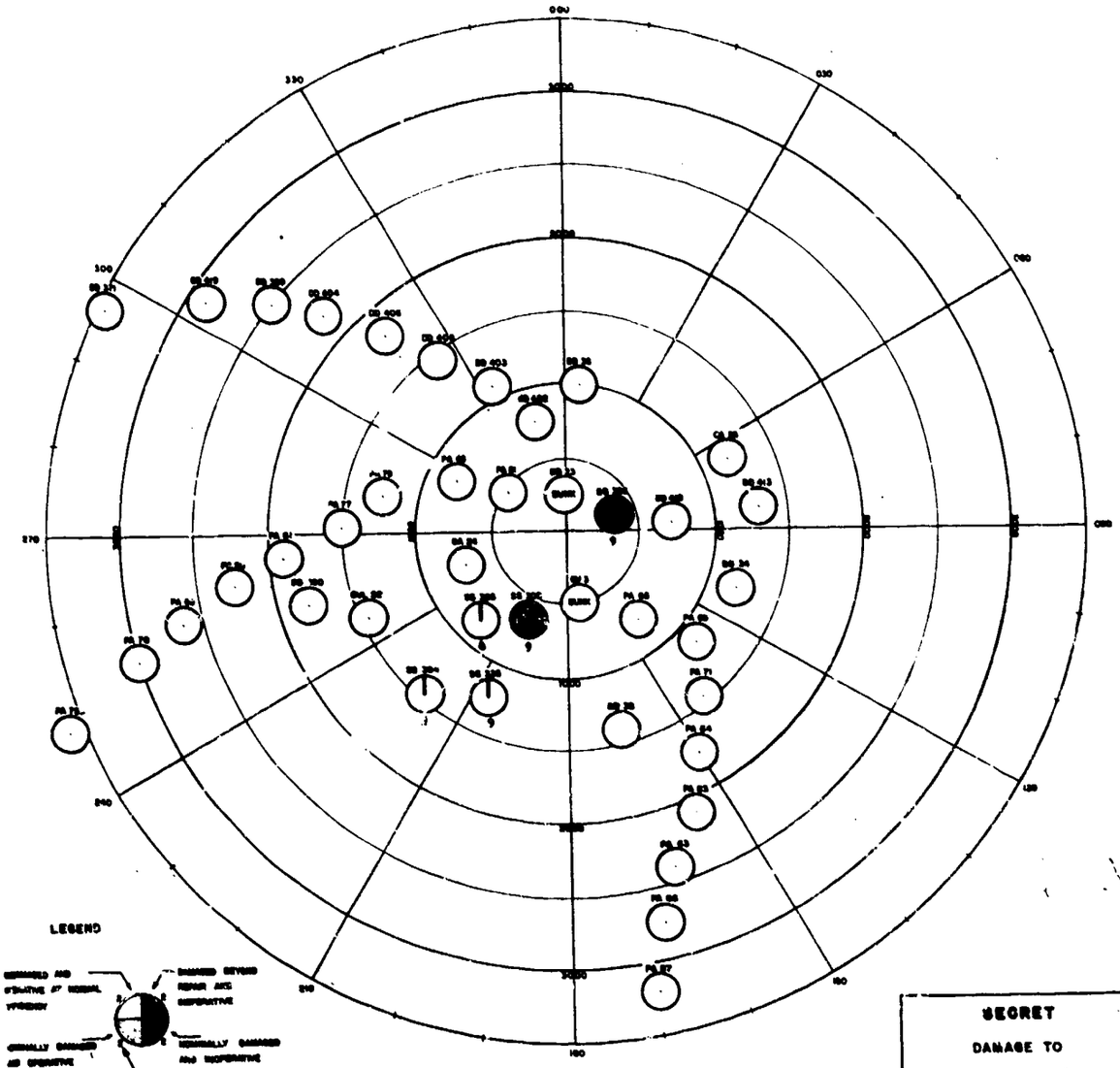
Enclosure (D) to Director Ship Material Serial 001800

SECRET

DAMAGE TO

FUZE SETTERS

TEST BAKER



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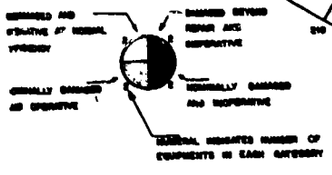

Enclosure (D) to Director Ship Material Serial 001600

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SECRET

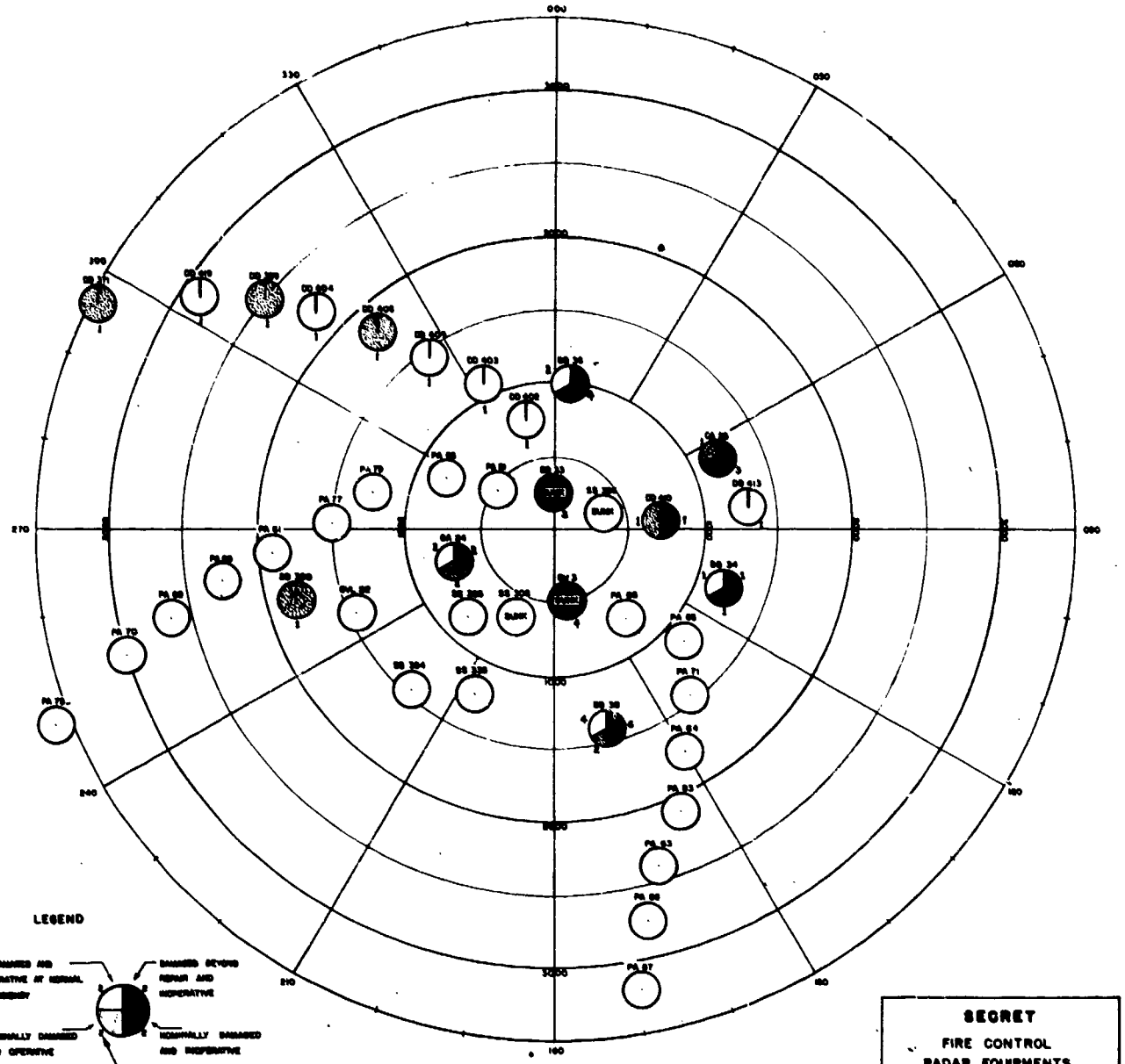
DAMAGE TO

SUBMARINE

FIRE CONTROL EQUIPMENT

3927

TEST BAKER



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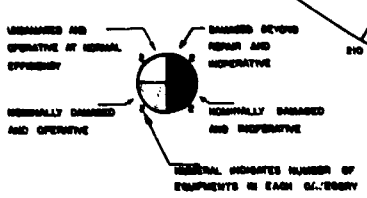

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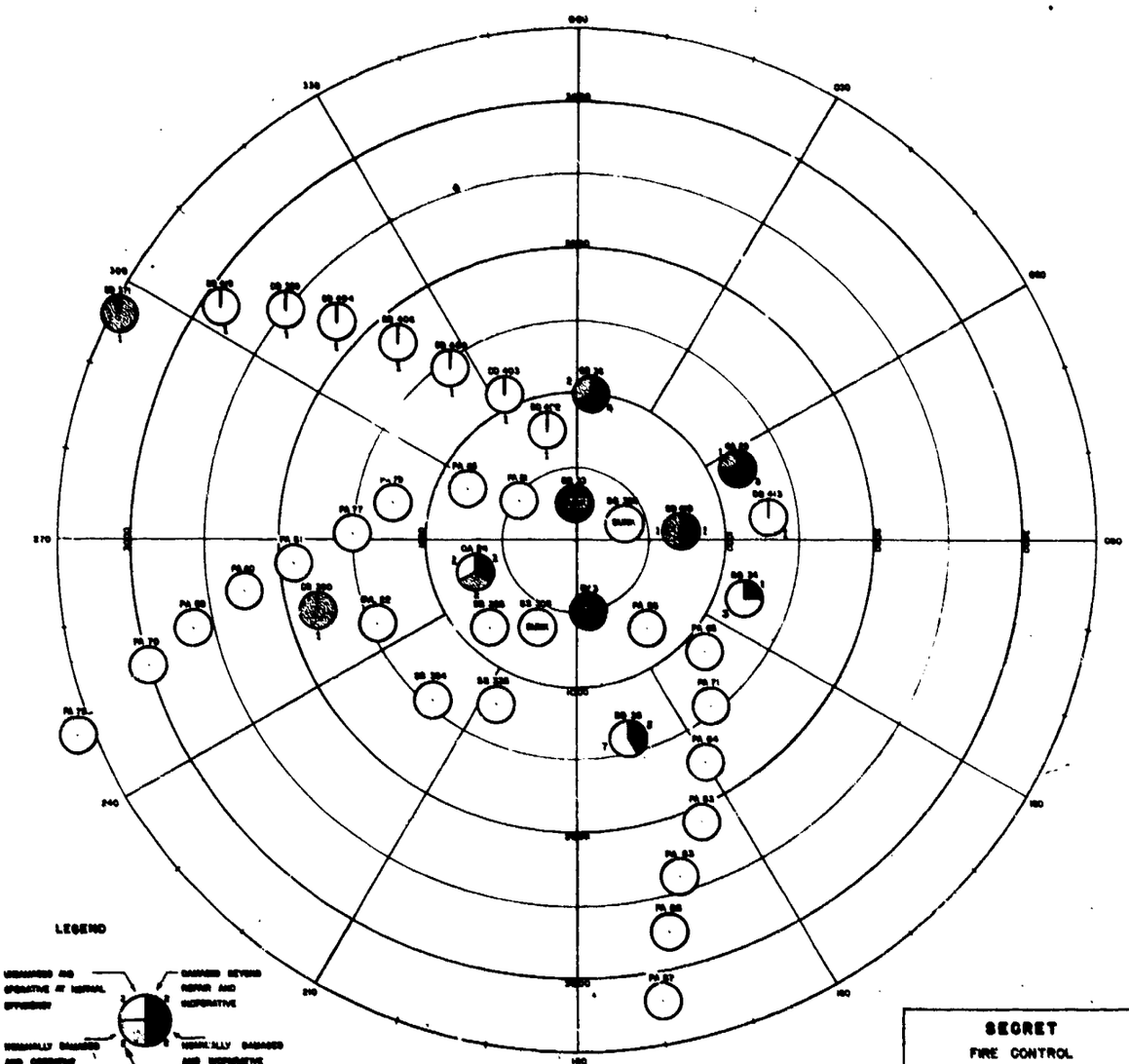
FIRE CONTROL
RADAR EQUIPMENTS

OVERALL DAMAGE INCLUDING ALL MARKS AND MODS.

TEST BAKER



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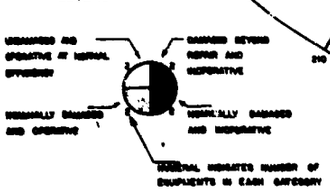
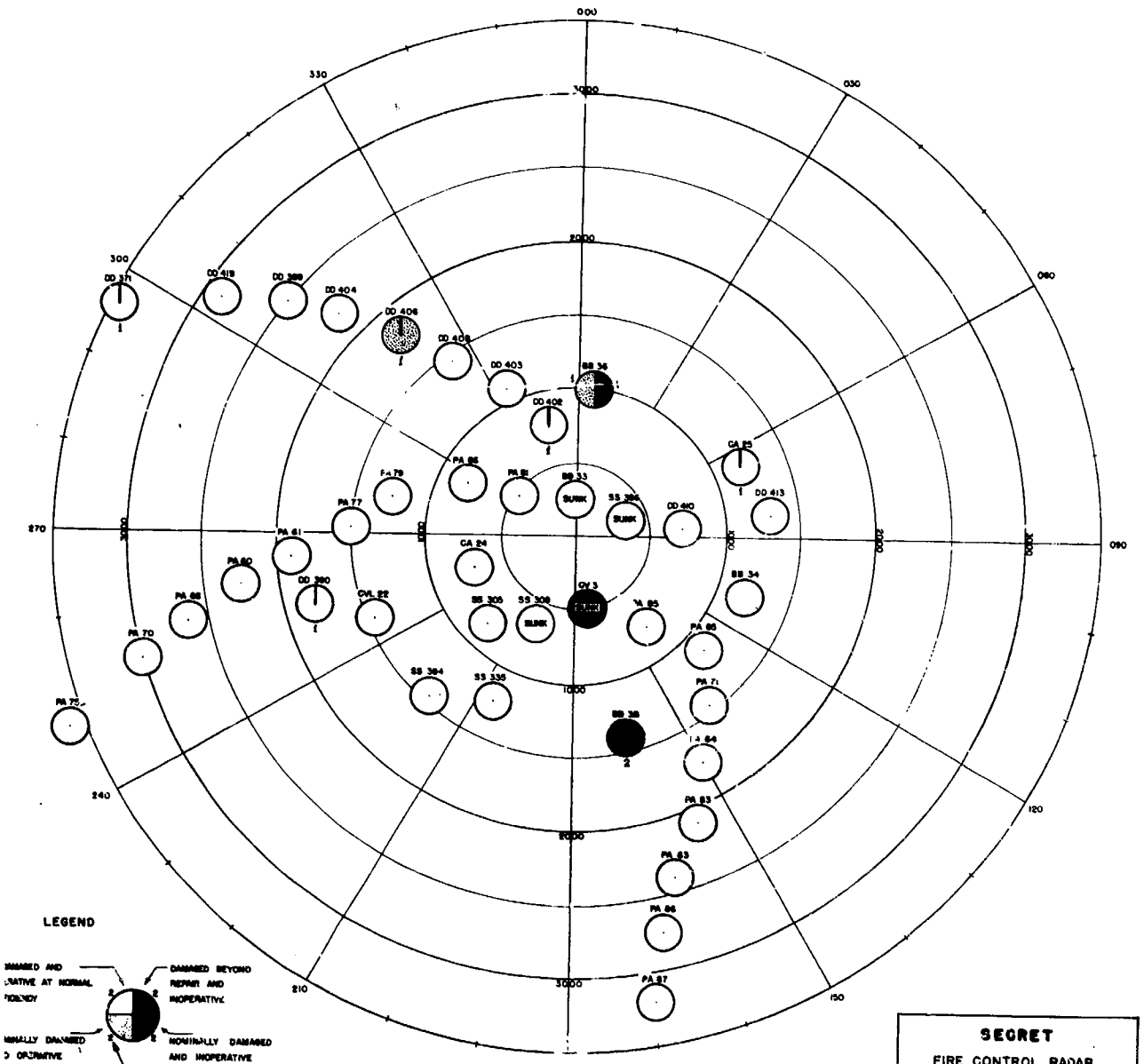


Enclosure (D) to Director Ship Material Serial 001800

SECRET
FIRE CONTROL
RADAR EQUIPMENT
BELOW DECKS UNITS ONLY
INCLUDING ALL MARKS AND MODS

3927

TEST BAKER



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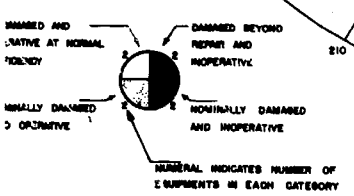


SECRET

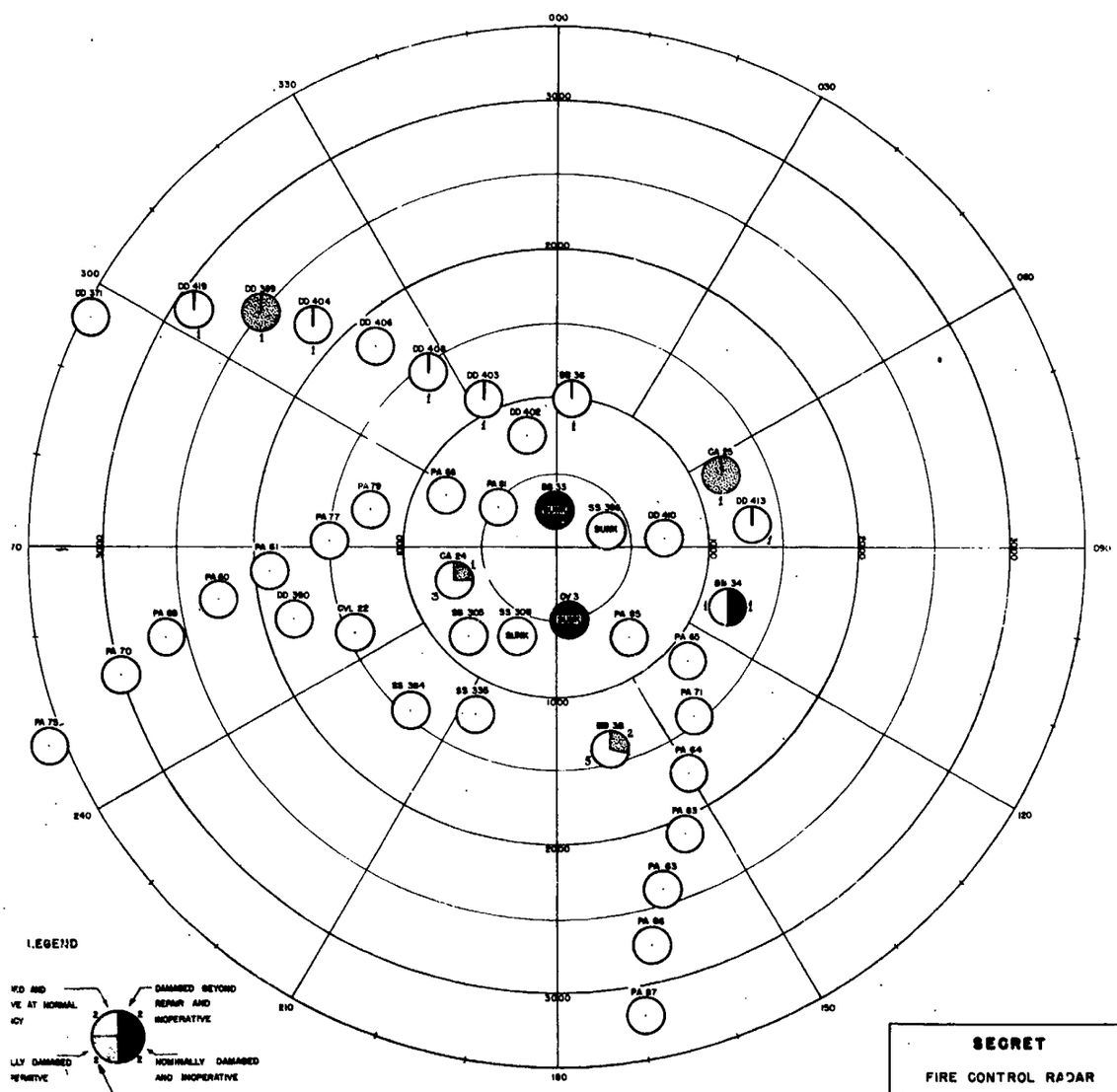
FIRE CONTROL RADAR

ANTENNAE ONLY

MK. 4 AND 12 ALL MODS.

3927

TEST BAKER



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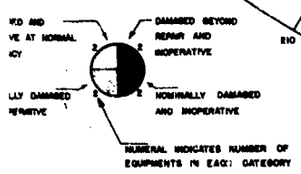


Enclosure (D) to Director Ship Material Serial 001500

SECRET

FIRE CONTROL RADAR ANTENNAE ONLY

MKS. 10, 28, 29. ALL MODS.

3927

SUMMARY

In general the casualties inflicted by the Air Burst to the Fire Control apparatus and systems were confined to above-decks equipment. All lightly mounted and constructed equipment which offered a large exposed surface to the blast suffered the greatest amount of damage. In this category are Radar Antennae and mountings, and lightly constructed director shields. In Test "B" this same equipment suffered little or no damage.

Considerable damage was inflicted to Gun Directors, Mark 33 and Mark 35, during the air-burst when the lightly constructed shields were buckled, dislodging brackets, and boxes. Plexiglas of various thicknesses and hatches and doors were blown-in while rangefinder glass in the same directors was not broken. Irrespective of the lightness of the construction of shields, no damage was incurred by the internal equipment from the direct effects of the explosion. However, equipment that had unrestrained movement such as canvas bloomers, flexibly-mounted stable element power-tubes and the de-energized sensitive element in the stable element, received serious damage which resulted in the loss of stablization. This particular type of damage was not evident in Test "B", probably due to the type and direction of the forces which were imposed on the equipment. No casualties occurred to below-decks stable elements in Test "A" while rangekeepers and computers withstood the effects of blast and shock in both Test "A" and Test "B".

The shock transmitted from the underwater explosions caused severe damage to the Gun Directors, Marks 33, 35, and 37. Three of the Gun Directors, Mark 33, were shocked off their roller paths and in the same directors the Stable Elements, Mark 2, had their aluminum cases cracked and ruptured in several places disarranging the gearing.

One Gun Director, Mark 35, was heavily damaged by the underwater shock accompanied by similar damage to the internal equipment. The Stable Element, Mark 3, sustained heavy damage to its sensitive element, the trainer's stand was broken, the base of each rangefinder pedestal was fractured and the elevation and cross-level drives were difficult to move.

The Gun Director, Mark 37, suffered damage that could be eliminated by changes in the future design. Damage seemed to be the result of a severe lateral rather than vertical thrust.

Two Gun Directors, Mark 37, located on a battleship were frozen in train because of distortion of the radial roller path, tight meshing of the engaging gear, and bending of the shafting. It is interesting to note that although one Gun Director, Mark 37, on a destroyer was approximately one-half the distance from the blast as the above directors and although the damage was not similar, the Gun Director, Mark 37, on the destroyer would not train because of

SUMMARY (Cont'd)

a ruptured gas-seal and a poorly lubricated training rack. The clearances of its radial rollers were normal and no excessive lateral shift was observed. This phenomena could possibly be attributed to the lighter construction of the shield on the destroyer and to a closer clearance between the radial rollers and the roller-path thus restraining the motion of the director.

On Gun Director, Mark 37, on a battleship was frozen when a seemingly lateral force damaged the train locking-pin in the secured position, preventing its withdrawal.

Weather-seal failure due to blast caused excessive friction in train movement in some cases, indicating room for improvement in present design. Range-finder bloomers and other canvas covers showed considerable tearing and ripping from the blast. However, the canvas provided protection from the heat of the blast wherever it remained intact.

The Torpedo Director, Mark 27, withstood the effects of blast and shock remarkably well except for minor damage due to secondary causes.

Battery Alignment data were not obtained after either Test "A" or Test "B" due to lack of personnel, the danger of over exposure to radioactivity and the acute shortage of time available.

The effects of the Air Blast of the nuclear fission bomb caused damage to the following components of Fire Control Radar Equipment installed in naval vessels exposed to the effects of the burst:

(a) Antenna structures and mounts.
(b) Coaxial transmission lines and wave guides.
(c) Indicating meters mounted in directors.
(d) Vacuum tubes.
(e) Below-decks units.

The components are listed in order of decreasing degree of damage. Only minor damage was found in components included under sub-paragraphs (c), (d), and (e) above.

It is concluded that the present design of below-decks electronic units in fire control radar equipment is adequate to withstand the shock and vibrations encountered in Test "A".

The majority of the damage to antenna structures appeared to be caused by blast, with shock as the next most prevalent cause of failure. At distances less than about one-half mile from the point of explosion, considerable heat-damage to exposed transparent or translucent plastic parts was observed.

SUMMARY (Cont'd)

The type, extent and location of this heat-damage appears to indicate that it was caused principally by radiant heat. No damage was observed to any component that could be attributed to radioactivity effects.

The location of the antenna assembly on the director appeared to have considerable effect on the extent of the damage. Those antennae located on the tops of directors where there was no protection from the blast were more consistently and more severely damaged than the antennae located on the fronts of the directors.

The following fire control radar equipment is listed in order of decreasing susceptibility to damage:

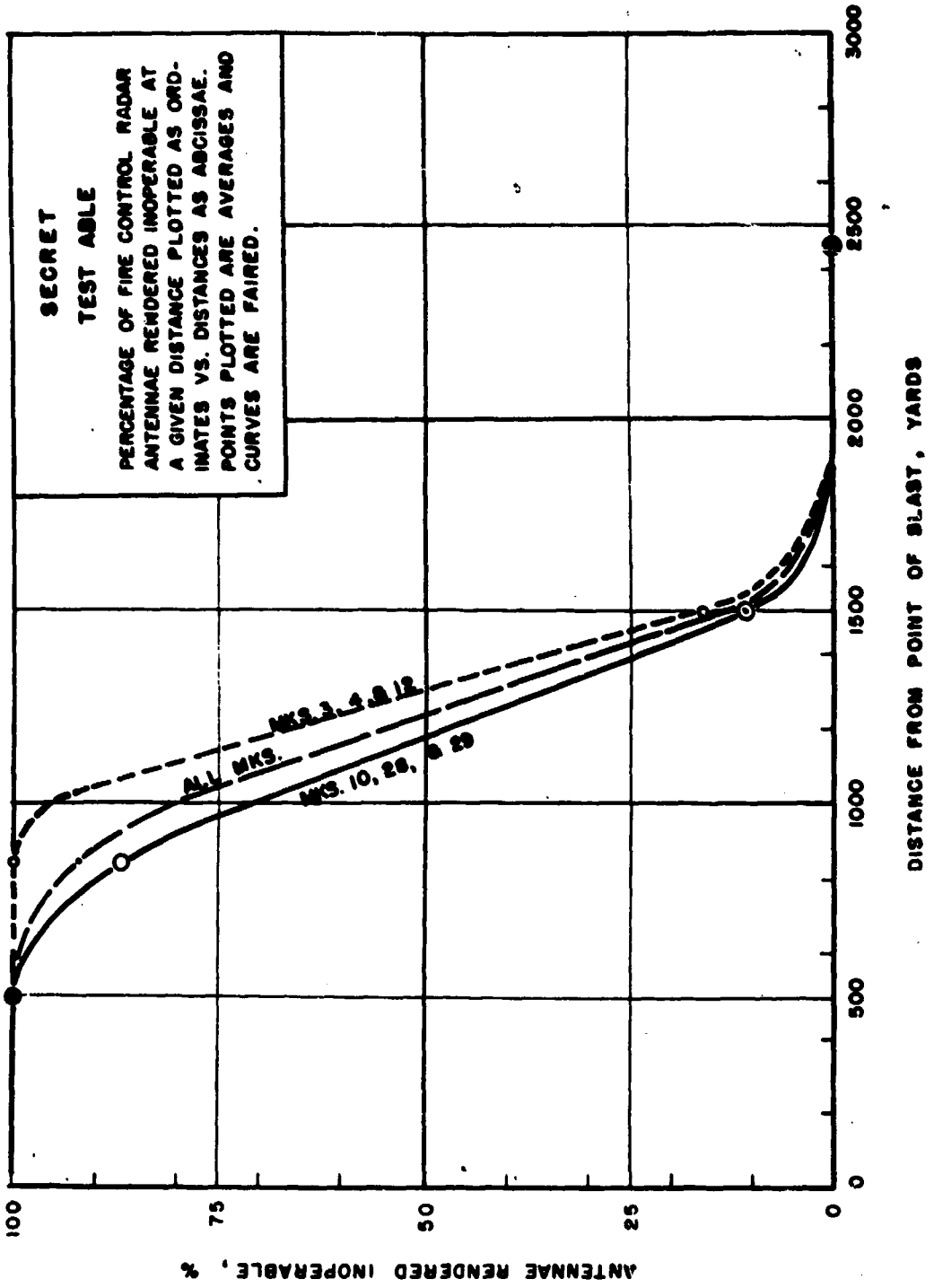
(a) Mark 3 and Mark 4.
(b) Mark 12.
(c) Mark 28, Mark 10, and Mark 29.
(d) Mark 8 (only one equipment observed).
(e) Mark 22.

Damage to the Mark 28 and similar radars (Mark 10 and Mark 29) was generally such as to be capable of repair by ship's force, whereas the heavier antenna arrays of the Mark 12 and similar radars require tender or navy yard facilities for repairs.

The following tabulation shows the rough correlation of damage vs distance from the point of explosion:

Approximate Distance (Nautical Miles)	Radars Undamaged or Operating at only slightly reduced efficiency
Less than 1/3 mile	All ships with F.C. radar were sunk within this area.
Between 1/3 mile and 1/2 mile	0%
Between 1/2 mile and 2/3 mile	About 20%
Between 2/3 mile and one mile	About 50%
Between 1 mile and 1 1/2 miles	About 90%
Over 1 1/2 miles	None observed. (No Target Ships with F.C. radar were in this area).

The damage caused to Fire Control Radar Equipments and especially to antennae by the "A" Test prevents a comparison of percentages of operable equipment before and after the "B" Test. However of 22 Fire Control Radar Equipments in Battleships, inspection indicated that nine received no additional disabling damage by Test "B".



NOTE: Each point plotted represents between 3 and 18 pieces of equipment. Curves therefore have a probable accuracy not better than about ± 15 %.

S-E-C-R-E-T

Enclosure (D) to Director Ship Material Serial 001500.

SUMMARY (Cont'd)

Six of the ten radar equipments in the cruisers escaped additional disabling damage while ten of the twelve destroyer fire control radar equipments received no additional disabling damage from Test "B". Most of the destroyers on which no damage was sustained by the radar equipments were located beyond the range of greatest damage.

The effects of the underwater explosion of the Atomic Bomb in general caused only minor damage to fire control radar equipments in those ships not sunk by the explosion. The primary damage was caused by the shock impulse produced by the explosion. There appeared to be no evidence of appreciable effects on the operation of the equipment due to radioactivity. There was little damage caused to the fire control radar equipment by the decontamination procedures for the reasons that; first, the equipment is well designed in the above decks units for moisture protection, and secondly that the exposed parts were spared, by intent, and because of their location, from the hazards of the decontamination process.

At distances less than 700 yards from the point of detonation of the bomb all equipments were rendered inoperative. At distances greater than about 1500 yards from the point of detonation, the operation of the equipments was relatively unaffected. In all cases except that of the damaged Mark 12 radar antenna mounts, repairs could have been effected by the ship's force in a short time.

The fire Control Radar Equipments, Mark 8, 10, 28, and 29 were much less susceptible to shock damage than the equipments, Mark 3, 4, 12, and 22. The most frequent causes of failure listed in order of importance are broken glass envelopes of large vacuum tubes, broken glass-to-metal seals in magnetrons, failure of cast light-metal alloy antenna supporting members and failure of shock-mounts.

It is instructive to note that the lighter types of antenna construction sustained the greater damage from the effects of the air-burst, which were principally air-blast effects, while the more massive types of antenna structures sustained the greater damage from the predominant shock effects produced by the sub-surface explosion.

The results of the nuclear fission bomb experiment indicated that the ordnance optical equipment used in ships of the U.S. Navy is of excellent design and construction. A greater amount of damage was anticipated than was actually caused by the shock and heat to which the ordnance optical installations were subjected. A general observation of the Test "A" and Test "B" damage suggests that the optical instruments as a whole are of a much more sturdy construction than the associated equipment. In several cases the optical installations were rendered inoperable by the failure of a cast-aluminum support or a

SUMMARY (Cont'd)

sheet-metal protective shield. The cast-aluminum support brackets for the Gun Sights, Marks 14 and 15, were particularly susceptible to the effects of the explosion.

A considerable number of lead computing Gun Sights, Mark 14 and 15, sustained a variety of casualties but the most prevalent cause of faulty operation was the inability of the gun sights to withstand exposure to the weather.

Moisture condensed on the internal mechanisms and optical surfaces of the Gun Sights, Mark 14 and 15, was commonly found after both Test "A" and Test "B". It is believed that the primary reason for the condensation was the period before and after each Test, during which the air compressor and air filtering system was not operated periodically.

A considerable number of Gun Sights, Mark 14 and 15, were found to have improper precession of train and elevation gyros. Several Gun Sights, Mark 14 and 15, were sent to the New York Naval Shipyard for an After Test "A" damage analysis. The results of these analyses revealed that the improper precession was caused by shifted gyro range units, which were probably shifted by the shock produced by the explosion. No cases were observed wherein a gyro unit was seriously damaged by the effects of the explosion, but a large percentage of the gun sights located at a comparatively short distance from the center of the explosion were rendered inoperative by the effects of the explosion until such time as they could be sent to a repair activity for adjustment and realignment.

The front and rear windows of the Gun Sights, Mark 14 and 15, were in several instances shattered by the effects of the Test "A" explosion. These windows are made of a comparatively thin laminated glass. It is suggested that a type of glass similar to that used for end-windows in the modern gun sight telescope would be more satisfactory for the purpose, since the end-window glass proved its worth by withstanding the effects of the Test "A" and Test "B" explosions without casualty.

A large number of the lead computing gun sights were rendered inoperable when the ray filter mechanisms jammed in the "IN" position. The cause of this trouble, determined by an analysis of the instruments sent to the New York Naval Shipyard, proved to be an improperly designed ray filter guide and stop mechanism. The ray filter mechanism of the Gun Sight, Mark 14, Mod. 6, is an example of the improper type of construction which can be rectified either by issuance of an OrdAlt and/or by the redesign of the ray filter system.

The aluminum fittings which couple the electrical leads to the housing of the Gun Sight, Mark 14, are particularly susceptible to corrosive action. In several instances these aluminum fittings had deteriorated to such an extent that the aluminum union collapsed when an

SUMMARY (Cont'd)

attempt was made to remove the connection from the gun sight housing.

Damage to the air hose connections, probably caused by the whipping action of the hose was prevalent where the hose support brackets supplied with the gun sights had not been installed.

The rangefinders withstood the test well. One Rangefinder, Mark 54, mounted in a Rangefinder Mount, Mark 35, was rendered inoperative by the secondary effects of the Test "A" explosion. This rangefinder was damaged primarily by blows from parts of the Rangefinder Mount, Mark 35, which was blown apart by the blast.

One Rangefinder, Mark 43, located in a Gun Director, Mark 35, was made inoperable by effects of the Test "B" explosion. The right and left end-reflectors were shattered and the base of each rangefinder mount pedestal was fractured.

The Rangefinder Mount, Mark 65, (open mount) which is usually located on the bridge of auxiliary vessels, exhibited a weakness in construction. A case was observed in which the bearing saddles of the Rangefinder Mount, Mark 65, were bent outward jamming the rangefinder in elevation. The mount was cracked at the inner corners formed by the rangefinder and bearing saddles and the head shield was bent and distorted.

In several cases, the training mechanism of the Rangefinder Mount, Mark 65, was frozen by the corrosion of the training shaft at the point where it passes through the support arm. In general the resistance of the Rangefinder Mount, Mark 65, to the effects of the Atomic Bomb explosion and to corrosion was not satisfactory.

The defrosting unit, located on the end-boxes of Rangefinders, Mark 42, in several instances were found to have been blown off the rangefinders.

The damage to gun sight telescopes was negligible. The optical and mechanical components of the telescopes, satisfactorily withstood the heat and shock effects of the Test "A" and Test "B" explosions with the exception of the Telescopes, Mark 20, mounted on the 5"/51 broadside guns, several of which exhibited internal damage.

A great number of telescopes located in open gun mounts were rendered inoperable by moisture which collected in the eyepiece system and by inoperative corroded eyepiece focussing units. The damage was probably caused by the decontamination methods used after Test "B".

SUMMARY (Cont'd)

A Telescope, Mark 60, which had been exposed to the Test "A" explosion was sent to the New York Naval Shipyard for a damage analysis. It was found that the light transmission of this telescope had decreased slightly, due to the exposure of the optics to effects of the Atomic Bomb explosion.

Prior to and after Test "A" and "B", the Torpedo Data Computer Mark 3, Mod. 5 and associated fire control instruments aboard the U.S.S. SKATE (SS-305), U.S.S. APAGON (SS-308), U.S.S. DENTUDA (SS-335), U.S.S. PARCHE (SS-384) and U.S.S. PILOTFISH (SS-386) were checked thoroughly and forty-four tests were run on each Torpedo Data Computer in order to establish definitely the accuracy of the computers by determining the difference of the average percentage errors.

Prior to and after Test "A" and "B" torque tests were conducted on the periscopes, target bearing transmitters, Mark 8 and Mark 9, and the gyro setting indicator regulators, Mark 1, Mods. 2 and 3, aboard the listed submarines in order to establish the torque work-load increase caused by the effects of the Atomic Bomb.

RECOMMENDATIONS

Utilizing as criteria the results of detailed and intensive investigation and study of the effects of subsurface and suprasurface nuclear fission explosions on fire control equipments, the following recommendations are submitted for use as guides in future design:

Wherever possible, place fire control equipment below decks. For equipment that must remain in exposed locations, strengthen the light-weight protective shields by the addition of stiffeners, allowing sufficient clearance from the equipment to prevent damage in case of distortion of the shield, and design all exteriors to approach a sphere in appearance.

Design mountings and fastenings to have strength adequate to withstand the forces set up by the effects of an Atomic Bomb explosion, keeping the weight of component parts at a minimum consistent with strength requirements; and develop structural strength in ship foundations equal to that of the base members of the equipment being supported.

Improve the design of shock-mounts, decreasing the loading of individual mounts, providing optimum damping, and allowing sufficient clearance between shock-mounted units and adjacent structures.

Discontinue or sharply curtail the use of aluminum and light-metal alloys, both cast and fabricated, as materials for primary structural members, and achieve strength and weight-reduction by the use of properly designed units fabricated from strong light ferrous alloys capable of great strain without complete failure, in contrast to the light-metal alloys that tend to give ultimate failure near the elastic limit. Revise upward the design specifications to include a higher factor of safety, and to correspond to the blast and shock produced by the nuclear fission explosions.

Protect exposed equipment against corrosion by fabricating moving parts from corrosion resisting materials and providing adequate means of lubrication, while at the same time diligently preserving water-tight integrity. Especial attention should be given to minimizing corrosive action at the bearing surfaces of adjustment shafts passing through the outer cases of instruments.

Discontinue the use of all "plastics" in exposed locations except for occasional use of the most heat-resistant types where absolutely necessary.

Redesign the ray filter mechanism of Gun Sights, Mark 14, and make the construction and mechanism of Gun Sights, Mark 15, more sturdy.

RECOMMENDATIONS (Cont'd)

Replace bloomers used as port closures with closures better able to withstand blast and water pressure.

Support gun directors and similar heavy equipment on base-ring mounts rather than on pedestal mounts, and improve the design of gun director locking-pin assemblies (especially of the Gun Director, Mk. 37) with a view to improving their corrosion and shock resisting characteristics. Improve the design of the present type of weather seal used on the Gun Director, Mk. 37, to afford greater protection against blast and shock, and strengthen the base-ring of the director. Limit the motion of sensitive elements in the stable elements and limit the motion of the mountings of associated electron tubes. Improve the method of securing the fork in the level gimbal in the Stable Element, Mk. 6, and redesign the method of locking the pivot stud bushing of the Stable Element, Mk. 2.

Strengthen considerably the antenna assemblies of Fire Control Radar equipments, revising the specifications for blast and shock resistance upward to correspond to the conditions encountered during the Atomic Bomb tests. Locate radar antennae in positions where the maximum protection from blast is obtained. Ideally, designing new directors with the antenna integrated into the director shell and possibly protected underneath reinforced plastic-impregnated shields that will not be affected by heat.

Strengthen the envelopes of electron tubes having large glass envelopes and redesign the sockets for such tubes to reduce the probability of envelope fracture by applied shock.

Strengthen the metal-to-glass seals of magnetron tubes and apply some means of auxiliary reinforcement to the leads from the seals.

ENCLOSURE (D)

Subject: Bureau of Ordnance Material Group Final Report for Tests "A" and "B".

PART IX - AVIATION ORDNANCE

AVIATION ORDNANCE

PLANNING

An aviation gunnery officer was assigned as the head of the Aviation Ordnance Unit with additional duties concerning liaison with the Bureau of Aeronautics Group. This liaison duty consisted of collaboration with the Bureau of Aeronautics Group in the procurement and installation in airplanes of certain items of special aviation ordnance equipment and was necessary because of the cognizance of the Bureau of Aeronautics over aircraft.

Early in March, the head of the Aviation Ordnance Unit accompanied members of the Bureau of Aeronautics Group to Alameda, California for inspection of airplanes to be used in Operation Crossroads as target material. Arrangements were made with Carrier Aircraft Service Unit No. 6 and with the Assembly and Repair Department for receipt and installation, under the supervision of a Bureau of Ordnance representative, of Aviation Ordnance Fire Control equipment which had been procured and shipped to Alameda for installation in airplanes in the U.S.S. SARATOGA.

Aviation Fire Control equipment used in the tests was that equipment suggested by the Aviation Ordnance Research Section of the Bureau of Ordnance. The airplanes selected by the Bureau of Aeronautics for the tests were specified to be in a state of combat readiness and therefore contained the aviation ordnance equipment normally supplied, such as intervalometers, bomb shackles, bomb racks, station distributors (for bombs and rockets), gunsights, telescopic sights, machine guns, etc. The additional test material consisted of bombs, ammunition, bomb directors, bombsights, stabilized gunsights, torpedoes and mines, etc. The bombs and rockets loaded aboard the planes were blind-loaded and fuzed. Machine gun ammunition was limited to ten rounds per gun and the bolts of the machine guns were removed. (Report of damage to torpedoes and mines is contained in reports on Underwater Ordnance.)

The installation of the Aviation Fire Control equipment suggested by the Aviation Ordnance Research Section of the Bureau of Ordnance was governed by the type and location of target ship, the type of aircraft and the disposition of aircraft in the target array as determined by the Bureau of Aeronautics. The Aviation Ordnance Fire Control equipment and munitions were installed in the type of plane usually employing that equipment. The types of aircraft required for the items selected were located in the SARATOGA and INDEPENDENCE for Test "A" and SARATOGA and BRISCOE for Test "B". The airplanes on the SARATOGA were selected for the display of more ordnance equipment and munitions for Test "A" than that placed aboard the airplanes of the INDEPENDENCE because of the very strong belief that the airplanes of the INDEPENDENCE would be completely demolished or lost. This belief was later confirmed. For Test "A" the disposition of airplanes provided for location of one airplane on the catapult and one on the main deck of battleships with exception of the ARKANSAS which

AVIATION ORDNANCE (Cont'd)

PLANNING (Cont'd)

had but one plane mounted on the catapult. Carrier's airplanes were located on the hangar and flight decks. The airplanes carried in the cruisers were located on the catapult mounts. One airplane was located on the main deck and one in the hold in fourteen APA's to simulate aircraft carrier loading. Damage sustained by airplanes in Test "A" necessitated redistribution of those remaining for Test "B". This redistribution is hereinafter tabulated.

METHOD OF INSPECTION

Inspections covering the general condition and operability of all Aviation Ordnance equipment were carried out both at West Coast points of loading and at Bikini prior to Tests "A" and "B".

As special equipment necessary for tests and inspection of Aviation Fire Control equipment to be used in Test "A" and Test "B" was not available at Bikini, these inspections were carried out at the Assembly and Repair shops of the Naval Air Station, Alameda, California; after which the equipment to be exposed to Test "A" was mounted in the designated aircraft and the equipment to be exposed to Test "B" was repacked in its special packing boxes and stored aboard the SARATOGA for shipment to Bikini. The Test "B" equipment was later transferred to the WHARTON prior to Test "A". Just prior to Test "A" and Test "B", the Aviation Fire Control equipment was visually inspected to insure that no changes had occurred subsequent to the inspections conducted at Alameda.

All items of Aviation Fire Control equipment recovered after both tests were shipped to the Naval Ordnance Plant, Indianapolis, Ind., for inspection and report. Representative items of other Aviation Ordnance equipment were shipped to the Naval Gun Factory, Washington, D.C. for inspection and report.

In addition, representative items of Aviation Ordnance Equipment were sent by the Bureau of Aeronautics group to Armament Test, Naval Air Test Center, Patuxent River, Maryland for inspection and report. Visual and operability inspections were conducted immediately following each test at Bikini.

EQUIPMENT

A total of seventy-three (73) airplanes for Test "A" and forty (40) airplanes for Test "B" were employed. These airplanes, with the exception of two (2) Coronado type seaplanes, were in a state of combat readiness, and therefore contained all items of Aviation Ordnance Equipment normally carried by that type airplane, such as standard bomb racks and shackles, rocket launchers, bomb and rocket release systems, machine guns and cannon and their respective firing and control systems, etc. Disposition of these airplanes with the exception of the Coronados was as listed below:

AVIATION ORDNANCE (Cont'd)

EQUIPMENT (Cont'd)

TEST "A"

TYPE AIRPLANE	SHIP	LOCATION	NUMBER	APPROXIMATE YARDS
TBM-3E	SARATOGA	Flight Deck	3	2700
TBM-3E	SARATOGA	Hangar Deck	4	2700
F6F-5N	SARATOGA	Flight Deck	2	2700
F6F-5N	SARATOGA	Hangar Deck	4	2700
SBF-4E	SARATOGA	Flight Deck	3	2700
SBF-4E	SARATOGA	Hangar Deck	4	2700
TBM-3E	INDEPENDENCE	Flight Deck	3	700
TBM-3E	INDEPENDENCE	Hangar Deck	2	700
F6F-5N	INDEPENDENCE	Flight Deck	2	700
F6F-5N	INDEPENDENCE	Hangar Deck	2	700
SBF-4E	INDEPENDENCE	Flight Deck	3	700
SBF-4E	INDEPENDENCE	Hangar Deck	2	700
OS2U-3	ARKANSAS	Atop #3 Turret	1	400
XSC-1	NEW YORK	Catapult	1	1900
SC-1	NEW YORK	Main deck, portside, #3 Turret.	1	1900
OS2U-3	NEVADA	Maindeck,Stbd.side aft	1	600
OS2U-3	NEVADA	Catapult	1	600
OS2U-3	PENNSYLVANIA	Catapult	1	1800
OS2U-3	PENNSYLVANIA	Maindeck,Stbd.side aft	1	1800
OS2U-3	PENSACOLA	Port Catapult Mount	1	600
OS2U-3	SALT LAKE CITY	Stbd. Catapult Mount	1	1000
JM-2	GILLIAM	2nd Platform deck, Cargo Hold.	1	200
F6F-5N	GILLIAM	Main deck aft, Port side.	1	200

AVIATION ORDNANCE (Cont'd)

EQUIPMENT (Cont'd)

TEST "A" (Cont'd)

TYPE AIRPLANE	SHIP	LOCATION	NUMBER	APPROXIMATE YARDS
FM-2	BANNER	2nd Platform deck, Cargo hold.	1	1400
FG-1D	BANNER	Main deck aft, portside	1	1400
FM-2	BARROW	2nd Platform deck, Cargo hold.	1	1300
FM-2	BARROW	Main deck aft, Stbd.side	1	1300
FM-2	BLADEN	2nd Platform deck, Cargo hold.	1	2800
FG-1D	BLADEN	Main deck aft, Stbd.side	1	2800
FM-2	BUTTE	2nd Platform deck, Cargo hold.	1	2000
FG-1D	BUTTE	Main deck aft, Stbd.side	1	2000
FM-2	CARLISLE	2nd Platform deck, Cargo hold.	1	300
F6F-5N	CARLISLE	Main deck aft, Stbd.side	1	300
FM-2	CARTERET	2nd Platform deck, Cargo Hold.	1	2000
FG-1D	CARTERET	Main deck aft, Stbd.side	1	2000
FM-2	CORTLAND	2nd Platform deck, Cargo hold.	1	3200
F6F-5N	CORTLAND	Main deck aft, Stbd.side	1	3200
FM-2	CRITTENDEN	2nd Platform deck, Cargo hold.	1	500
FM-2	CRITTENDEN	Main deck aft, Stbd.side	1	500
FM-2	DAWSON	2nd Platform deck, Cargo hold.	1	900
F6F-5N	DAWSON	Main deck aft, Stbd.side	1	900
FM-2	FALLON	2nd Platform deck, Cargo hold.	1	1400
FG-1D	FALLON	Main deck aft, Stbd.side	1	1400

AVIATION ORDNANCE (Cont'd)

EQUIPMENT (Cont'd)

TEST "A"(Cont'd)

TYPE AIRPLANE	SHIP	LOCATION	NUMBER	APPROXIMATE YARDS
FM-2	FILLMORE	2nd Platform deck, Cargo hold.	1	2500
F6F-5N	FILLMORE	Main deck aft, Stbd. side	1	2500
FM-2	GASCONADE	2nd Platform deck, Cargo hold.	1	2800
FG-1D	GASCONADE	Main deck aft, Stbd. side	1	2800
FM-2	NIAGARA	2nd Platform deck, Cargo hold.	1	4000
F6F-5N	NIAGARA	Main deck aft, Stbd. side	1	4000
TEST "B"				
TBM-3E	SARATOGA	Flight Deck	3	500
TBM-3E	SARATOGA	Hanger Deck	1	500
SBF-4E	SARATOGA	Flight Deck	3	500
SBF-4E	SARATOGA	Hanger Deck	3	500
TBM-3E	INDEPENDENCE	Flight Deck	1	1400
SBF-4E	INDEPENDENCE	Flight Deck	1	1400
XSC-1	NEW YORK	Catapult	1	1200
SC-1	NEW YORK	Main deck, port, #3 Turret.	1	1200
F6F-5N	PENNSYLVANIA	Main deck, portside, aft.	1	1400
FG-1D	BANNER	Upper deck, portside aft.	1	2300
F6F-5N	BARROW	Upper deck, Stbd. side aft.	1	1900
FG-1D	BLADEN	Upper deck, Stbd. side aft.	1	2400
FM-2	BLADEN	2nd Platform deck, Cargo hold.	1	2400

AVIATION ORDNANCE (Cont'd)

EQUIPMENT (Cont'd)

TEST "B" (Cont'd)

TYPE AIRPLANE	SHIP	LOCATION	NUMBER	APPROXIMATE YARDS
TBM-3E	BRACKEN	Upper deck, Stbd. side, forward.	1	1800
F6F-5N	BRISCOE	Upper deck, Stbd. side, forward.	1	1200
F6F-5N	BRULE	Upper deck, Stbd. side, forward.	1	800
FG-1D	BUTTE	Upper deck, Stbd. side, aft.	1	2700
FG-1D	CARTERET	Upper deck, Stbd. side, aft.	1	3000
FM-2	CARTERET	2nd Platform deck, Cargo hold.	1	3000
F6F-5N	CORTLAND	Upper deck, Stbd. side, aft.	1	3600
FM-2	CORTLAND	2nd Platform deck, Cargo hold.	1	3600
F6F-5N	CRITTENDEN	Upper deck, Stbd. side, aft.	1	1500
F6F-5N	DAWSON	Upper deck, Stbd. side, aft.	1	1300
FM-2	DAWSON	2nd Platform deck, Cargo hold.	1	1300
FG-1D	FALLON	Upper deck, Stbd. side, aft.	1	500
FM-2	FALLON	2nd Platform deck, Cargo hold.	1	500
F6F-5N	FILLMORE	Upper deck, Stbd. side, aft.	1	2100
FG-1D	GASCONADE	Upper deck, Stbd. side, aft.	1	800

AVIATION ORDNANCE (Cont'd)

EQUIPMENT (Cont'd)

TEST "B" (Cont'd)

TYPE AIRPLANE	SHIP	LOCATION	NUMBER	APPROXIMATE YARDS
FM-2	GASCONADE	2nd Platform deck, Cargo hold.	1	800
TBM-3E	GENEVA	Upper deck, Stbd. side, forward.	1	2800
F6F-5N	NIAGARA	Upper deck, Stbd. side, aft.	1	3200
FM-2	NIAGARA	2nd Platform deck, Cargo hold.	1	3200

In addition, specially prepared items of Aviation Ordnance and Fire Control Equipment were installed in those type airplanes normally employing such equipment. These additional items are listed below:

TEST "A"

EQUIPMENT	NUMBER	PLANE & SHIP	APPROXIMATE YARDS
Bomb, 100 lb., G.P., B.L.&F.	1	OS2U-3 (NEVADA, BB) Maindeck, Stbd. side, aft.	600
Bomb, 100 lb., G.P., B.L.&F.	1	OS2U-3 (NEVADA, BB) Catapult	600
Bomb, 100 lb., G.P., B.L.&F.	1	OS2U-3 (ARKANSAS, BB) Atop #3 Turret	400
Bomb, 100 lb., G.P., B.L.&F.	1	OS2U-3 (PENNSYLVANIA, BB) Main deck, Stbd. side, aft.	1800
Bomb, 100 lb., G.P., B.L.&F.	1	XSC-1 (NEW YORK, BB) Catapult	1900
Bomb, 100 lb., G.P., B.L.&F.	1	SC-1 (NEW YORK, BB) Main deck, port side #3 Turret	1900
Torpedo, Mk. 13	1	TBM-3E (INDEPENDENCE, CVL) Flight Deck.	700

AVIATION ORDNANCE (Cont'd)

EQUIPMENT (Cont'd)

TEST "A" (Cont'd)

EQUIPMENT	NUMBER	PLANE & SHIP	APPROXIMATE YARDS
Mine, Mk. 24, B.L.&F.	1	TBM-3E (INDEPENDENCE, CVL) Flight Deck	700
Aircraft Rocket, 11.75", B.L.&F.	1	F6F-5N (SARATOGA, CV) Flight Deck	2700
High Velocity Aircraft Rockets, 5.0", B.L.&F.	6	F6F-5N (SARATOGA, CV)	2700
Bombs, 500 lb., G.P., Inert.	2	SBF-4E (SARATOGA, CV) Flight deck	2700
Bombs, 500 lb., G.P., B.L.&F.	2	SBF-4E (SARATOGA, CV) Flight deck	2700
Bomb Director, Mk. 1, Mod. 2.	1	SBF-4E (SARATOGA, CV) Flight deck	2700
Bombsight, Mk. 15, Mod. 7	1	TBM-3E (SARATOGA, CV) Flight deck	2700
Gunsight, Mk. 23	1	F6F-5N (SARATOGA, CV) Flight deck	2700
Bombsight, Mk. 23	1	TBM-3E (SARATOGA, CV) Flight Deck	2700
Mine, Mk. 24, B.L.&F.	1	TBM-3E (SARATOGA, CV) Flight deck	2700
Torpedo, Mk. 13	1	TBM-3E (SARATOGA, CV) Flight Deck	2700
TEST "B"			
Bombs, 500 lb., G.P., Inert.	2	SBF-4E (SARATOGA, CV)* Flight Deck	500
Bombs, 500 lb., G.P., B.L.&F.	2	SBF-4E (SARATOGA, CV) Flight Deck	500

AVIATION ORDNANCE (Cont'd)

EQUIPMENT (Cont'd)

TEST "B" (Cont'd)

EQUIPMENT	NUMBER	PLANE & SHIP	APPROXIMATE YARDS
Bomb Director, Mk. 1, Mod. 2	1	SBF-4E (SARATOGA, CV) Flight Deck	500
Torpedo, Mk. 13, B.L.&F.	1	TBM-3E (SARATOGA, CV) Flight Deck	500
Mine, Mk. 24, B.L.&F.	1	TBM-3E (SARATOGA, CV) Flight Deck	500
Bombsight, Mk. 15, Mod. 7	1	TBM-3E (SARATOGA, CV) Flight Deck	500
Bombsight, Mk. 23	1	TBM-3E (SARATOGA, CV) Flight Deck	500
Bomb, 100 lb., G.P., B.L.&F.	1	XSC-1 (NEW YORK, BB) Catapult	1200
Aircraft Rocket, 11.75" B.L.&F.	1	F6F-5N (BRULE, APA) Upper deck, Stbd. side forward.	300
High Velocity Aircraft Rockets, 5.0", B.L.&F.	6	F6F-5N (BRISCOE, APA) Upper deck, Stbd. side, forward.	1200
Gunsight, Mk. 23	1	F6F-5N (BRISCOE, APA) Upper deck, Stbd. side, forward.	1200

SECRET

AVIATION ORDNANCE

DAMAGE SUSTAINED IN TEST "A"

U.S.S. SARATOGA (Approximately 2700 yards)

1. Machine Guns and Cannon.

Undamaged.

2. Bomb Racks and Shackles.

Undamaged.

3. Bombs and Fuzes.

Undamaged. The nose and tail fuzes from two 500 lb. bombs were returned to the Naval Ordnance Laboratory, Washington, D.C. for laboratory inspection and report.

4. Rockets and Fuzes.

Undamaged. The nose fuzes from six 5.0 HVAR's were returned to the Naval Ordnance Laboratory, Washington, D.C., for laboratory inspection and report.

5. Fixed Fire Control Equipment.

Undamaged.

6. Special Fire Control Equipment.

The Bombsights, Mk. 15 and Mk. 23 suffered no visible damage attributable to Test "A". Upon inspection following the test, three (3) units of the Mk. 1, Mod. 2 Bomb Director were missing from the airplane in which they had been mounted.

These units were:

(1) One (1) Control Box, Mk. 8, Mod. 2, No. 3552.
(2) One (1) Computor, Mk. 20, Mod. 2, No. 2020.
(3) One (1) Altimeter, Mk. 1, Mod. 1, No. 1812.

An exhaustive search failed to locate these units. The Gyro Mk. 20, Mod. 1 of the Bomb Director Mk. 1, Mod. 2 was recovered undamaged and this, together with one (1) Mk. 15 Bombsight, one (1) Mk. 23 Bombsight and one (1) Mk. 23 Gunsight was returned to the Naval Ordnance Plant, Indianpolis, Indiana, for laboratory inspection and report.

SECRET

Enclosure (D) to Director Ship Material Serial 001500.

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. SARATOGA (Continued)

7. Machine Gun Ammunition.

Undamaged.

8. Torpedoes and Mines.

Undamaged. These were turned over to the Underwater Ordnance Unit.

U.S.S. INDEPENDENCE (Approximately 700 yards.)

Seven of the airplanes on this vessel were blown over the side by the blast. The remaining seven were completely demolished. Of those remaining, the damage suffered by the Aviation Ordnance equipment was as follows:

1. Machine Guns and Cannon.

The twin .30 caliber guns and mount were missing from the two SBF-4E airplanes on the hangar deck. A turret was torn out of a TBM-3E airplane on the hangar deck but the guns remained operable. A Twin .30 caliber mount and guns were found on the flight deck. No damage was noted except a broken latch on the mount. This assembly was returned to the U.S. Naval Gun Factory, Washington, D.C. for laboratory inspection and report. One TBM-3E .50 caliber wing gun was missing.

2. Bomb Racks and Shackles

All bomb racks and shackles which were recovered remained undamaged and operable.

3. Fixed Fire Control Equipment

Intervalometers and station distributors which were recovered were found to be intact and operable as a unit. This is attributed to the fact that this equipment was protected by the airplane's structure in which it was mounted. Two Mark 9 gunsights were missing from the SBF-4E airplanes in which they were mounted. Damage to Mark 8 gunsights was limited to broken reflectors.

4. Torpedoes and Mines

Only a small portion of the tail section of the Mark 24 mine which was mounted

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. INDEPENDENCE (Continued)

4. Torpedoes and Mines (Continued)

in a TBM-3E airplane on the flight deck was recovered. This was turned over to the Underwater Ordnance Unit. The airplane was missing. The Mark 13 torpedo minus the warhead, was found on deck and turned over to the Underwater Ordnance Unit. The airplane in which it was mounted was missing.

5. Machine Gun Ammunition

All ammunition which was recovered was undamaged.

U.S.S. ARKANSAS (Approximately 400 yards)

The OS2U-3 airplane on this vessel was blown over the side and no Aviation Ordnance equipment was recovered.

U.S.S. NEW YORK (Approximately 1900 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Bombs and Fuzes

Undamaged.

4. Fixed Fire Control Equipment.

Undamaged. The nose and tail fuzes from one 100 lb. bomb was returned to the Naval Ordnance Laboratory, Washington, D.C. for laboratory inspection and report.

5. Machine Gun Ammunition

Undamaged.

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. NEVADA

1. Machine Guns

Machine Guns were rendered inoperable due to broken mechanical connections, but were otherwise undamaged. This was attributed to secondary rather than primary reasons as the airplanes were completely demolished. One .30 caliber machine gun was returned to the Naval Gun Factory, Washington, D. C. for laboratory inspection and report.

2. Bomb Racks and Shackles

This equipment, where recovered, remained operable with the exception of one Mark 41 Bomb Rack from which a 100 lb. bomb was torn. The internal mechanism of the rack appeared to be strained and loosened. This bomb rack was returned to the U.S. Naval Gun Factory, Washington, D. C., for laboratory inspection and report.

3. Bombs and Fuzes

One 100 lb. bomb was blown off the bomb rack and over the side. The other was recovered with no damage to the bomb body but with the tail assembly broken off. The arming vane and arming vane cup were sheared off the nose fuze. The arming vane, arming vane cup and arming spindle and housing were sheared off the tail fuze. Neither fuze had been fired but they were jammed and frozen in the bomb and were therefore jettisoned with the bomb because of their dangerous condition.

4. Fixed Fire Control Equipment

Both telescope sights were recovered; one undamaged and the other with badly scorched paint. The latter was returned to the Naval Gun Factory, Washington, D. C., for laboratory inspection and report.

5. Machine Gun Ammunition

Most of the twenty rounds of machine gun ammunition in the two airplanes was missing but a few recovered rounds showed no evidence of damage.

U.S.S. PENNSYLVANIA (Approximately 1800 yards)

1. Machine Guns

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "A" (Cont'd)

U.S.S. PENNSYLVANIA (Cont'd)

2. Bomb Racks and Shackles

This equipment was undamaged except for one bomb rack, Mark 50, Mod. 3, which had a 100 lb. bomb torn off it when the airplane was blown off the catapult to the main deck. This bomb rack was returned to the Naval Gun Factory, Washington, D.C. for laboratory inspection and report.

3. Bombs and Fuzes

One bomb was undamaged. The other was recovered from the starboard waterway aft where it had come to rest after being torn off the port bomb rack of the airplane when the airplane was blown off the catapult. The tail assembly had been bent at an angle of approximately 90 degrees. The arming vane and arming vane cup and arming spindle and housing were sheared off the tail fuze.. Neither fuze had been fired but were jettisoned with the bomb because of their dangerous condition. The nose and tail fuzes from the undamaged bomb were returned to the Naval Ordnance Laboratory, Washington, D.C. for laboratory inspection and report.

4. Fixed Fire Control Equipment

There was no apparent damage to this equipment but one Mark 3, Mod. 7, telescope sight was returned to the Naval Gun Factory, Washington, D.C. for laboratory inspection and report.

5. Machine Gun Ammunition

Undamaged.

U.S.S. PENSACOLA (Approximately 600 yards)

The airplane was blown over the side. No ordnance equipment was recovered.

U.S.S. SALT LAKE CITY (Approximately 1000 yards)

The airplane was blown over the side. No ordnance equipment was recovered.

U.S.S. GILLIAM (Approximately 200 yards)

This ship sunk with both airplanes and ordnance equipment.

U.S.S. BANNER (Approximately 1400 yards)

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. BANNER (Continued)

1. Machine Guns.

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. BARROW (Approximately 1300 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. BLADEN (Approximately 2600 yards)

1. Machine Guns

Undamaged.

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. BLADEN (Continued)

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. BUTTE (Approximately 2000 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. CARLISLE (Approximately 300 yards)

This ship was sunk with both airplanes and ordnance equipment.

U.S.S. CARTERET (Approximately 2000 yards)

1. Machine Guns

Machine guns in the starboard wing of the FG-1D airplane on deck were missing together with the wing panel in which they were mounted. Other guns remained undamaged.

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. CARTERET (Continued)

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Machine Gun Ammunition was missing together with the starboard wing of the FG-1D on deck. Other machine gun ammunition was undamaged.

U.S.S. CORTLAND (Approximately 3200 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. CRITTENDEN (Approximately 500 yards)

1. Machine Guns

The starboard wing guns of the FM-2 airplane on deck were rendered inoperable because of major damage to the wing in which they were mounted. The guns themselves were undamaged.

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. CRITTENDEN (Continued)

2. Bomb Racks and Shackles

The internal mechanism of the bomb shackle of the FM-2 airplane on deck was damaged when the droppable fuel tank was torn from it by the blast. Other bomb racks and shackles were undamaged.

3. Fixed Fire Control Equipment

The sunfilter of the gun sight mounted in the FM-2 on deck was broken by the collapsing canopy. Other fire control equipment was undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. DAWSON (Approximately 900 yards)

1. Machine Guns

The port inboard gun of the F6F-5N on deck was wrenched off its mount, but was otherwise undamaged. The starboard inboard gun had a broken back plate. Other guns were undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

The Gunsight of the FM-2 in the hold was smashed when the overhead latch covers fell on it. Other equipment was undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. FALLON (Approximately 1400 yards)

1. Machine Guns

Undamaged.

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. FALLON (Continued)

2. Bomb Racks and Shackles

The starboard wing bomb shackle of the FG-1D on deck was binding and operated very stiffly. This was attributed to the torsional effect placed on it by twisting of the wing. Other equipment was undamaged.

3. Fixed Fire Control Equipment

The gunsight of the FM-2 in the hold was smashed by falling overhead hatch covers. Other equipment was undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. FILLMORE (Approximately 2500 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

The gunsight of the FM-2 in the hold was smashed by falling overhead hatch covers. Other equipment undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. GASCONADE (Approximately 2800 yards)

1. Machine Guns

Undamaged.

AVIATION ORDNANCE (Continued)

DAMAGE SUSTAINED IN TEST "A" (Continued)

U.S.S. CASCONADE (Continued)

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. NIAGARA (Approximately 4000 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

AVIATION ORDNANCE

DAMAGE SUSTAINED IN TEST "B"

U.S.S. SARATOGA (Approximately 500 yards)

This ship was sunk with the loss of all airplanes and aviation ordnance equipment on board. Airplanes on the flight deck were blown or washed overside before the ship sank.

U.S.S. INDEPENDENCE (Approximately 500 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. NEW YORK (Approximately 1200 yards)

1. Machine Guns

Undamaged.

2. Bombs and Fuses

Undamaged. The fuses from a 100 lb. bomb were returned to Naval Ordnance Laboratory, Washington, D.C., for laboratory inspection and report.

3. Bomb Racks and Shackles

Undamaged.

4. Fixed Fire Control Equipment

Undamaged.

5. Machine Gun Ammunition

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. PENNSYLVANIA (Approximately 1400 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Removed from airplane prior to Test "B".

U.S.S. [redacted] (Approximately 2300 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged. One Station Distribution, Mark 3, Mod. 1, was returned to the Naval Gun Factory, Washington, D.C., for laboratory inspection and report.

4. Machine Gun Ammunition

Undamaged.

U.S.S. BARROW (Approximately 1900 yards)

1. Machine Guns

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. BARROW (Cont'd)

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. BLADEN (Approximately 2400 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. BRACKEN (Approximately 1800 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. BRACKEN (Cont'd)

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. BRISCOE (Approximately 1200 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Rockets and Fuzes

One 5.0" HVAR was missing. Four others had been shocked off the launchers and were lying n deck. In each case, the after suspension lugs on the Mk. 5 launchers were badly bent. However, the wings of the airplane had been folded due to lack of space and the rockets therefore were supported in a nose down attitude at an angle of approximately 15° from the vertical. It is believed that this casualty would not have occurred had the wings of the airplane been spread. The Mk. 149 nose fuzes of the rockets on deck were badly battered and apparently armed. These were jettisoned with the rockets. The Mk. 149 nose fuse of the rocket remaining on the airplane was recovered and returned to the Naval Ordnance Laboratory, Washington, D. C., for laboratory inspection and report.

4. Fixed Fire Control Equipment

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. BRISCOE (Cont'd)

5. Special Fire Control Equipment

The Mk. 23 Gunsight was recovered with no visible evidence of damage and returned to the Naval Ordnance Plant, Indianapolis, Indiana for laboratory inspection and report.

6. Machine Gun Ammunition

Undamaged.

U.S.S. BRULE (Approximately 800 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

5. Rockets and Fuses

Undamaged.

U.S.S. BUTTE (Approximately 2700 yards)

1. Machine Guns

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. BUTTE (Cont'd)

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. CARTERET (Approximately 3000 yards)

1. Machine Guns

No damage as a result of Test "B", Guns in starboard wing of airplane on deck were missing together with wing as a result of Test "A".

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. CORTLAND (Approximately 3600 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. CORTLAND (Cont'd)

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. CRITTENDEN (Approximately 1500 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. DAWSON (Approximately 1300 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. DAWSON (Cont'd)

4. Machine Gun Ammunition

Undamaged.

U.S.S. FALLON (Approximately 500 yards)

The airplane on the deck of this ship was blown over the side. The airplane in the hold was submerged in approximately nine feet of water and fuel oil. Inspection was impossible.

U.S.S. FILLMORE (Approximately 2100 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. CASCONADE (Approximately 800 yards)

1. Machine Guns

One starboard wing gun of the airplane on deck suffered a broken backplate latch when the wing in which it was mounted came in violent contact with the deck. Other guns were undamaged.

2. Bomb Racks and Shackles

One bomb shackle was strained and twisted when the auxiliary fuel tank of the plane on deck was wrenched off it. Other racks and shackles were undamaged

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. CASCO (Cont'd)

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. GENEVA (Approximately 2800 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

U.S.S. NIAGARA (Approximately 3200 yards)

1. Machine Guns

Undamaged.

2. Bomb Racks and Shackles

Undamaged.

AVIATION ORDNANCE (Cont'd)

DAMAGE SUSTAINED IN TEST "B" (Cont'd)

U.S.S. NIAGARA (Cont'd)

3. Fixed Fire Control Equipment

Undamaged.

4. Machine Gun Ammunition

Undamaged.

~~S-E-C-R-E-T~~

AVIATION ORDNANCE

LIST OF AVIATION ORDNANCE MATERIAL RETURNED FOR LABORATORY INSPECTION AND REPORT

ITEM	TARGET SHIP	AIRPLANE	TEST	DESTINATION
Gyro, Mk. 20, Mod. 1 from Bomb Director, Mk. 1, Mod. 2 (1)	SARATOGA	SBF-4E Flight Deck	"A"	Naval Ordnance Plant, Indianapolis, Indiana
Bombsight, Mk. 23 (1)	SARATOGA	TBM-3E Flight Deck	"A"	Naval Ordnance Plant, Indianapolis, Indiana
Gunsight, Mk. 23 (1)	SARATOGA	F6F-5N Flight Deck	"A"	Naval Ordnance Plant, Indianapolis, Indiana
Bombsight Mk. 15 (1)	SARATOGA	TBM-3E Flight Deck	"A"	Naval Ordnance Plant, Indianapolis, Indiana
Machine Gun .30 Cal. (1)	NEVADA	OS2U-3 Main Deck	"A"	Naval Gun Factory, Washington, D. C.
Bomb Rack Mk. 41 (1)	NEVADA	OS2U-3 Catapult	"A"	Naval Gun Factory, Washington, D. C.
Telescope sight Mk. 3, Mod. 7 (1)	NEVADA	OS2U-3 Main Deck	"A"	Naval Gun Factory, Washington, D. C.
Bomb Rack Mk. 50, Mod. 3	PENNSYLVANIA	OS2U-3 Catapult	"A"	Naval Gun Factory, Washington, D. C.
Telescope Sight, Mk. 3, Mod. 7	PENNSYLVANIA	OS2U-3 Main Deck	"A"	Naval Gun Factory, Washington, D. C.
Bomb Rack Mk. 51, Mod. 7 (1)	INDEPENDENCE	F6F-5N Flight Deck	"A"	Naval Gun Factory, Washington, D. C.
Machine Guns Twin Mount, .30 Cal. (2)	INDEPENDENCE	SBF-43 Flight Deck	"A"	Naval Gun Factory, Washington, D. C.

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Enclosure (D) to Director Ship Material Serial 001500.

AVIATION ORDNANCE (Cont'd)

LIST OF AVIATION ORDNANCE MATERIAL RETURNED FOR LABORATORY INSPECTION AND REPORT (Cont'd)

ITEM	TARGET SHIP	AIRPLANE	TEST	DESTINATION
Gunsight Mk. 23 (1)	BRISCOE	F6F-5N O1 Deck	"B"	Naval Ordnance Plant Indianapolis, Indiana
Intervalometer K2 (1)	INDEPENDENCE	TBM-3E Flight Deck	"A" "B"	Naval Gun Factory, Washington, D. C.
Station Distributor Mk. 3, Mod. 1 (1)	BANNER	FG-1D Main Deck	"A" "B"	Naval Gun Factory, Washington, D. C.
Station Distributor SD-1 (1)	INDEPENDENCE	TBM-3E Flight Deck	"A" "B"	Naval Gun Factory, Washington, D. C.
Belt Links, .50 Cal. (11)	NIAGARA	F6F-5N Main Deck	"A" "B"	Naval Gun Factory, Washington, D. C.
Machine Gun .50 Cal. (1)	NIAGARA	F6F-5N Main Deck	"A" "B"	Naval Gun Factory, Washington, D. C.
Hydraulic .50 Cal. Gun Charger	NIAGARA	F6F-5N	"A" "B"	Naval Gun Factory, Washington, D. C.
Fuze, Nose ANM103A1 (2)	SARATOGA	SBF-43 Flight Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Tail ANM101A2 (2)	SARATOGA	SBF-43 Flight Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Nose Mk. 149 (6)	SARATOGA	F6F-5N Flight Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Nose ANM103A1 (2)	PENNSYLVANIA	OS2U-3 Main Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.

Enclosure (D) to Director Ship Material Serial 001500.

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AVIATION ORDNANCE (Cont'd)

LIST OF AVIATION ORDNANCE MATERIAL RETURNED FOR LABORATORY INSPECTION AND REPORT (Cont'd)

ITEM	TARGET SHIP	AIRPLANE	TEST	DESTINATION
Fuze, Tail ANM100A2 (1)	PENNSYLVANIA	OS2U-3 Main Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Tail ANM100A2 (1)	NEVADA	OS2U-3 Main Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Nose ANM103A1 (1)	NEW YORK	OS2U-3 Main Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Tail M115	NEW YORK	OS2U-3 Main Deck	"A"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Nose Mk. 149 (1)	BRISCOE	F6F-5N Main Deck	"B"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Tail ANM100A2 (1)	NEW YORK	OS2U-3 Main Deck	"B"	Naval Ordnance Laboratory, Washington, D. C.
Fuze, Nose ANM103A1 (1)	NEW YORK	OS2U-3 Main Deck	"B"	Naval Ordnance Laboratory, Washington, D. C.

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AVIATION ORDNANCE

SUMMARY OF DAMAGE IN TESTS "A" AND "B".

Examination of the damage to Aviation Ordnance Equipment after Tests "A" and "B" served only to point up the inherent sturdiness of this equipment in relation to the airplanes in or on which it was mounted. While damage to aircraft in both tests varied from complete destruction and/or loss to no damage, the damage to Aviation Ordnance equipment directly attributable to the forces of the bombs was negligible or non-existent. Where damage did occur, it was principally of a secondary nature, i.e. from flying or falling debris, collapse of supporting structures, etc. Where guns, bomb racks, fire control apparatus and firing circuits were rendered inoperable because of broken electrical and mechanical connections due to collapse of supporting structures, the units proper still remained operable. Damage to bomb tails and fuzes and rockets and fuzes was attributed to their striking or tumbling end over end on deck. Damage due to rust and corrosion was attributed to the long exposure of this equipment to extremely adverse weather conditions during the period of the tests and the decontamination procedures carried out subsequent to each test. While radioactive contamination in Test "B" was much higher than in Test "A", in no case was there evidence of the radioactivity affecting adversely the efficiency or operability of the equipment insofar as the equipment itself was concerned.

CONCLUSION

Aviation Ordnance material at the present time is far stronger structually than the airplanes in or on which it is mounted and therefore no major changes in design appear to be warranted until the airplanes themselves are strengthened. Complete loss of Aviation Ordnance Equipment as operable units may be expected from an atomic bomb air burst within a radius of 1000 yards due to loss or complete demolition of the airplane in which it is mounted. Outside this radius, although airplanes will receive damage to a varying degree, damage to Aviation Ordnance Equipment will be comparatively light and may be quickly repaired by routine maintenance and upkeep. The extent of damage attributable to a shallow underwater burst will be substantially the same although the effective radius is reduced to about 500 yards.

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Defense Special Weapons Agency
6801 Telegraph Road
Alexandria, Virginia 22310-3398

TRC

18 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER
ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

~~AD-366584~~	XRD-203-Section 12
~~AD-366585~~ AD-366589	XRD-200-Section 9
~~AD-366590~~	XRD-204-Section 13
~~AD-366591~~	XRD-183
AD-366586	XRD-201-Section 10
~~AD-367487~~	XRD-131-Volume 2
~~AD-367516~~	XRD-143
~~AD-367493~~	XRD-142
~~AD-801410L~~	XRD-138
~~AD-376831L~~	XRD-83
~~AD-366759~~	XRD-80
~~AD-376830L~~	XRD-79
~~AD-376828L~~	XRD-76
~~AD-367464~~	XRD-106
~~AD-801404L~~	XRD-105-Volume 1
~~AD-367459~~	XRD-100

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Subject: Declassification of Reports

AD-367491	XRD-134-Volume 2
AD-367479	XRD-123
AD-367478	XRD-122
AD-367481	XRD-125
* AD-367500	XRD-159-Volume
AD-367499	XRD-160-Volume 3
AD-367498	XRD-161-Volume 4
AD-367512	XRD-147
AD-367511	XRD-148
AD-367465	XRD-107
AD-366733	XRD-43
AD-367477	XRD-121
AD-367476	XRD-120
AD-367467	XRD-109-Volume 1
AD-367475	XRD-119
AD-367474	XRD-118
AD-367473	XRD-117
AD-367472	XRD-116
AD-367471	XRD-115
AD-367466	XRD-108
AD-801405L	XRD-113
AD-367470	XRD-112
AD-367469	XRD-111

TRC 18 April 1997

Subject: Declassification of Reports

~~AD-901406L~~ ✓ XRD-114

In addition, all of the cited reports are now **approved for public release; distribution statement "A" now applies.**

Ardith Jarrett

ARDITH JARRETT
Chief, Technical Resource Center